



**2019 WESTERN SNOWY PLOVER AND CALIFORNIA LEAST TERN
MONITORING REPORT
GUADALUPE-NIPOMO DUNES
NATIONAL WILDLIFE REFUGE
SAN LUIS OBISPO COUNTY, CALIFORNIA**

January 2020

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PREPARED FOR: Hopper Mountain National Wildlife Refuge Complex
United States Fish and Wildlife Service

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Table of Contents

EXECUTIVE SUMMARY	i
1.0 INTRODUCTION	1-1
2.0 SURVEY AREAS.....	2-1
3.0 METHODS	3-1
4.0 RESULTS AND DISCUSSION.....	4-1
4.1 Western Snowy Plover Numbers	4-1
4.2 Western Snowy Plover Nests.....	4-3
4.3 Western Snowy Plover Nest Depredation.....	4-7
4.4 Western Snowy Plover Nest Exclosures.....	4-8
4.5 Western Snowy Plover Eggs and Chicks.....	4-9
4.6 Trespass Incidents within Western Snowy Plover Habitat.....	4-10
4.7 California Least Tern Numbers	4-10
5.0 CONCLUSIONS AND RECOMMENDATIONS	5-1
5.1 Monitoring Study Conclusions for the 2019 Period.....	5-1
5.2 Conservation Recommendations for the 2020 Monitoring Period.....	5-1
6.0 REFERENCES	6-1

List of Tables

1. Survey Dates and Western Snowy Plover Numbers in 2019
2. Color Banded Western Snowy Plovers Recorded in 2019
3. Western Snowy Plover Nest Locations in 2019
4. Predator Observations in 2019

List of Figures

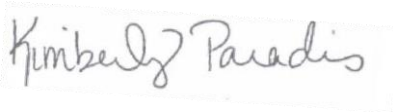
1. Regional Vicinity Map
2. Western Snowy Plover Nest Locations and Fates
3. Adult Western Snowy Plovers Observed During the Winter Range-Wide Survey: 2002-2019
4. Adult Western Snowy Plovers Observed During the Breeding Range-Wide Survey: 2002-2019
5. Western Snowy Plovers Observed Per Month – 2019
6. Western Snowy Plover Breeding Pairs Observed Per Week – 2019
7. Western Snowy Plover Nests and Hatching Success: 2002-2019
8. Fate of Western Snowy Plover Nests – 2019
9. Western Snowy Plover Nests Located by Month – 2019
10. Western Snowy Plover Nests by Location – 2019
11. Western Snowy Plover Eggs Hatched Per Season: 2002-2019

List of Acronyms

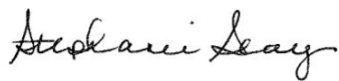
CAHFS	California Animal Health and Food Safety Laboratory
CDFW	California Department of Fish and Wildlife
FESA	Federal Endangered Species Act
GRP	Guadalupe Restoration Project
KP	Kimberly Paradis (Lead Project Scientist, Trihydro Corporation)
LETE	California Least Tern
MOU	Memorandum of Understanding
ODSVRA	Oceano Dunes State Vehicular Recreation Area
Refuge	Guadalupe-Nipomo Dunes National Wildlife Refuge
SBMNH	Santa Barbara Museum of Natural History
SS	Stephanie Seay (Compliance/ Project Biologist, Trihydro Corporation)
Trihydro	Trihydro Corporation
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
VAFB	Vandenberg Air Force Base
WSPL	Western Snowy Plover

AUTHENTICITY AND SIGNATURE PAGE

Trihydro Corporation (Trihydro) hereby certifies that all statements furnished in the following *Western Snowy Plover and California Least Tern Monitoring Report* and all supporting information required for the biological evaluation are true and correct to the best of our knowledge and belief. I, Kimberly K. Paradis, certify that the information in this survey report, and its exhibits, fully and accurately represent my work and those individuals listed on my permit as sub-permittees. Further, we certify that all field surveys associated with this report were performed utilizing the protocol developed by the United States Fish and Wildlife Service (USFWS). All activities were conducted pursuant to my USFWS 10a1A Recovery Permit (211100-0) and a California Department of Fish and Wildlife (CDFW) Scientific Collecting Permit (10627) for recovery activities associated with the western snowy plover. Lastly, this authorization page and its signatures certify that the below listed individuals were the primary authors of the following Western Snowy Plover Survey Report.



Kimberly K. Paradis
Lead Project Scientist



Stephanie M. Seay
Compliance/Project Biologist



EXECUTIVE SUMMARY

Trihydro Corporation (Trihydro) has prepared this report to document the results of western snowy plover (*Charadrius nivosus nivosus*) (WSPL) and California Least Tern (*Sternula antillarum browni*) (LETE) surveys and monitoring events conducted during the 2019 breeding season at the Guadalupe-Nipomo Dunes National Wildlife Refuge (Refuge), located in San Luis Obispo County, California. Trihydro biologists who perform the WSPL and LETE surveys are permitted by the United States Fish and Wildlife Service (USFWS) to independently survey for the WSPL as permittees or sub-permittees under the USFWS Recovery Permit 10(a)(1)(A) TE-211100-0 and the California Department of Fish and Wildlife (CDFW) Memorandum of Understanding (MOU) SCP-10627. Trihydro biologists survey in accordance to the monitoring guidelines included in Appendix J of the USFWS Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (U.S Fish and Wildlife, 2007).

The USFWS requires the submittal of an annual report to the Recovery Permit Coordinator at the USFWS Ventura Fish and Wildlife Office following each year that surveys are conducted when the permit is in effect. The USFWS also requires submittal of an annual report to the Refuge Manager at the end of the breeding season.

The start date for the WSPL breeding season is March 1st, and the start date for the LETE breeding season is mid-May. Monitoring of breeding WSPL and LETE began at the Refuge March 26th and concluded September 25th. WSPL were present during all 28 surveys conducted during this period. An average of 16 WSPL were observed per survey at the Refuge. LETE were heard flying over the beach in July. No LETE were observed roosting or landing on the Refuge in 2019.

A total of 37 WSPL nests were located within the survey area. The number of hatched WSPL nests observed in 2019 was one of the lowest years on record. Refer to Figure 2 – Western Snowy Plover Nest Locations and Fates. The WSPL nests were present within suitable habitat during the period from March 26th to August 8th, with the last chicks fledging on September 4th, 2019. Of the 37 nests, 10 nests hatched successfully (27 percent), 25 failed (68 percent) and 2 had an unknown fate (5 percent). The 37 WSPL nests contained a total of 93 eggs, of which 28 hatched (30 percent). No nesting LETE were observed at the Refuge within 2019. Although the Refuge contains suitable habitat for breeding LETE, nesting LETE have never been observed by biologists at the Refuge.

In 2019, a total of 15 confirmed WSPL nest depredations were identified at the Refuge. Common ravens (*Corvus corax*) were the most common confirmed nest predator, responsible for four of the nest depredations (27 percent). Coyote (*Canis latrans*) were responsible for two depredations (13 percent) and unidentified predators were responsible for a total of nine predations (60 percent). Due to high winds in the beginning of the season, tracks were difficult to find. Other possible predators observed on the beach were gull spp. (*Larus* spp.), and peregrine falcon (*Falco peregrinus*).

1.0 INTRODUCTION

Trihydro Corporation (Trihydro) has prepared this report to document the results of western snowy plover (*Charadrius nivosus nivosus*) (WSPL) and California Least Tern (*Sternula antillarum browni*) (LETE) surveys and monitoring events conducted during the breeding season at the Guadalupe-Nipomo Dunes National Wildlife Refuge (Refuge). Refer to Figure 1 – Site Location Map. The WSPL taxon is listed as a threatened species and the LETS is listed as an endangered species under the Federal Endangered Species Act (FESA). The Trihydro biologists who performed the surveys are permitted by the United States Fish and Wildlife Service (USFWS) to independently survey under the direction of Ms. Kimberly Paradis, who maintains USFWS Recovery Permit 10(a)(1)(A) TE-211100-0 and the California Department of Fish and Wildlife (CDFW) Memorandum of Understanding (MOU) SCP-10627. Ms. Stephanie Seay is a sub-permittee on Ms. Paradis' permit.

2.0 SURVEY AREAS

The survey area includes the coastal region that defines the western margin of the Refuge. The eastern boundary of the survey area is roughly designated by the elevated foredunes that extend north to south along the western margin of the Refuge. In some areas, the foredunes are less steep and the WSPL have been known to nest farther back in the habitat. The western border of the survey area is roughly the mean high tide line along the Pacific Ocean. The northern border of the survey area is the Oceano Dunes State Vehicular Recreation Area (ODSVRA) at Oso Flaco Lake. The southern border of the survey area is the Guadalupe Restoration Project (GRP). The length of the Refuge survey area between the northern and southern boundaries is approximately 1.8 miles. There are six signs located throughout the beach (referred to as signs No. 0 through No. 5), which are used as markers, starting at No. 0 on the northern Refuge boundary. The signs are spaced approximately 0.3 miles apart from one another. It should be noted that markers No. 3 and No. 4 will need to be replaced prior to the 2020 season. Refer to Figure 2 – Western Snowy Plover Nest Locations.

Habitat types within the survey area that provide suitable WSPL and LETS nesting habitat include beach, foredune, and vegetated back dunes interspersed with open areas of sand. Habitat heterogeneity includes driftwood of various sizes, wrack (surf-cast kelp), and some anthropogenic debris. The deposited natural debris adds heterogeneity that provides camouflage from predators benefiting WSPL nests. Throughout the nesting season, the beach receives periodic influxes of wrack that provides refuge and breeding opportunities to invertebrates that are readily consumed by WSPL.

It should be noted that during the WSPL surveys, the biologists identified several areas of European beachgrass (*Ammophila arenaria*) and ice plant (*Carpobrotus edulis*) spread throughout the back dunes of the WSPL habitat within the Refuge. An invasive species removal program is in effect to remove the beachgrass and ice plant within the dunes. In 2019, WSPL were found nesting on the southern portion of the beach where ice plant had been sprayed. The removal of these species will continue to improve the nesting habitat for WSPL.

3.0 METHODS

Trihydro biologists, Ms. Kimberly Paradis and Ms. Stephanie Seay, conducted pedestrian surveys of all potential WSPL and LETE habitat within the Refuge survey area once per week. Kimberly also used a small off-road vehicle to place and remove WSPL exclosures and to count birds after all the nests were hatched. Additionally, ODSVRA biologists surveyed the area by vehicle periodically to observe banded birds.

During the 2019 WSPL and LETE nesting season, the Trihydro biologists coordinated with ODSVRA biologists and predator managers, the Santa Barbara County Rancho Guadalupe Dunes Preserve biologists, and the United States Department of Agriculture (USDA) Wildlife Services' representatives to collect as much information as possible about predators, most specifically common ravens and peregrine falcons at the landscape level.

During each survey, the biologists followed a designated route through the survey area, beginning at the southern Refuge boundary. Then the biologists walked north along the western edge of the foredunes through the WSPL and LETE habitat and returned south outside of the habitat to look for WSPL, LETE, or nests that were located outside of the signs that delineate the breeding area to the public. The survey route was traveled in reverse every other survey period. The biologists would routinely take minor deviations from the route to follow tracks or other evidence of WSPL or LETE activity. Each survey involved, on average, six miles of walking.

Biologists walked the survey route, stopping at approximately 100-meter intervals, scanning 360-degrees for WSPL and LETE with the aid of binoculars. Then noting the number of individuals, their approximate age, sex, and the presence of colored leg identification bands. When a WSPL was observed with colored leg identification bands, extra effort was made to record the band combinations. As WSPL tend to visit their nests several times a day during the nest initiation and egg-laying stages, scanning areas with dense concentrations of WSPL footprints was the primary technique used to locate active WSPL nests. Areas of high concentrations of WSPL nest scrapes prior to egg deposition were also noted during each survey as potential indicators of nest locations. Nests were also located by biologists opportunistically by observing the behaviors of adult WSPL (e.g., adult WSPL flushing or leaving nests and wing feigning).

During each survey, the status of every nest was checked and assigned to one of the following categories:

- **Active/Tended** – Eggs present, with adults or fresh tracks near the nest.
- **Hatched** – Chicks or egg pips (small fragments of eggshell produced during hatching) present in nest.

- **Depredated** – Nest lost to a predator. If possible, monitor identifies the predator to species or group (mammalian, avian) otherwise describes the nest as lost to an unidentified predator.
- **Abandoned pre-term** – Nest abandoned prior to the expected hatch date; cause may include, but are not limited to, disturbance or adult mortality.
- **Abandoned post-term** – Nest incubated past the expected hatch date. Eggs unviable and eventually abandoned.
- **Fail to unknown cause** – Nests that disappear 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, also nests that have insufficient information to estimate an initiation date.

An index card was designated for each nest which included the nest's status and location to be used during each survey. Nests were located during each subsequent survey using the five numbered signs within the habitat and recognizable landmarks illustrated on the nest cards. The location data was placed on a map indicating the final status of each nest based on color (refer to Figure 2). Any predators, predator tracks, or human foot traffic that was observed during each survey were recorded. Additionally, the time of the survey, biologist's name, weather (i.e., wind speed and temperature), prior weather, visibility, estuary height, surf conditions, the presence of fisherman, beachcombers, and surfers were also recorded. The data was collected in field notebooks and transferred to an electronic database. When colored leg identification bands were observed, the unique color combinations observed on any individual WSPL were reported via email to the WSPL band reporting group. Reporting WSPL colored leg identification bands observations helped provide understanding of the range-wide status, survival, movements, and distribution of the species.

4.0 RESULTS AND DISCUSSION

4.1 WESTERN SNOWY PLOVER NUMBERS

Trihydro biologists conducted the annual winter range-wide window survey on January 29th, 2019 and the breeding range-wide window survey on May 21st, 2019. Refer to Figure 3 – Adult Western Snowy Plovers Observed During Winter Range-Wide Survey: 2002-2019 and Figure 4 – Adult Western Snowy Plover Numbers During the Breeding Range-Wide Window Survey: 2002-2019. The winter window survey documented a total of 8 birds and the breeding window survey documented a total of 15 birds.

FIGURE 3. ADULT WESTERN SNOWY PLOVERS OBSERVED DURING THE WINTER RANGE-WIDE SURVEY: 2002-2019

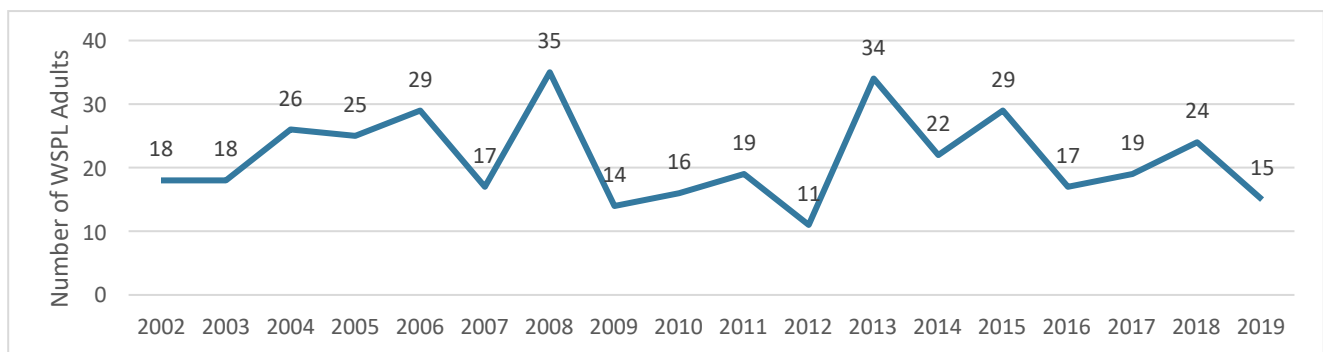
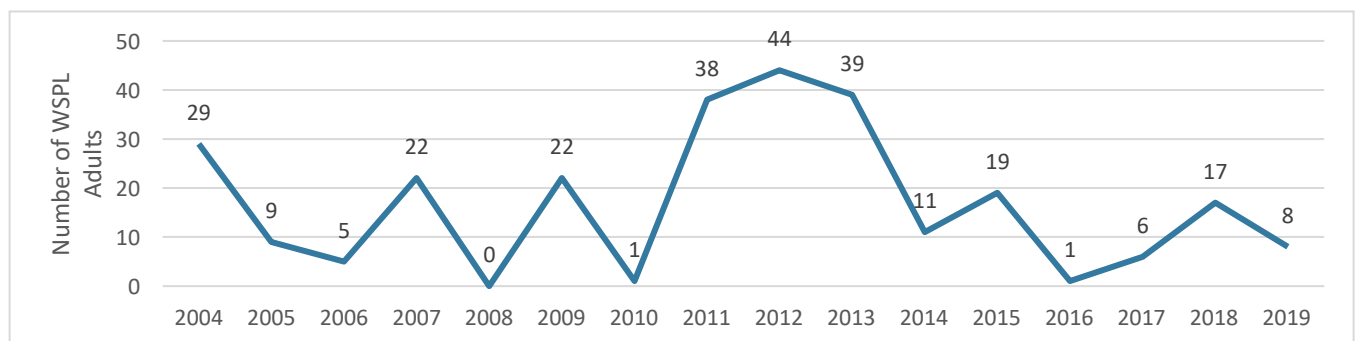
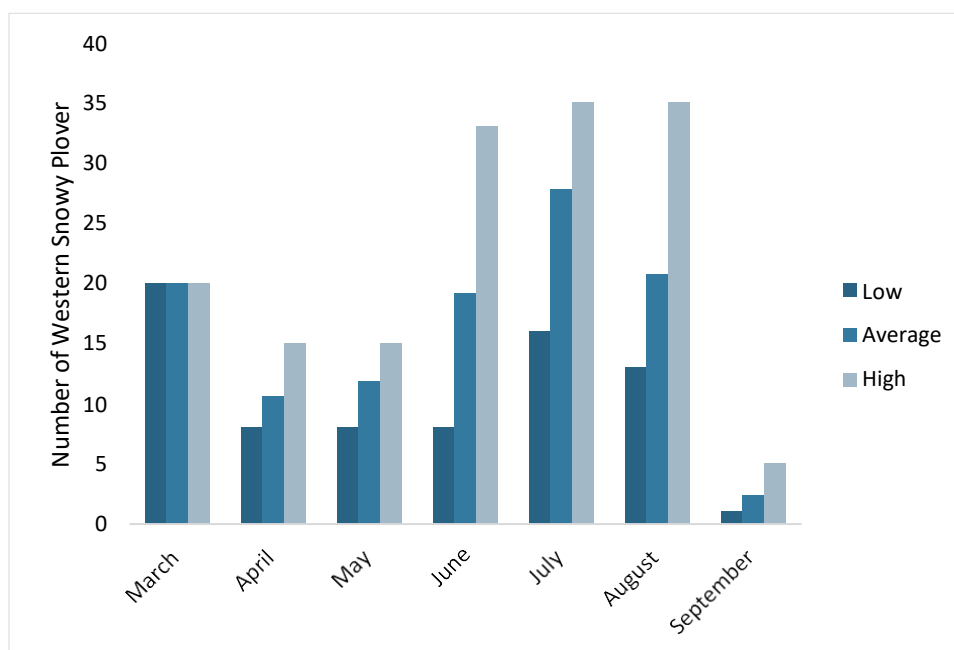


FIGURE 4. ADULT WESTERN SNOWY PLOVERS OBSERVED DURING THE BREEDING RANGE-WIDE SURVEY: 2002-2019



Trihydro biologists conducted 28 surveys during the period from March 26th to September 25th, 2019. Refer to Table 1 – Survey Dates and Western Snowy Plover Numbers. The average number of WSPL observed during each survey throughout the nesting season was 16, similar to 2017 and 2018 where an average 17 WSPL were observed each year. The number of WSPL counted each survey ranged from a minimum of 1 on September 12th and 18th, 2019 to a maximum of 35 observed on July 5th and 9th, and August 28th, 2019. The number of WSPL observed per month throughout the nesting season is presented in Figure 5 – Western Snowy Plovers Observed per Month - 2019, which depicts the monthly low, average, and high number of WSPL observed.

FIGURE 5. WESTERN SNOWY PLOVERS OBSERVED PER MONTH - 2019

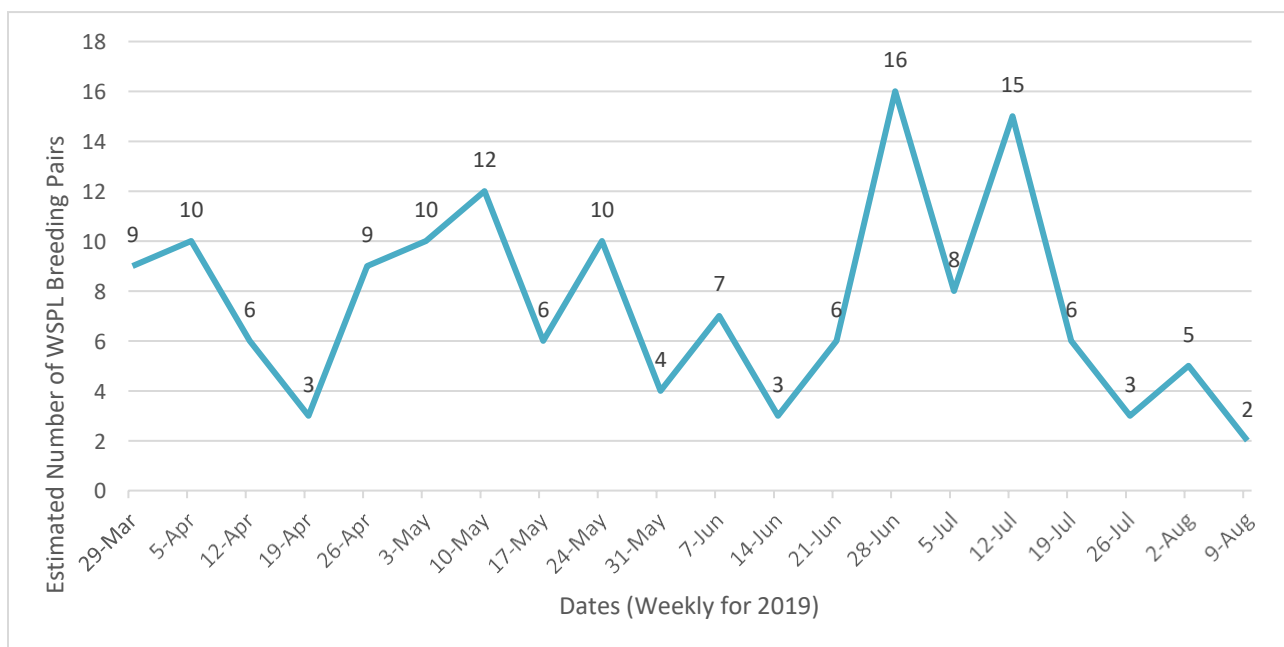


The number of breeding WSPL pairs observed weekly is presented on Figure 6 – Western Snowy Plover Breeding Pairs Observed per Week - 2019. Not all birds were observed during each survey due to weather conditions or due to birds moving into the back dunes with broods. The highest number of pairs (16 pairs) were seen in late-June. The average number of breeding pairs observed in each month are presented below:

- March – 9 breeding pairs
- April – 6 breeding pairs
- May – 7 breeding pairs
- June – 7 breeding pairs

- July – 8 breeding pairs
- August – 4 breeding pairs

FIGURE 6. WESTERN SNOWY PLOVER BREEDING PAIRS OBSERVED PER WEEK - 2019

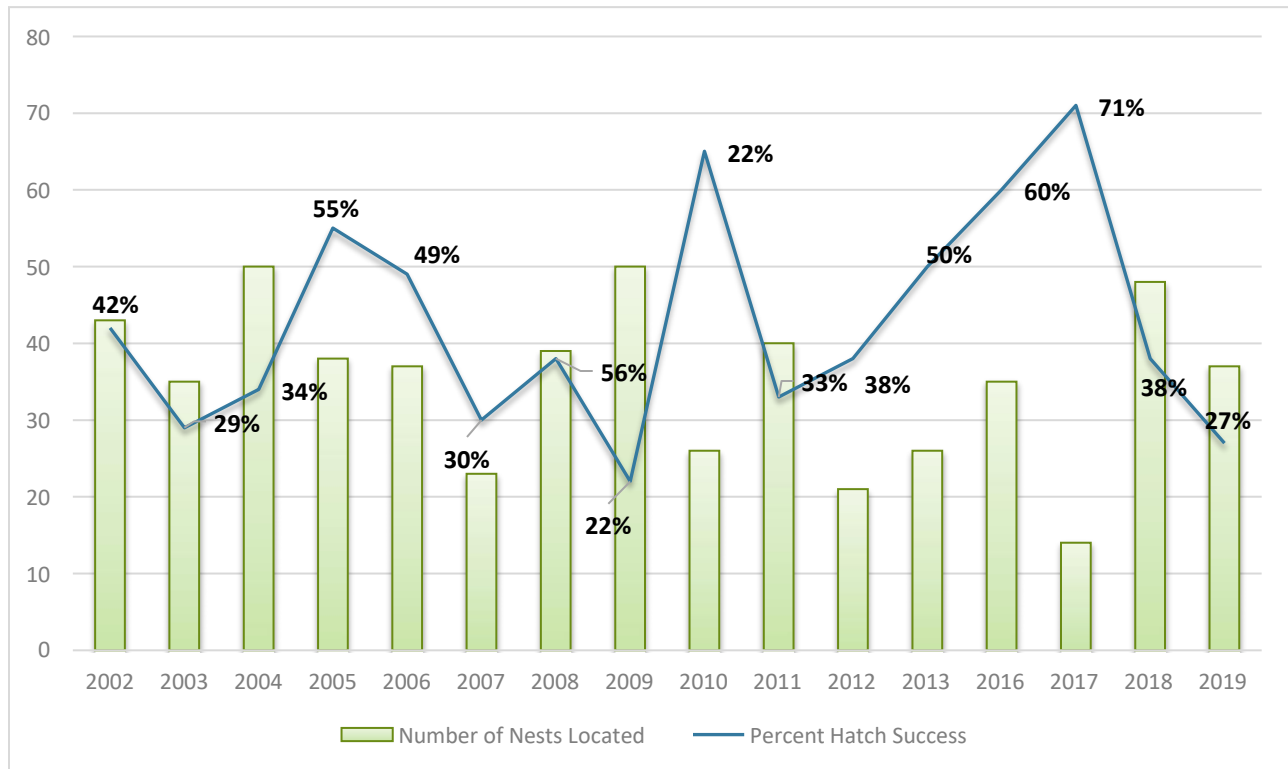


Among the WSPL observed at the Refuge, 26 individuals were marked with identification leg bands, which were placed on the birds at various research areas throughout the WSPL breeding range, less than the number observed 2018. Refer to Table 2 – Color Banded Western Snowy Plover Recorded. The majority of the banded WSPL were banded at ODSVRA (22). Of the 22 banded WSPL from ODSVRA, 4 were fledglings banded in 2019. Four birds observed at the Refuge were banded at Vandenberg Air Force Base (VAFB) in 2015 and 2016. There were some WSPL that were recorded with colored bands, however, we were unable to locate their origin.

4.2 WESTERN SNOWY PLOVER NESTS

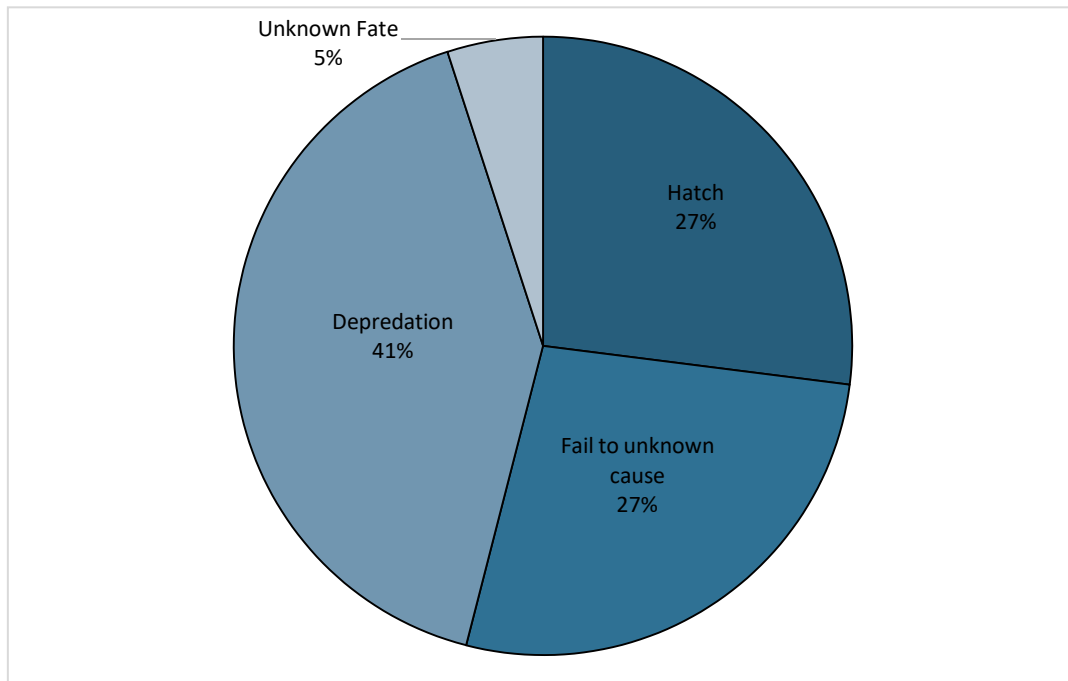
In 2019, a total of 37 WSPL nests were located within the survey area. The WSPL nests were present within suitable habitat during the period March 26th to August 8th, with the last brood expecting to have fledged on September 4th, 2019. Of the 37 nests, 10 nests hatched successfully (27 percent), 25 failed (68 percent), and 2 nests had unknown fates (5 percent). The number of WSPL nests identified at the Refuge in 2019 (37) was lower than the number of nests identified in 2018, but higher than the average number of nests found since 2002. Refer to Figure 7 – Western Snowy Plover Nests and Hatching Success: 2002-2019.

FIGURE 7. WESTERN SNOWY PLOVER NESTS AND HATCHING SUCCESS: 2002-2019



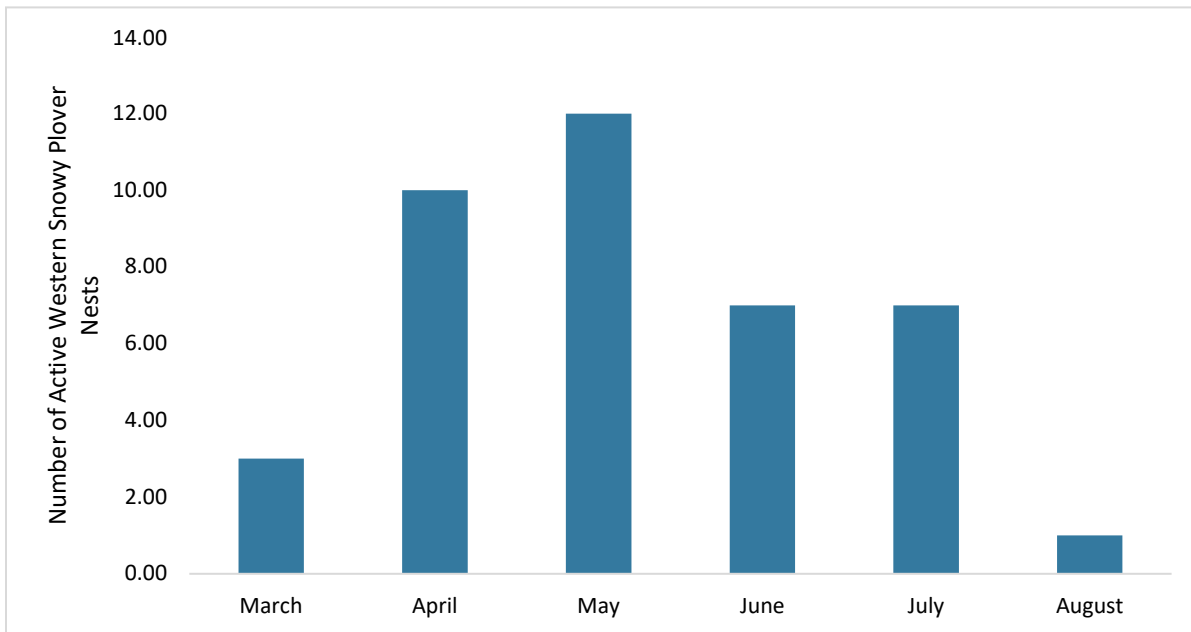
Of the 25 nests that failed, 10 nests (27 percent) failed due to an unknown cause, 15 nests (41 percent) were depredated, and 2 nests (5 percent) had an unknown fate. Refer to Figure 8 – Fate of Western Snowy Plover Nests - 2019.

FIGURE 8. FATE OF WESTERN SNOWY PLOVER NESTS - 2019



The first nest was observed on March 26th, 2019, and the last nest hatched on August 8th, 2019. The nest location data is presented in Table 3 – Western Snowy Plover Nest Locations. May was the most productive nesting month of the WSPL nesting season, with a maximum of 12 active nests. Refer to Figure 9 – Western Snowy Plover Nests Located by Month - 2019.

FIGURE 9. WESTERN SNOWY PLOVER NESTS LOCATED BY MONTH - 2019



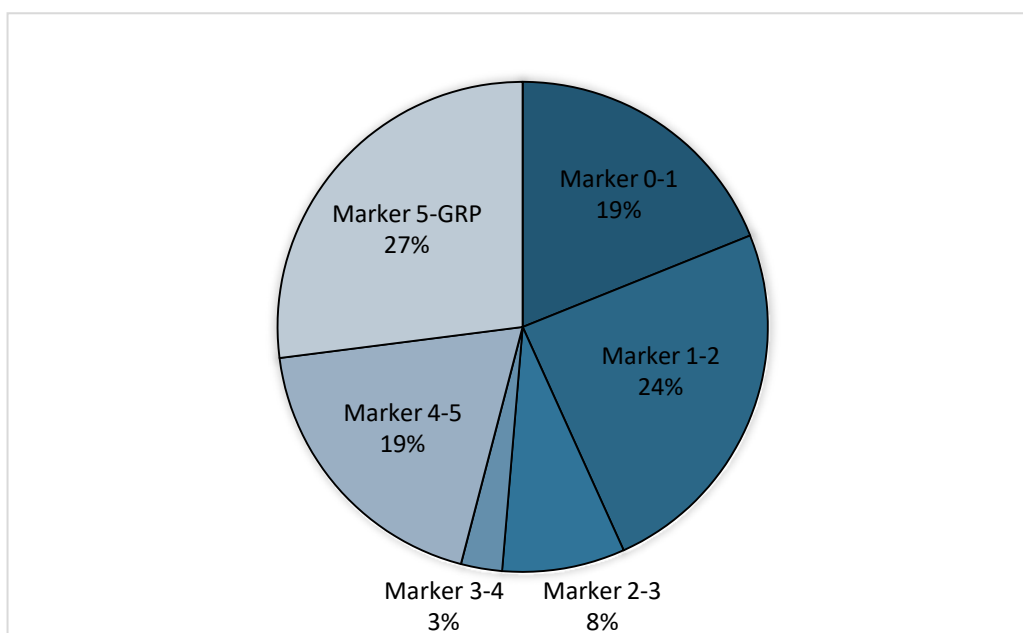
Some of the WSPL nests were not located before clutch completion (i.e., before there were three eggs in the nest), which made it difficult to calculate an accurate expected hatch date (i.e., approximately 27 days from the day of clutch completion). The Trihydro biologists assigned approximate hatching dates to the nests by estimating the date of clutch completion.

Figure 10 – Western Snowy Plover Nests by Location - 2019 presents the number of nests located within the pre-determined marker locations at the Refuge. The data is summarized below:

- Seven nests (two hatched, four failed, and one had an unknown fate) were located between the northern property boundary (marker No. 0) and marker No. 1
- Nine nests (one hatched, seven failed, and one had an unknown fate) were located between marker No. 1 and 2
- Three nests (one hatched and two failed) were located between marker No. 2 and 3
- One nest was located and failed between marker No. 3 and 4
- Seven nests (one hatched and six failed) were located between marker No. 4 and 5
- Ten nests (five hatched and five failed) were located between marker No. 5 and the southern property boundary at the GRP

Most of the nests found in 2019 (65 percent) were placed throughout the length of the beach within the foredune habitat. These nests were often located within or just west of the foredunes. This is where natural debris (logs, sticks, and dried kelp) is most abundant. In the southern part of the beach, south of marker No. 5, some nests were placed in the back-dune habitat (16 percent). This habitat consists of open sand sheets and vegetated dunes. One nest was placed on top of a tall dune within dead ice plant. The ice plant had been treated as part of the weed eradication effort. Other plover nests in this area were placed further back in low growing abronia and ambrosia plants. This area is also where adults were seen brooding chicks when they were not foraging on the shoreline. Plover tracks were observed in the open sand sheets to the east of marker No. 4, but no nests were ever observed. Seven nests (19 percent) were placed in the strand habitat. This habitat is often characterized by flat open sand sometimes consisting of broken shell mounds. Five of the seven nests found on the open strand were spread evenly between marker No. 5 and the GRP property boundary. The other two nests on the open strand were near marker No. 1.

FIGURE 10. WESTERN SNOWY PLOVER NESTS BY LOCATION - 2019



4.3 WESTERN SNOWY PLOVER NEST DEPREDATION

In 2019, a total of fifteen confirmed WSPL nest depredations were identified at the Refuge. Common raven was the most common confirmed nest predator, responsible for four of the nest depredations (27 percent), however additional plover nest loss to ravens is suspected. Two nests were confirmed taken by an avian predator and seven by an unknown predator. Nest depredations caused by common raven were confirmed by raven tracks at and around the nest

bowl. Common ravens were also observed by USDA Wildlife Services Specialists that were stationed at Oso Flaco to the north. They reported seeing the raven landing in the plover habitat on the Refuge. Due to the windy conditions of the beach, some nests were depredated but the plover biologist was unable to see any tracks before the wind removed them, therefore resulting in an unknown predator loss. Coyotes were the other confirmed nest predator, taking two of the depredated nests (13 percent). Nest depredations caused by coyote were confirmed by both tracks at the nest bowl and often egg shell and egg yolk. Coyotes often eat the eggs at the nest therefore leaving egg remnants behind.

Common ravens were also a common nest predator on neighboring beaches. Ravens were observed in the agriculture fields east of the Refuge, as well as at the GRP and ODSVRA beaches. Raven sightings and sign were observed on the Refuge from May through June. Raven predation was documented from May 14th through the week of June 11th, 2019. Lethal removal of common ravens was conducted by USDA Wildlife Services Specialists contracted by ODSVRA. On May 10th, two juvenile ravens were lethally removed at a raven nest site, on Adams Bros Ranch property (approximately seven miles south of the Refuge). On May 13th, two more juvenile ravens were lethally removed at the same raven nest site. On June 8th, an adult raven was lethally removed on the Teixeira Farms property (approximately one mile east of the Refuge). All raven removals were done with prior approval by the landowners.

ODSVRA and GRP observed peregrine falcons hunting WSPL adults and chicks on the beach north and south of the Refuge. The peregrine falcons were also observed on the Refuge throughout the season. It is unknown if the peregrines were the same birds seen on each beach. Refer to Table 4 – Predator Observations.

Other sightings or signs of WSPL predators on the Refuge were gull species, American kestrel (*Falco sparverius*), great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), and striped skunk (*Mephitis mephitis*). Great horned owl and striped skunk were not observed but tracks were observed within the habitat.

4.4 WESTERN SNOWY PLOVER NEST ENCLOSURES

In 2019, three-foot by three-foot wire nest enclosures were placed over six WSPL nests. All six nests successfully hatched. Although nest enclosures have been shown to increase WSPL nest hatching success, they pose potential hazards to adult WSPL and hatching chicks. The Trihydro biologist's professional experience with nest enclosures indicate that predators may correlate the presence of enclosures with the presence of all life stages of WSPL and may use this association to harm adult WSPL. Predators that have been seen keying into enclosures are: common ravens, coyote, and American kestrels. The plover biologists have witnessed coyotes key into nest enclosures and attempt to reach the eggs in the center. In 2019, an active enclosure had coyote tracks and evidence of digging near the edge. The plover nest was found to have hatched, but it is not known if the chicks were removed by the coyote. Another event in

2019, the GRP plover biologists observed a peregrine falcon perching on a dune near a nest enclosure. Ravens have been observed walking around enclosures and perching on top of the wire cages. Wire spikes were left above the enclosures to dissuade predators from perching on the tops. Nest enclosures are used on a case by case basis and because ravens were a cause of nest loss on all Guadalupe-Nipomo Dune Complex beaches, it was decided that enclosures would be used to keep eggs on the beach while the USDA Wildlife Services attempted to remove the problem ravens.

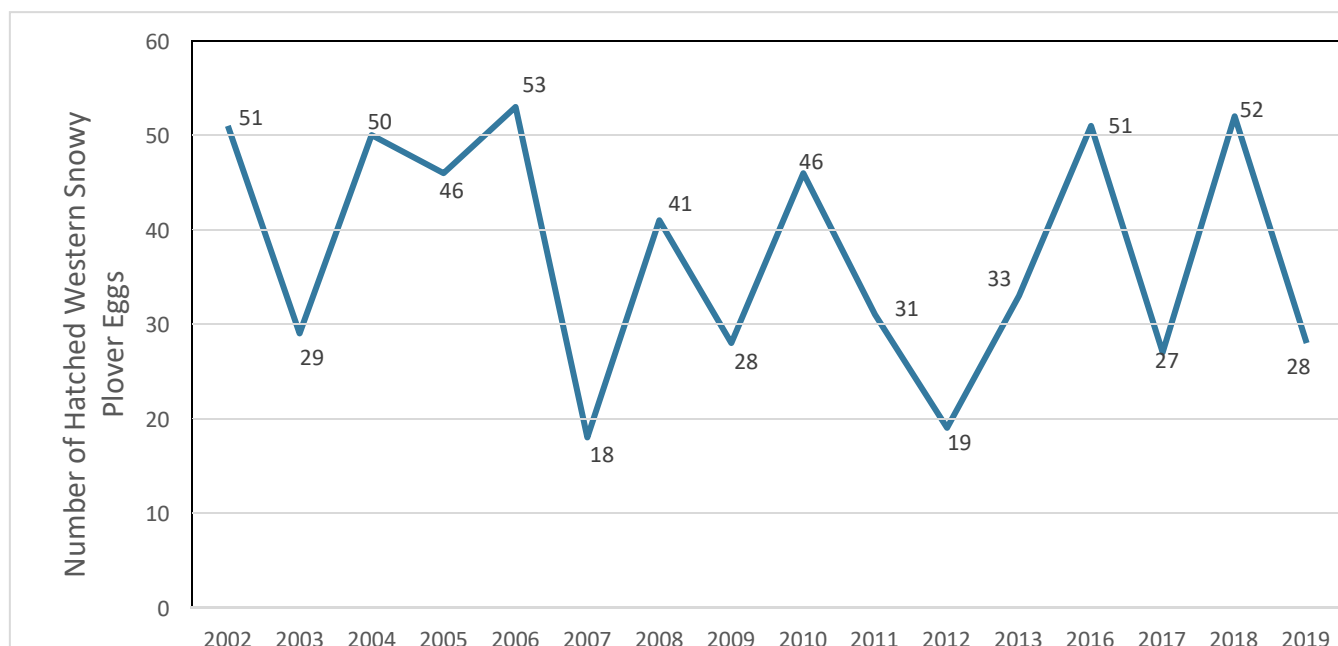
4.5 WESTERN SNOWY PLOVER EGGS AND CHICKS

The 37 WSPL nests located contained a total of 93 eggs; the fates of the WSPL eggs are presented below.

- 28 eggs (30 percent) hatched
- 23 eggs (25 percent) failed to an unknown cause
- 6 eggs (6 percent) had an unknown fate
- 35 eggs (38 percent) were depredated
- 1 egg (1 percent) was unviable

The number of eggs that hatched in 2019 (28 eggs), is less than in 2018 (52 eggs) but more than 2017 (27 eggs). Refer to Figure 11 – Number of Western Snowy Plover Eggs Hatched per Season: 2002-2019.

FIGURE 11. WESTERN SNOWY PLOVER EGGS HATCHED PER SEASON: 2002-2019



Biologists observed WSPL chicks during nearly every survey that followed the first nest hatch in June 2019. Biologists continued to see chicks, fledges, and juveniles on the beach until late August. During typical WSPL surveys, the biologists did not actively seek out chicks to avoid separating attending adult birds from their chicks.

4.6 TRESPASS INCIDENTS WITHIN WESTERN SNOWY PLOVER HABITAT

The biologists did not note any observable affects to WSPL or nests resulting from trespassers. There were only three instances of trespassing onto the Refuge, within suitable breeding habitat, recorded during the monitoring period. In 2019, the number of trespassers decreased from 2018, when 19 instances were noted. One of the trespassing events in 2019 was observed by the biologist, a beachgoer walked into the habitat and sat on a dune before continuing down the beach. This instance was later in the season when no active nests were present on the beach. The other two instances of trespassing were identified by footprints within the habitat, as well as by marks left from trespassers who appeared to have been dragging logs out of the habitat.

4.7 CALIFORNIA LEAST TERN NUMBERS

Although the Refuge contains suitable habitat for breeding LETE, Trihydro biologists did not observe nesting LETE during the 2019 monitoring period. Nesting LETE have not been observed at the Refuge since biological monitoring

began in 2002. However, Trihydro Biologists did observe LETE flying over the Refuge on two separate occasions this year (2019). LETE have not been observed flying over the Refuge during WSPL surveys since 2016.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 MONITORING STUDY CONCLUSIONS FOR THE 2019 PERIOD

Trihydro biologists conducted WSPL and LETE surveys from March 26th to September 25th, 2019. In summary, 37 WSPL nests were identified within the survey area at the Refuge, and no LETE nests were observed during the monitoring period. The WSPL nests were present on the beach from March 26th through August 8th, 2019. Of these 37 WSPL nests, 10 nests (27 percent), containing 28 eggs, hatched successfully, whereas 25 nests failed (68 percent), and 2 (5 percent) had an unknown fate.

Common ravens were the top WSPL nest predator in 2019 at the Refuge and surrounding beaches. Five ravens were lethally removed by USDA Wildlife Services in May and June on neighboring properties.

In 2019, some surveys were conducted by the ODSVRA plover biologists by way of vehicle. The biologists were searching for banded broods that may have migrated from ODSVRA. The Trihydro biologist also used a small off-road vehicle to place and retrieve exclosures. The monitoring frequency of once per week makes it difficult to know fates of lost nests during the times of inclement weather, it is common for the early part of the season to experience high winds and some rain. When nests are lost to predators or to abandonment during periods of high wind, the biologists are often unable to decipher the cause because all signs of the nest, signs of predators, or abandoned eggs have been buried in sand.

The Refuge does not currently have a predator management program. The ODSVRA and GRP properties located to the north and south of the Refuge are permitted to work with USDA Wildlife Services to conduct predator management. The Refuge benefits from the neighboring properties' predator management practices because most predators, particularly avian predators, move throughout the dune complex.

5.2 CONSERVATION RECOMMENDATIONS FOR THE 2020 MONITORING PERIOD

The biologists at the Refuge should continue to coordinate with representatives from Santa Barbara County Rancho Guadalupe Dunes Preserve, Guadalupe Restoration Project, and ODSVRA regarding predator activity observed in WSPL and LETE habitat.

Nest exclosures were used and will be considered for the 2020 season if ravens continue to cause nest loss. Exclosures may be placed on nests earlier in the nesting season and will be monitored closely for predators showing interest in the exclosures.

Any eggs that fail to hatch due to abandonment or unviability should be collected and transported to the Santa Barbara Museum of Natural History (SBMNH) for the museum's collection, per the individual biologist's USFWS Section 10a1a Endangered Species Act Recovery Permit(s). Any deceased WSPL or LETE shall be reported immediately to USFWS and either sent to SBMNH or California Animal Health and Food Safety Laboratory (CAHFS), depending on the recommendations of the USFWS.

Prior to the 2020 season, all public notification signs within suitable WSPL and LETE habitat should be checked for wear and replaced if needed. Due to the weather conditions at the Refuge many of the signs are difficult to read, and some of the signs are buried by moving sand and are only partially exposed. Notably, marker No. 3 and 4 will need to be replaced prior to the 2020 season.

It is recommended to continue the weed eradication effort on the Refuge including European beachgrass (*Ammophila arenaria*) and ice plant (*Carpobrotus edulis*). The removal of these species has already started creating additional preferable nesting habitat in the southern portion of the foredunes at the Refuge.

6.0 REFERENCES

Neuman, K.K., Page, G.W., Stenzel, L.E., Warriner, J.C., and Warriner, J.S. 2004. Effect of mammalian predator management on Snowy Plover breeding success. *Waterbirds* 27 :257-263.

U.S. Fish and Wildlife Services. 2007. Recovery Plan for the Pacific Coast Population of the Western Snowy Plover. Vol. 1, Recovery Plan. California/Nevada Operations Office. Sacramento, CA. September 13, 2007.

Personal Communications

Applegate, Thomas, WSPL biologist at Rancho Guadalupe Dunes Preserve. 2019. Personal communication regarding nest depredations and predator sightings at the Preserve and Refuge.

Covington, Eric, San Luis Obispo District Supervisor, United States Department of Agriculture, Wildlife Services. 2019. Frequent personal communication regarding nest depredation, predator sightings, and predator removal.

Oceano Dunes State Vehicular Recreation Area State Park. 2019. Frequent personal communication with various plover biologists and predator management personnel representatives regarding depredations within the region.

TABLES

TABLE 1. SURVEY DATES AND WESTERN SNOWY PLOVER NUMBERS IN 2019

Survey Date	Survey Crew	Total Number of WSPL
03.26.19	K. Paradis	20
4.2.19	K. Paradis	15
4.9.19	K. Paradis	11
4.17.19	K. Paradis	8
4.23.19	K. Paradis	10
4.30.19	K. Paradis	9
5.7.19	K. Paradis	8
5.14.19	K. Paradis	14
5.21.19	ODSVRA	15
5.22.19	K. Paradis	12
5.30.19	K. Paradis	10
6.4.19	K. Paradis	21
6.11.19	K. Paradis	11
6.18.19	K. Paradis	8
6.26.19	K. Paradis	33
6.27.19	K. Paradis	23
7.5.19	S.Seay	35
7.9.19	K. Paradis	35
7.17.19	K. Paradis	16
7.23.19	K. Paradis	22
7.31.19	Ryan Slack	31
8.1.19	K. Paradis	20
8.8.19	K. Paradis	15
8.26.19	K. Paradis	13
8.28.19	K. Paradis	35
9.12.19	K. Paradis	1
9.18.19	K. Paradis	1
9.25.19	K. Paradis	5
Average Number of WSPL:		16

TABLE 2. COLOR BANDED WESTERN SNOWY PLOVERS RECORDED IN 2019

Left Bands	Right Bands	Sex	March	April	May	June	July	August	September	Total Times Seen	Band Site (year banded)
a	gwg	F			2	1				3	VAFB 16
an	aw	J						1		1	VAFB 15
b	ao	J						1		1	ODSVRA 19
bb	av	J					1	1		2	ODSVRA 19
bb	ba	J				1	1	1		3	ODSVRA 19
bb	oa	J						2		2	ODSVRA 19
bb	vw	F	1	1						2	ODSVRA18
ga	gb	M			1	1				2	ODSVRA18
ga	gr	unk						1		1	ODSVRA 15 or 16
ga	pr	M	1	1	2			2		6	ODSVRA 16 or 17
ga	yr	M						1		1	ODSVRA 14
gg	ar	unk						1		1	ODSVRA 11
gg	oy	F					1			1	ODSVRA 18
gg	wr	M						1		1	ODSVRA 14 or 16
gg	yr	F	1	2			1	1		5	ODSVRA 10
gg	yw	unk								1	ODSVRA 13 or 15
pg	vr	F		1	1	1				3	ODSVRA14
pg	yy	M		1	1	1	1			4	ODSVRA 15
pv	gy	F		1	1					2	ODSVRA18
pv	ob	M	1	1	1	1				4	ODSVRA 15 or 17
pv	wy	F				2	1			3	ODSVRA 14
pv	yb	M					1			1	ODSVRA 12

Band colors: a=aqua, b=blue, g=green, l=lime, n=natural, o=orange, p=pink, r=red, v=violet, w=white, y=yellow

Sex: M=male, F=Female, J=juvenile

Bands with / signify split color bands; uppercase letters signify a band over the knee joint

TABLE 3. WESTERN SNOWY PLOVER NEST LOCATIONS IN 2019

Nest #	Date found	Final # eggs	Projected Hatch date	End	Fate	Location	Notes
1	3.26.19	2	4.29.19	4.17.19	Fail	Located between Marker 5 and GRP	Nest bowl gone, no tracks, shell fragments or sign of nest. Windy conditions.
2	3.26.19	1	4.29.19	4.17.19	Fail	Located between Marker 4 and 5	Nest bowl gone, no tracks, shell fragments or sign of nest. Windy conditions.
3	3.26.19	3	4.21.19	4.17.19	Fail	Located between Marker 2 and 3	Nest bowl gone, no tracks, shell fragments or sign of nest. Windy conditions.
4	4.2.19	1	5.6.19	4.17.19	Fail	Located between Marker 5 and GRP	Nest bowl gone, no tracks, shell fragments or sign of nest. Windy conditions.
5	4.9.19	3	5.14.19	5.14.19	Unknown fate	Located between marker 0 and 1	On 5.7 two eggs might have began hatching, 5.14 nest bowl was gone, new scrapes in the area suggest failed nest.
6	4.17.19	2		4.23.19	Fail	Located between marker 2 and 3	Unknown fail, no sign of nest or any tracks. windblown.
7	4.17.19	1		4.30.19	Fail	Located south of marker 5	Looks like the egg had rolled out of a nest bowl, unknown if still active. Egg not found during the next survey. Nest bowl still intact, unknown predator.
8	4.23.19	3	5.20.19	5.22.19	Hatch	Located between Marker 5 and GRP	Hatched all eggs, two chicks seen with adults near the hatch site.
9	4.23.19	3	5.20.19	5.22.19	Hatch	Located between Marker 5 and GRP	Hatch, no tracks, no pips seen due to high winds. Gone during time of predicted hatch date. Seen large chicks close to fledge age in June.
10	4.23.19	2	5.27.19	5.14.19	Fail	Located between Marker 4 and 5	Gone, possible raven tracks at nest.
11	4.23.19	3	5.20.19	5.7.19	Unknown fate	Located between Marker 1 and 2	Nest found at three eggs, gone, no trace of nest bowl.
12	4.23.19	2	5.27.19	5.22.19	Fail	Located between Marker 0 and 1	Windblown, no pips, no tracks, unknown predator.
13	4.23.19	3	5.20.19	5.14.19	Fail	Located between Marker 1 and 2	Raven tracks at the nest,
14	4.23.19	3	5.20.19	4.30.19	Fail	Located between Marker 5 and GRP	Nest bowl still intact, some coyote tracks nearby, eggs completely gone.
15	4.30.19	2	6.3.19	5.14.19	Fail	Located between Marker 3 and 4	Unknown avian predator, likely raven.

TABLE 3. WESTERN SNOWY PLOVER NEST LOCATIONS IN 2019

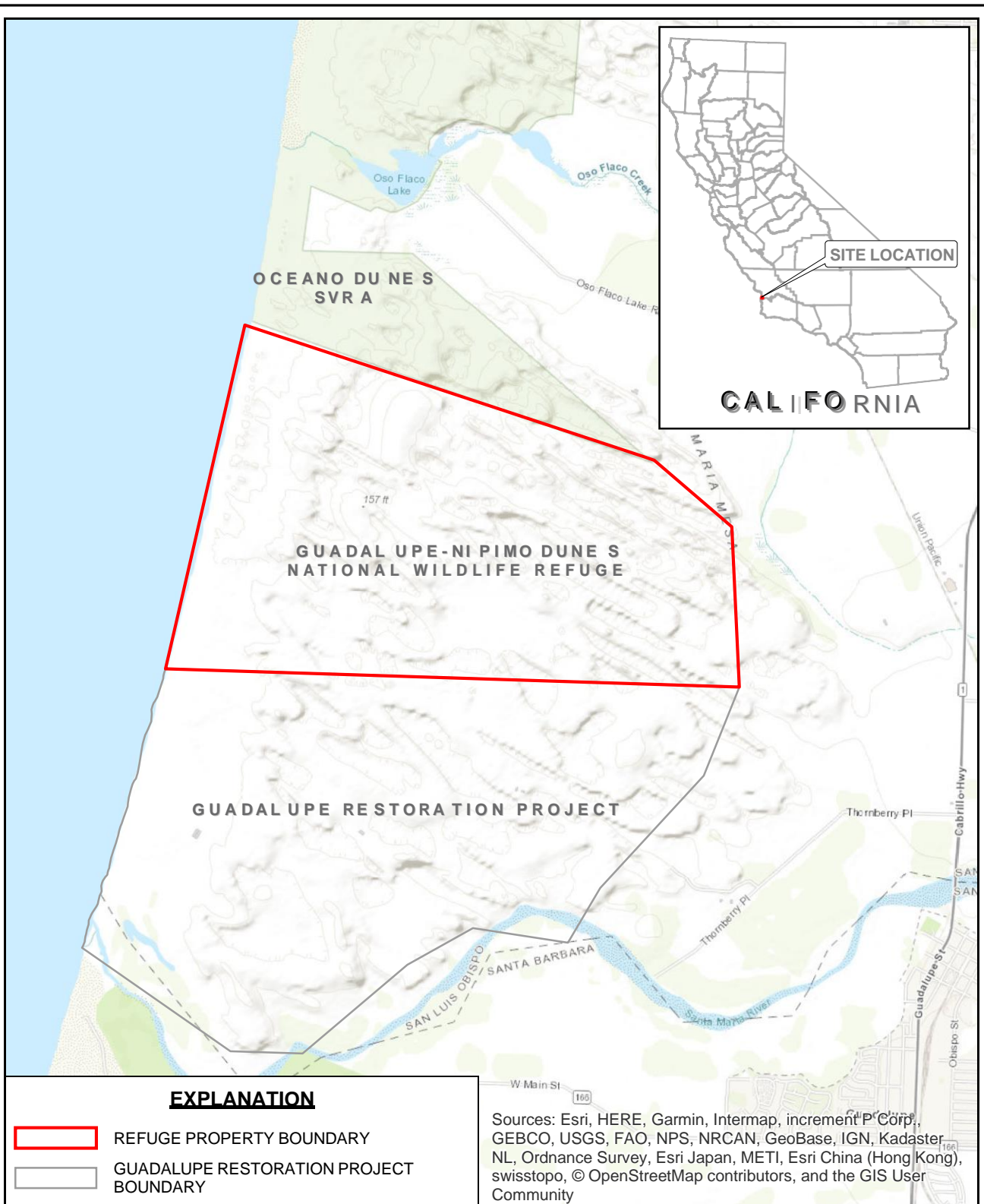
Nest #	Date found	Final # eggs	Projected Hatch date	End	Fate	Location	Notes
16	4.30.19	2	6.3.19	5.14.19	Fail	Located between Marker 4 and 5	Eggs gone, no tracks observed, avian take.
17	5.7.19	2		5.14.19	Fail	Located between Marker 4 and 5	Gone, could not find nest bowl, unknown fail.
18	5.7.19	2		5.14.19	Fail	Located between Marker 0 and 1	Avian tracks at nest, raven depredation.
19	5.7.19	3	6.10.19	5.22.19	Fail	Located between Marker 1 and 2	Unknown predator, no tracks visible due to high winds.
20	5.14.19			5.22.19	Fail	Located between GRP and Marker 5	Windblown, no eggs or tracks. Unknown predator.
21	5.14.19	3	6.18.19	6.18.19	Fail	Located between Marker 1 and 2	One egg rolled out of the nest bowl under kelp. Coyote tracks to nest, crunchy egg pieces in nest bowl.
22	5.22.19			5.30.19	Fail	Located between Marker 5 and GRP	Lost to unknown predator after windy afternoon, no tracks were visible.
23	5.22.19	3	6.18.19	6.11.19	Fail	Located between Marker 1 and 2	Eggs gone, windblown, unknown predator.
24	5.22.19			5.30.19	Fail	Located between Marker 0 and 1	Lost to unknown predator after windy afternoon, no tracks were visible.
25	6.11.19	3	7.8.19	6.18.19	Hatch	Located between Marker 5 and GRP	Pips in nest bowl, hatched three eggs.
26	6.4.19			6.11.19	Fail	Located between Marker 0 and 1	Raven tracks at the nest.
27	6.11.19	3	7.8.19	7.9.19	Hatch	Located between 0 and 1	Exclosed Two eggs hatched, one egg left. Coyote tracks near nest and digging at edge of cage. Female seen sitting on egg two weeks later, then abandoned.
28	6.18.19	3	7.23.19	7.17.19	Hatch	Located between GRP and Marker 5	Exclosed All three eggs hatched.
29	6.18.19	3	7.15.19	7.17.19	Hatch	Located between GRP and Marker 5	Exclosed All three eggs hatched.
30	6.18.19	3	7.23.19	7.17.19	Hatch	Located between GRP and Marker 4	Exclosed All three eggs hatched.
31	6.18.19	3	7.15.19	7.17.19	Hatch	Located between Marker 2 and 1	Exclosed All three eggs hatched.
32	6.27.19			7.9.19	Fail	Located between GRP and Marker 5	Unable to locate, no eggs, or predator tracks.
33	6.27.19			7.5.19	Fail	Located between Marker 1 and 2	Unable to locate, no eggs or predator tracks.
34	7.5.19	2		7.17.19	Fail	Located between Marker 1 and 2	Unable to locate, no eggs or predator tracks.
35	7.9.19	2	8.5.19	8.8.19	Hatch	Located between Marker 0 and 1	Exclosed. Both eggs hatched
36	7.9.19			7.17.19	Fail	Located between Marker 1 and 2	Was not found again after the first date located.
37	6.18.19	3	6.18.19	6.18.19	Hatch	Located between GRP and Marker 5	Nest not found but chicks with adults found near Marker 5.

TABLE 4. PREDATOR OBSERVATIONS IN 2019

Survey Date	Species	Info
3.26.19	Common raven, owl sp.	Raven seen at Oso Flaco by USDA Wildlife Services/Oceano Dunes Biologist, owl tracks in the back dunes and coyote tracks throughout.
4.2.19	Red tailed hawk	Flying over dunes
4.17.19	Gull sp.	Flying low over the nesting habitat
4.23.19	Common raven	Raven tracks at two depredated plover nests
4.30.19	Gull sp.	Gull tracks walking through the nesting habitat
5.7.19	Common raven	Raven tracks at depredated plover nest
5.14.19	Common raven	Raven tracks were seen in the habitat and a bird was observed flying over
5.22.19	Peregrine falcon	Peregrine was flushed from the Oceano Dunes beach by the avian predator control person. The peregrine landed on the Refuge beach inside the habitat. It was continually flushed by the plover monitor as it moved south on the beach.
5.30.19	Gull sp.	Many gulls flew over habitat
6.4.19	Gull sp., owl sp., American kestrel, common raven	Many gull tracks in the habitat, owl tracks in the back dunes, and an American Kestrel was seen perching within the habitat. Common raven tracks up to depredated plover nest.
6.11.19	Common raven	Raven tracks were seen in the habitat.
6.18.19	Peregrine falcon, gull sp., owl sp.	Peregrine was seen in the habitat, gull tracks were observed in the habitat. Owl tracks were observed in the back dunes.
6.27.17	Owl sp.	Owl tracks were observed in the back dunes.
7.9.19	Owl sp.	Owl tracks were observed in the back dunes.
7.31.19	Peregrine falcon, red-tailed hawk	Peregrine and red-tailed hawk observed perched on the foredunes.
8.8.19	Peregrine falcon	Peregrine seen perching on the foredunes

FIGURES

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FIGURE 1

REGIONAL VICINITY MAP

GUADALUPE-NIPIMO DUNES NATIONAL WILDLIFE REFUGE WSPL MONITORING

Drawn By: PH

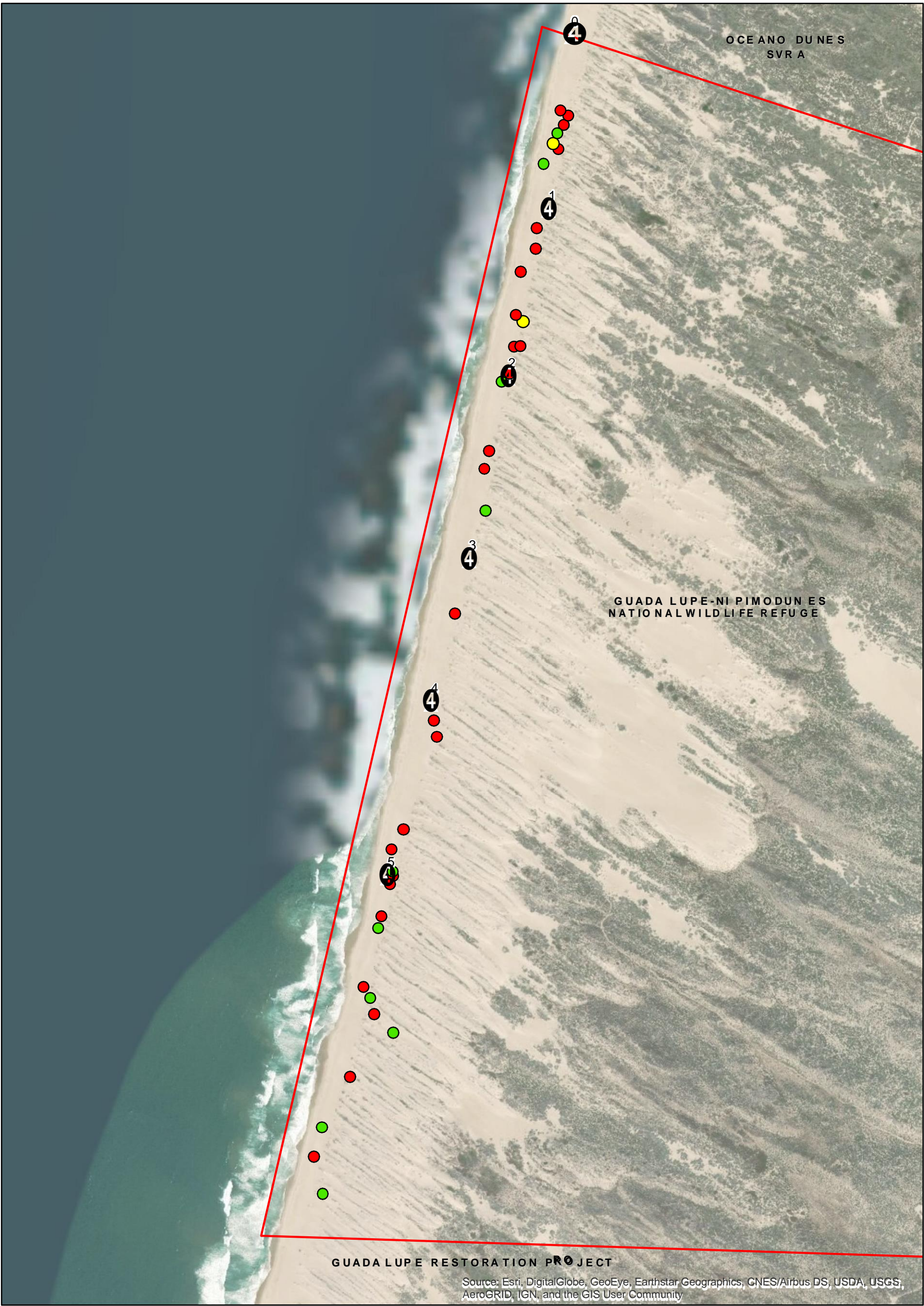
Checked By: KP

Scale: 1" = 4,000'

Date: 10/30/19

File: Fig1_TLCGNDNWR_SiteVic.mxd

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EXPLANATION

- FAIL (25 NESTS)
- HATCH (10 NESTS)
- UNKNOWN FATE (2 NESTS)
- 4 SIGN LOCATION AND NUMBER
- REFUGE PROPERTY BOUNDARY





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FIGURE 2

WESTERN SNOWY PLOVER NEST LOCATIONS AND FATES			
GUADALUPE-NIPIMO DUNES NATIONAL WILDLIFE REFUGE WSPL MONITORING			
Drawn By: PH	Checked By: KP	Scale: 1 " = 750 '	Date: 10/30/19
File: Fig2_TLCGNDNWR_NestLocFates.mxd			