# 2018 Final Report on the Western Snowy Plovers

Coal Oil Point Reserve
University of California
Santa Barbara, CA

Cristina Sandoval and Jessica Nielsen

Permit Number **TE073205-5**

Date of Preparation: January 31, 2019

Site: Sand's Beach, Coal Oil Point Reserve (COPR)

Location: RU5, Santa Barbara, CA

Lat-Long: 34 25 00 N, 119 52 30 W

USGS maps: Goleta 7.5, Dos Pueblos Canyon 7.5, Goleta 15

Jurisdiction: Owned and managed by the University of California Santa Barbara.

Climate: Avg precip 14-21 in/year, avg min temp 42 F, avg max temp 75 F

Total linear beach length: 1,200 m

Protected linear beach length: 300-400 m during winter and fall and 800 m during the breeding season

Protected area during breeding season: 30,700 sq meters or 7.6 acres

Docent program? Yes, all year, most daylight hours

Interpretive and regulatory signs? Yes, at beach entrances and fences

Management Plan? Yes

Enforcement? Docents request compliance with leash law and restricted areas. Officers are called when problem is not solved.

Monitoring: Yes, weekly in the winter and fall and 3-4 times per week in the spring and summer.

Predator management: Crow deterrence, fencing to prevent skunk, predator control.

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## ABSTRACT

In 2018, we continued with the monitoring of the Western Snowy Plover population at Coal Oil Point Reserve as in previous years. The number of breeding adults (54), hatched nests (61), and fledged chicks (82) were the highest observed since monitoring began in 2001. The wintering population remained around the average (182) for this site. This year, predation affected nest fate slightly more than weather. 86% of nests were initiated on the beach, and 14% were initiated on the mudflats of the slough (delta). The rate of infertile eggs has returned to normal levels after an four-fold increase in infertility in 2016.

## INTRODUCTION

Sands Beach at Coal Oil Point Reserve (COPR) has an average wintering population Western Snowy Plover (WSP) of 182 individuals and an average breeding population of about 20 pairs. The lower beach is open to the public all year, but most of the dry sandy beach, where plovers congregate while resting, has been protected by a symbolic fence since spring 2001.

## METHODS AND RESULTS

In 2018, we continued with the same management practices established in the 2004 Snowy Plover Management Plan (Sandoval, 2004). Figure 1 shows the location of the plover habitat and the maximum extent of the symbolic fences. The exact location of the fences varies based on tides and season, and whether the slough mouth is open. When the slough mouth is open, a portion of the fencing is removed to prevent it from being washed away. In the last few years, the entire fence had to be removed in the winter due to beach erosion.

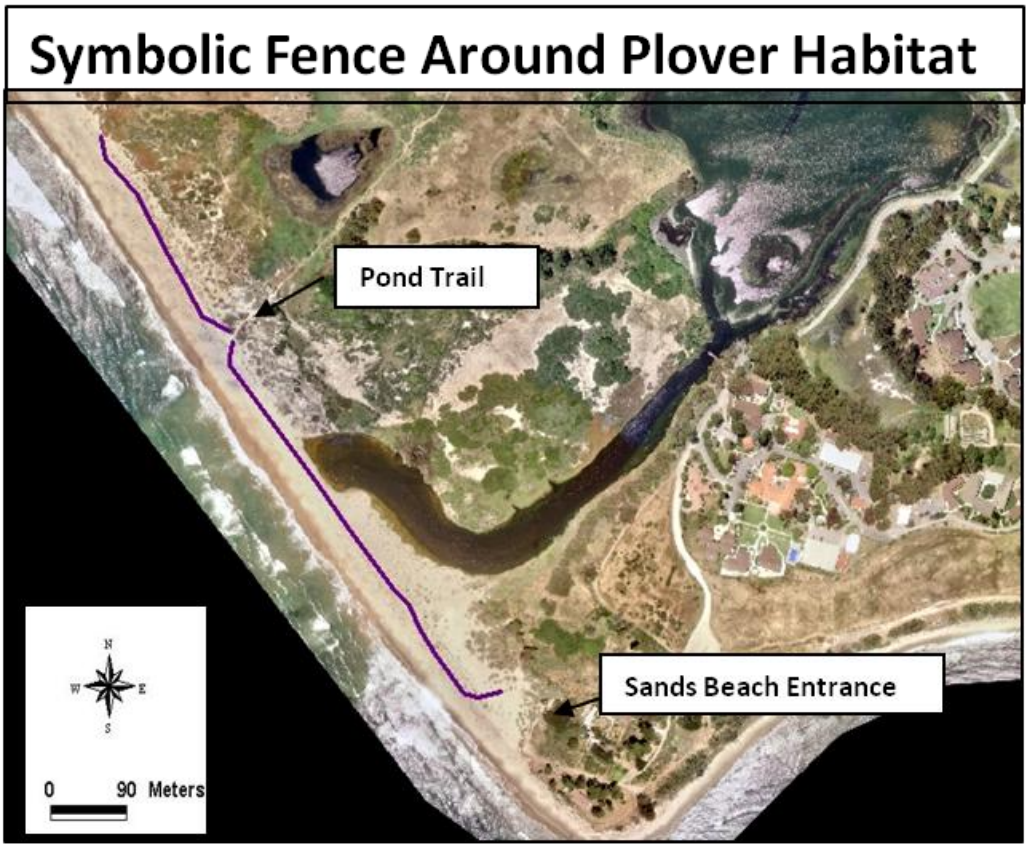



Figure 1. Location of the habitat protected for the Western Snowy Plovers (year round) on Sands Beach at Coal Oil Point Reserve. The mudflats (not shown in this photo) are also protected. The fence is shown in purple.

**Wintering Population**

To count WSP, we walked along the wet sand from the eastern boundary of Sands Beach to the western boundary of the reserve and recorded all individuals seen with binoculars. On the way back, we stopped at groups of individuals to look for color bands on the legs. During the 2018 winter window survey, we counted 185 WSP. The average number of wintering WSP at Coal Oil Point Reserve since 2003 is 182 individuals. The number of wintering plovers at the reserve had been steadily declining over the previous decade, but has been increasing since 2017 (Figure 2).

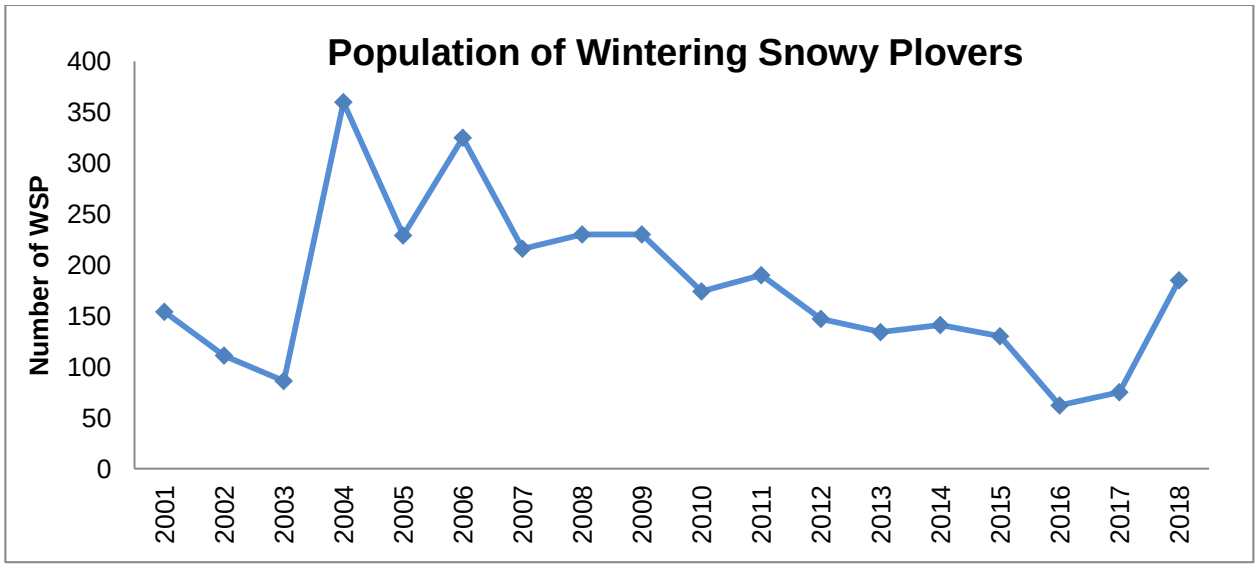



Figure 2. Results of winter window surveys at Coal Oil Point Reserve

**Breeding Population**

We surveyed WSP during the breeding season window survey in the same way as the wintering population. We counted 54 WSP during the 2018 breeding window survey. The graph below shows that the number of adults increased right after the implementation of the management plan in 2001 and has reached a mean of about 34 adults since 2003 (Figure 3). This year, we observed the largest breeding population on record at COPR.

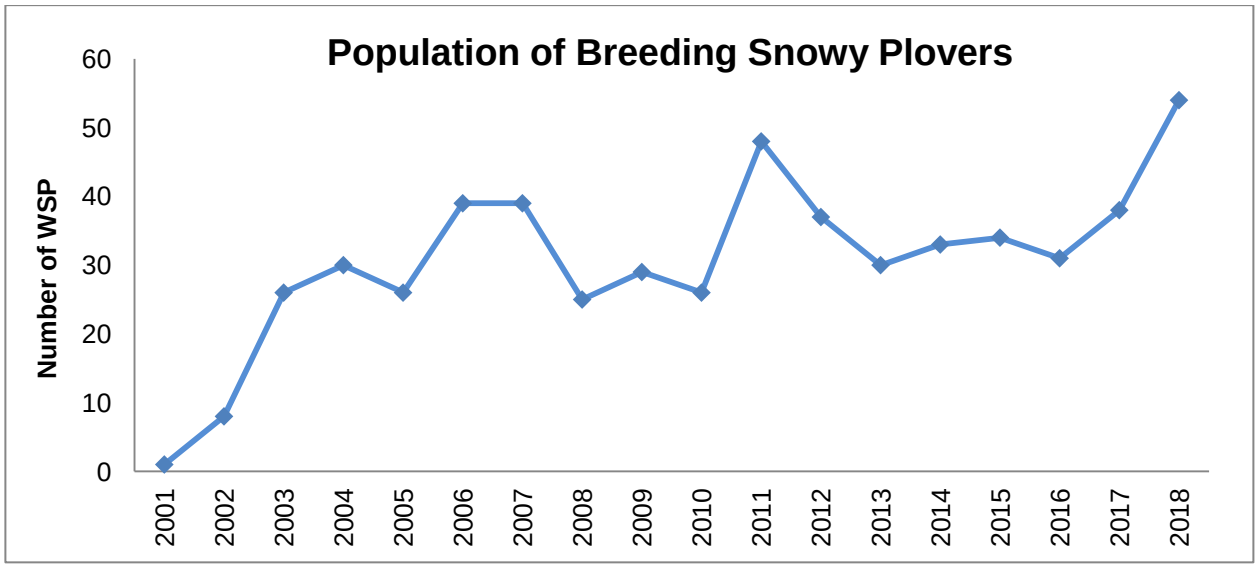



Figure 3. Results of breeding window surveys at Coal Oil Point Reserve

**Nesting**

During the nesting season in 2018, the numbers and locations of adult plovers, nests, and chicks were counted 3-4 times per week by Jessica Nielsen and Katelyn Nyberg. Table 1, below, summarizes the results of observations each year. The number of males for the estimation of fledged chicks/male is calculated based on half of the adult number counted in the breeding window survey. Because different males can arrive to COPR within a season, the number of males may be underestimated.

Detailed discussion of nest and chick fate follow below.

| Year | Breeding Population | # Nests | # Nests Hatched | Hatching Rate (nests hatched/#nests*100) | # Chicks Fledged | # Fledges Per Male | Fledging Rate (nests that fledged /nests that hatched *100) |
|---|---|---|---|---|---|---|---|
| 1970- 2000 | few | ~2-4/30yr | none | 0 | none | none | none |
| 2001 | 1 | 1 | 1 | 100% | 1 | 1 | 100% |
| 2002 | 8 | 9 | 6 | 67% | 14 | 2.8 | 83% |
| 2003 | 26 | 24 | 16 | 67% | 40 | 3.3 | 94% |
| 2004 | 30 | 51 | 20 | 39% | 27 | 1.9 | 67% |
| 2005 | 26 | 64 | 16 | 25% | 30 | 2.3 | 81% |
| 2006* | 39 | 43 | 22 | 56% | 37 | 1.9 | 91% |
| 2007* | 39 | 66 | 20 | 30% | 17 | 0.9 | 55% |
| 2008* | 25 | 57 | 3 | 38% | 8 | 0.7 | 100% |
| 2009 | 29 | 64 | 39 | 60% | 61 | 4.2 | 74% |
| 2010 | 26 | 74 | 42 | 57% | 19 | 1.5 | 26% |
| 2011 | 48 | 84 | 35 | 42% | 9 | 0.4 | 14% |
| 2012 | 37 | 73 | 34 | 47% | 22 | 1.2 | 44% |
| 2013 | 30 | 65 | 36 | 55% | 30 | 2.0 | 41% |
| 2014 | 33 | 77 | 21 | 27% | 26 | 1.6 | 67% |
| 2015 | 34 | 62 | 34 | 55% | 45 | 2.7 | 74% |
| 2016 | 31 | 43 | 29 | 67% | 49 | 3.2 | 86% |
| 2017 | 38 | 52 | 35 | 65% | 53 | 2.8 | 77% |
| 2018 | 54 | 81 | 61 | 75% | 82 | 3.0 | 67% |

Table 1. Changes in WSP fitness estimates at Coal Oil Point Reserve since 2001.

**In 2006, predator exclosure cages were used. This was a change from the standard protocol at this site.*
***In 2007-2008, some nests were collected, incubated in the nursery, and replaced prior to hatching. This was a change from the standard protocol at this site. Numbers reported for number of hatched nests*

*and number of fledged chicks are those that hatched and fledged in the wild without intervention, and exclude those that hatched and fledged in the nursery.*

**Nest Fate**

In 2018, 81 WSP nests were initiated at COPR and 61 of them hatched. Figure 5 shows the number of nests laid and the number of nests hatched between 2001-2018. This year, COPR had an above-average hatching rate of 75%. For nests that failed, the largest contributing factor was predators, followed by high tides and abandonment (Figure 6, Table 2).

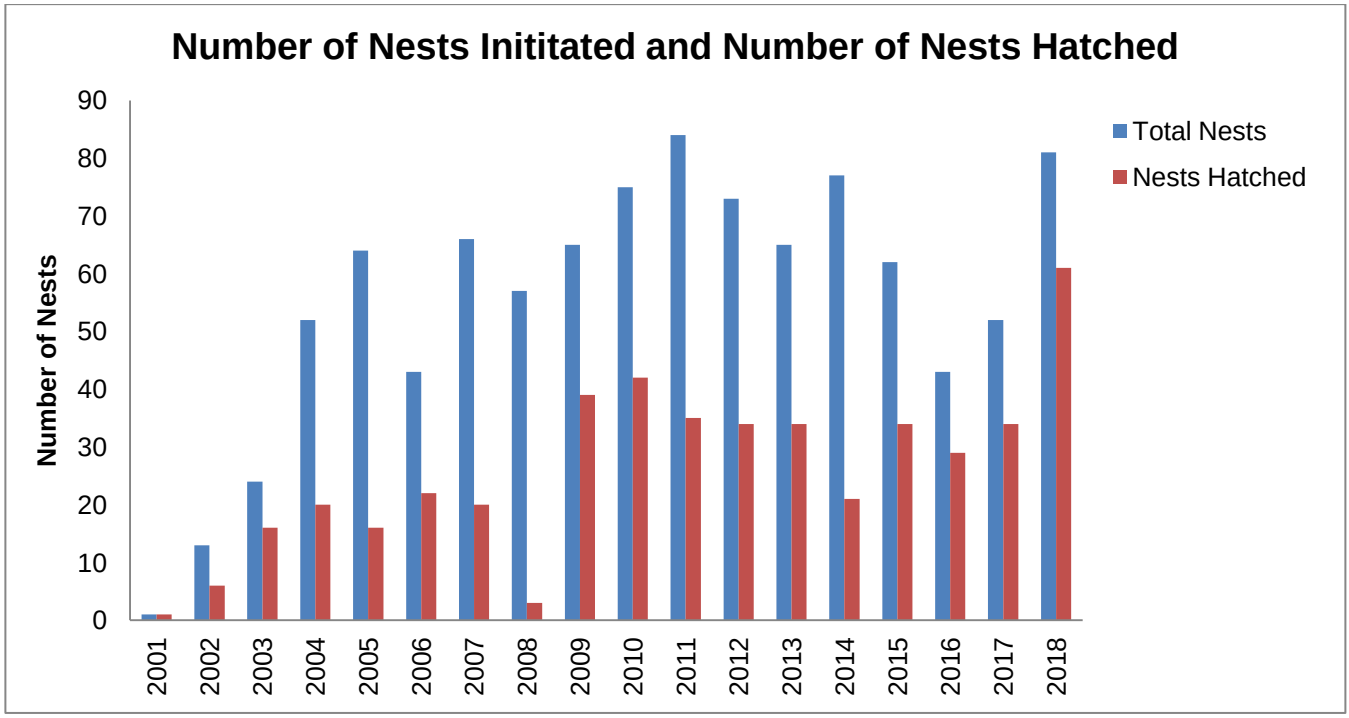



Figure 5. Nests initiated and hatched by year (total number of nests that had at least one egg vs. total number of nests that hatched at least one chick).

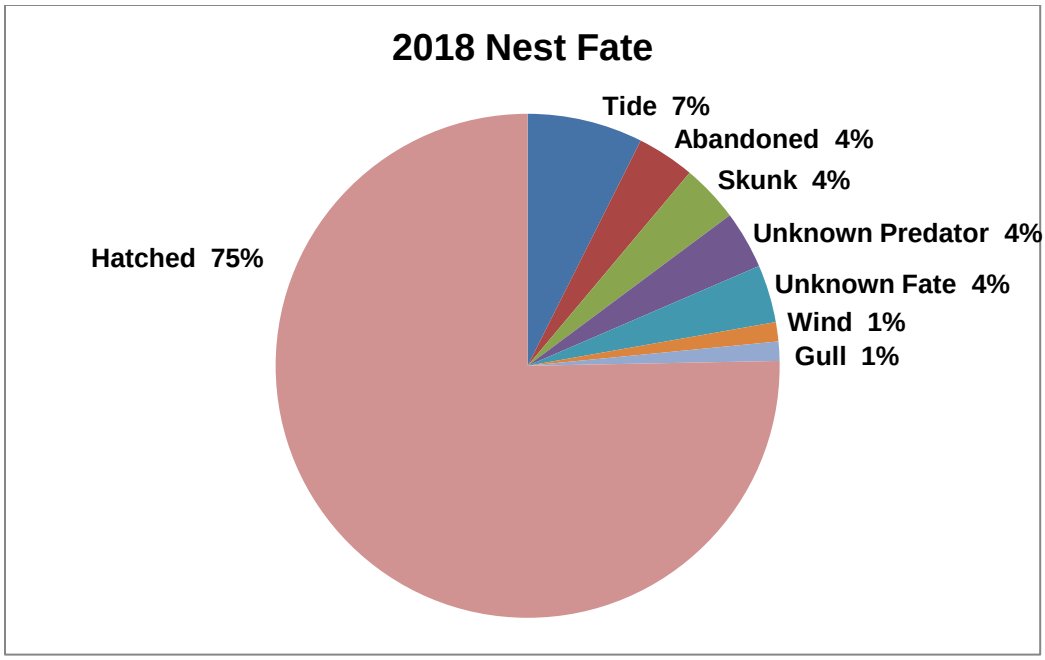



Figure 6. Nest fate at COPR in 2018

| Year 20-XX | '02 | '03 | '04 | '05 | '06 * | '07 ** | '08 ** | '09 | '10 | '11 | '12 | '13 | '14 | '15 | '16 | '17 | '18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total nests** | **13** | **24** | **52** | **64** | **43** | **66** | **57** | **65** | **75** | **84** | **73** | **65** | **77** | **62** | **43** | **52** | **81** |
| **Hatched** | 6 | 16 | 20 | 16 | 22 | 20 | 3 | 39 | 42 | 35 | 34 | 34 | 21 | 34 | 29 | 34 | 61 |
| **Skunk** | 0 | 0 | 9 | 18 | 2 | 19 | 18 | 10 | 0 | 0 | 0 | 4 | 10 | 15 | 6 | 4 | 3 |
| **Crow** | 2 | 4 | 8 | 3 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Wind** | 1 | 2 | 2 | 6 | 1 | 2 | 2 | 5 | 2 | 10 | 2 | 0 | 0 | 1 | 0 | 3 | 1 |
| **Tide** | 0 | 0 | 4 | 5 | 2 | 1 | 6 | 2 | 5 | 12 | 16 | 6 | 3 | 5 | 2 | 8 | 6 |
| **Abandoned** | 0 | 1 | 1 | 9 | 3 | 1 | 0 | 2 | 3 | 5 | 3 | 4 | 9 | 1 | 2 | 1 | 3 |
| **Abandoned Owl** | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Egg Replacement** | 0 | 0 | 0 | 0 | 0 | 11 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Flooded** | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Raccoon** | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 2 | 4 | 0 | 1 | 0 | 0 |
| **Whimbrel** | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Gull** | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 |
| **Opossum** | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Dog** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| **Unknown Cause** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 8 | 4 | 0 | 21 | 0 | 0 | 0 | 0 |
| **Human** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unknown Predator** | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 4 | 0 | 10 | 3 | 15 | 9 | 3 | 0 | 2 | 3 |
| **Unknown Fate** | 0 | 0 | 0 | 1 | 3 | 12 | 4 | 1 | 0 | 0 | 8 | 0 | 0 | 3 | 0 | 0 | 3 |

Table 2. Number of nests lost by fate from 2002-2018

**Note that in 2006, predator exclosure cages were used which may have affected nest fate.*
***Note that in 2007 and 2008, some nests were collected, replaced with decoy eggs, incubated in the nursery, and replaced prior to hatching which may have affected nest fate.*

## Predation

A minimum of 9% of nests were predated in 2018, mostly by skunks. In 2018, there were 3 documented nest failures due to skunk predation (Figure 7). All skunk predation occurred between June 11th and June 13th. Early implementation of skunk trapping after predation events or predator tracks were observed in the nesting area resolved this issue for the remainder of the breeding season.

We had one nest predated by a gull and several nests that were affected by an unknown predator. We observed three instances in which 1 to 2 eggs from a nest went missing while the remaining eggs remained in the nest. In one case, the parent continued to incubate the remaining eggs until they were washed out by tide. In another case, the parent continued to incubate until a second egg disappeared, and then abandoned the remaining egg. In the 3rd case, the nest was abandoned after the first egg went missing. Additionally, there was a nest where 2 eggs were rolled out of the nest by a few inches, but did not completely go missing. These instances are unusual at our site. In previous years, all eggs from a nest would go missing after a predation event. We suspect that a small predator such as a rodent may be responsible for these egg disappearances, but the cause has not been confirmed. If these unusual instances continue next breeding season, we hope to determine the cause using camera traps. Determining an unknown predator that is removing the eggs could help us modify our predator management in the future.

Crows attempted to make nests on the bluffs above Sands Beach. One crow was removed (Appendix D) and crow harassment techniques were implemented as soon as crows were observed. We had no evidence of crow predation on nests this year. Thus, it is crucial to initiate predator control as soon as there is evidence of potential predators in the vicinity of the nesting area.

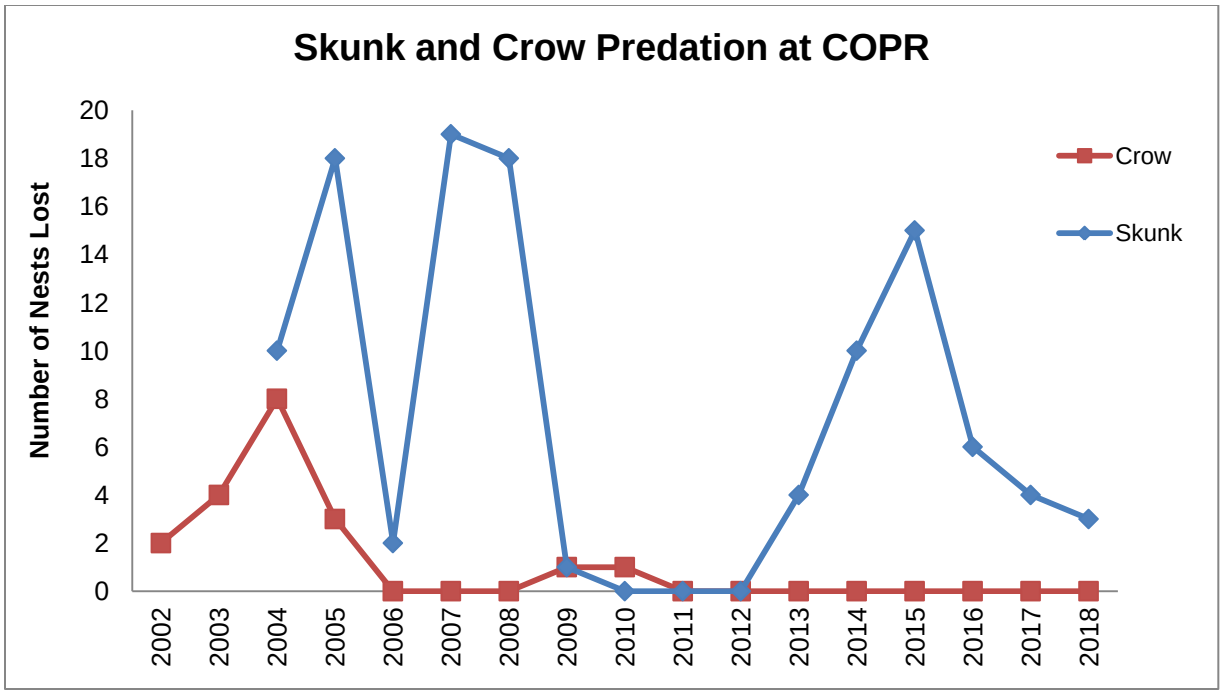



Figure 7. Crow and skunk predation by year

**Infertility**

All unhatched and abandoned eggs were collected and incubated to determine viability. Of the 20 eggs that did not hatch in 2018, 2 were infertile (Figure 9. The rate of infertile eggs fluctuates from year to year at COPR, but had increased four-fold in 2016 which was the year after the Refugio Oil Spill affected Sands Beach (Nielsen et al. 2017). In 2018, the egg infertility rate has returned to a rate below average at 0.84% (Figure 8).

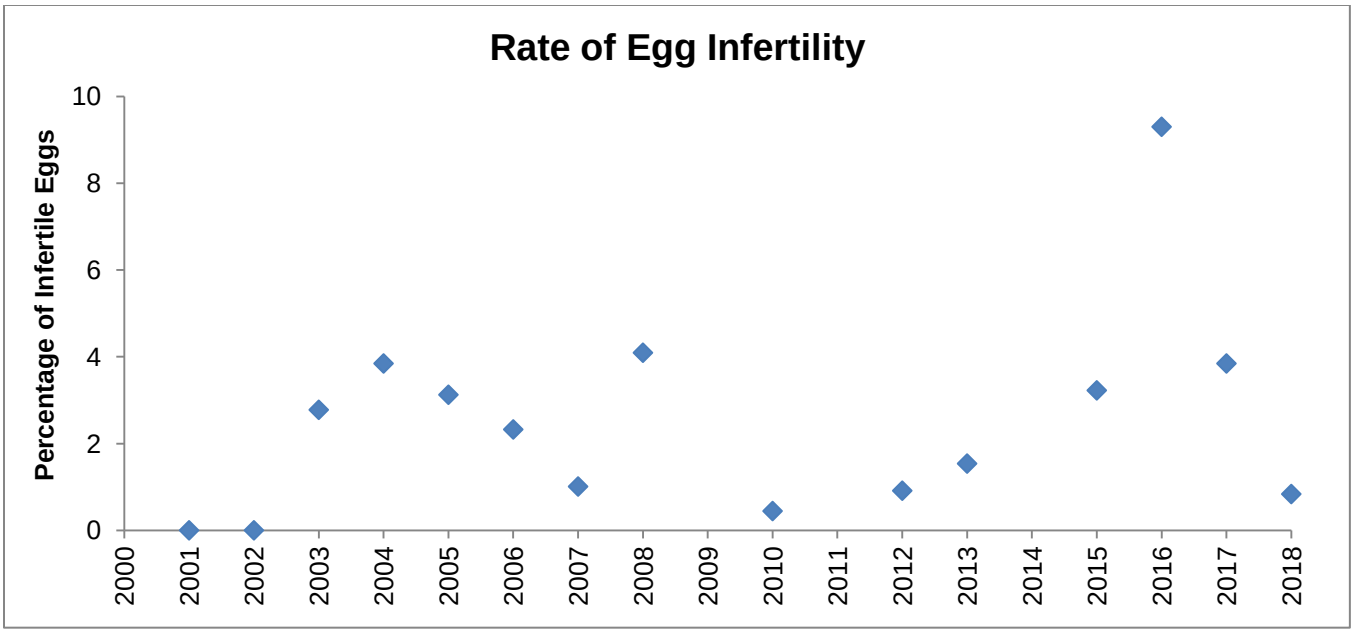



Figure 8. Percentage of infertile eggs by year (# infertile eggs / # total eggs *100). *Infertility data were not collected during the years 2009, 2011, and 2014. Eggs with undetermined fertility were excluded from calculations.*

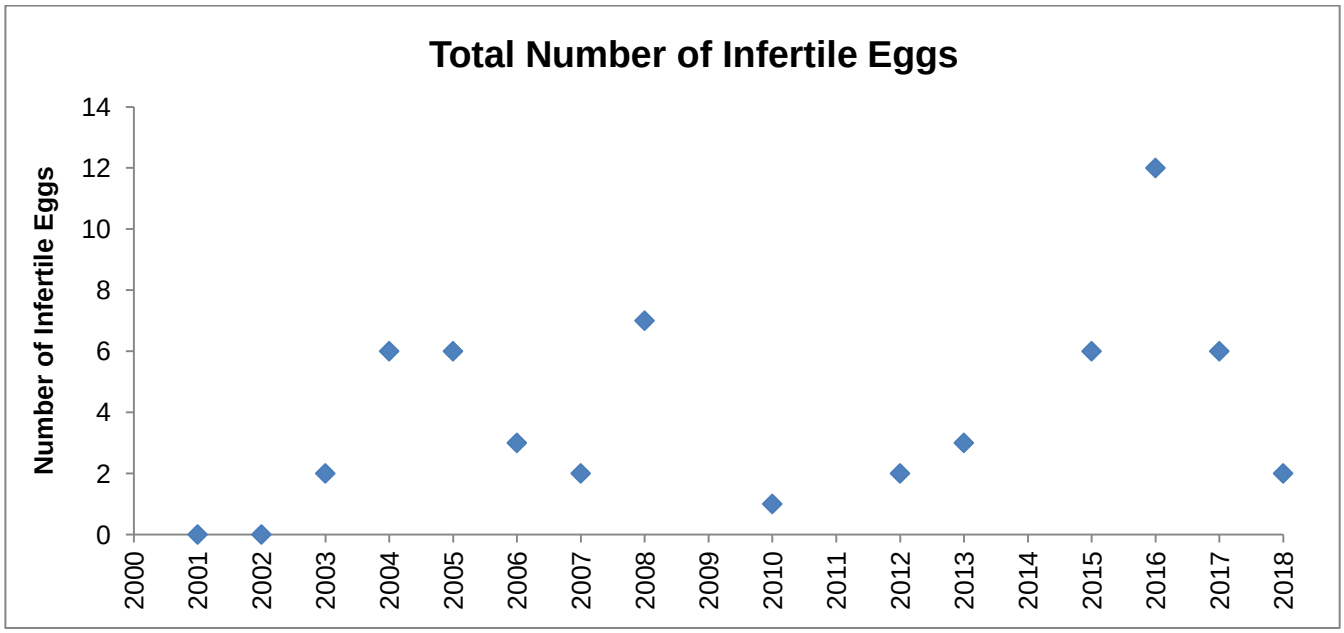



Figure 9. Total number of infertile eggs by year. *Infertility data were not collected during the years 2009, 2011, and 2014.*

**Chick Survival**

The average number of WSP chicks fledged each year at COPR since 2001 is 34 and has ranged between 1 individual in 2001 (beginning of the WSP management program) and 82 in 2018 (Figure 10). **Note that the calculation of average number of hatched chicks and fledged chicks excludes years 2006-2008 due to a change in protocol during those years.*

In 2018, 82 WSP chicks fledged at COPR. The fledging rate (nests that fledged at least one chick/total nests that hatched at least one chick) was 67% (Figure 11). This year, COPR had 3.0 chicks fledged per male (Table 1).

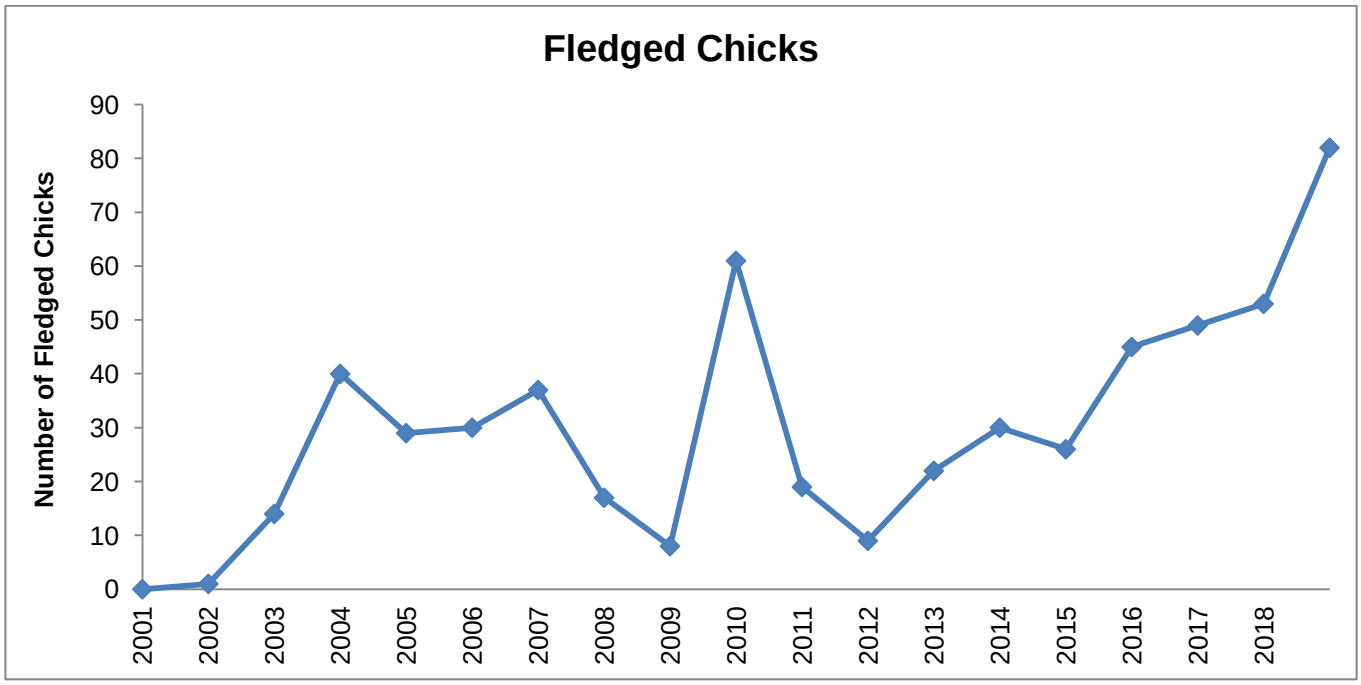



Figure 10. Number of chicks fledged by year

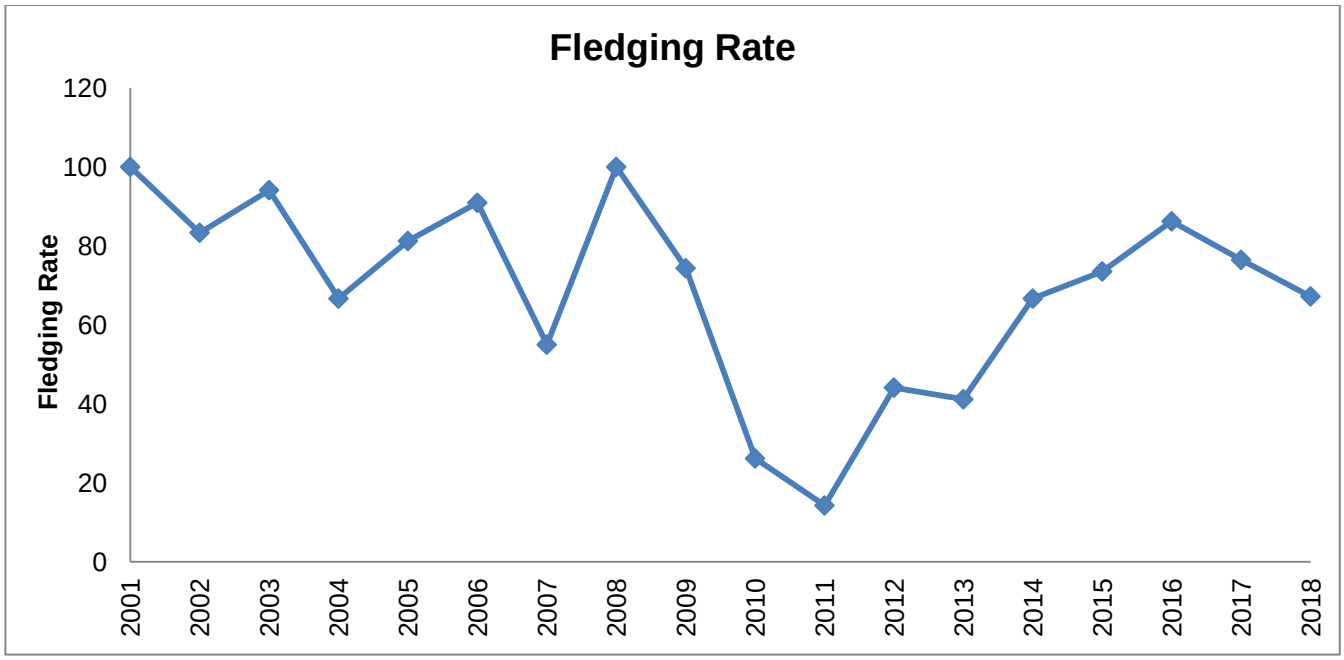



Figure 11. Fledging rate by year (# nests that fledge one chick/# total nests *100)

**Timing of Nests**

In 2018, the first nest was initiated on March 16th and the last chick fledged on August 27th for a total breeding season length of 164 days (Table 3). The length of this year's breeding season was 12 days longer than the average at COPR. The dates of all nesting events in 2018 fell within the range of previous years' dates (Figure 12). Thus, at COPR, there is no indication that nesting phenology is changing.

| 2018 Nesting Event | Date |
|---|---|
| First Nest Initiation | 3/16/18 |
| Last Nest Initiation | 7/3/18 |
| First Hatch | 4/16/18 |
| Last Hatch | 7/30/18 |
| First Fledge | 5/14/18 |
| Last Fledge | 8/27/18 |

Table 3. Dates of nesting events in 2018

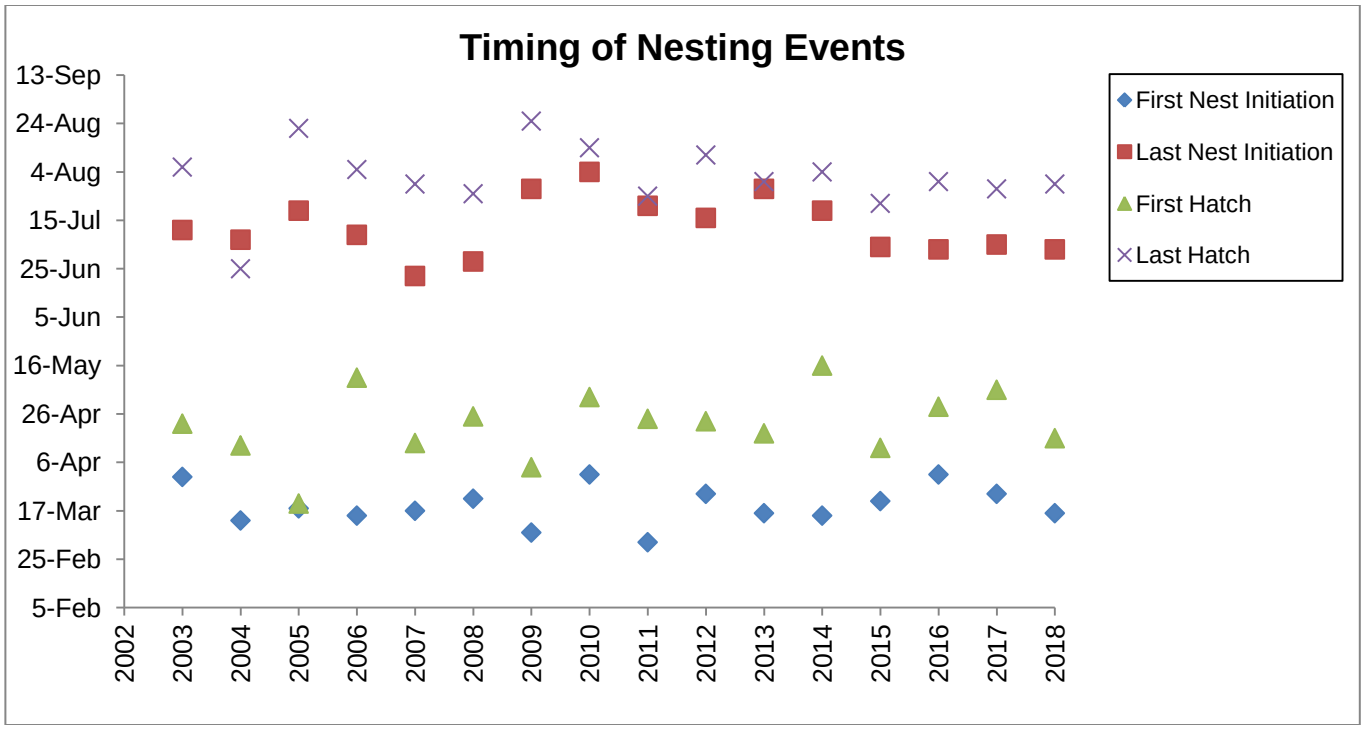



Figure 12. Timing of nest events by year

**Location of Nests**

GPS coordinates were taken for each individual WSP nest. We used the mapping data to look for spatial patterns in hatching and fledging success. This year, 86% of all nests (70 nests) were initiated on the beach (Figure 13). The majority of the nests on the beach were concentrated on the slough mouth and western portion of the beach. Each winter, the slough has been breaking farther west and widening the slough mouth. This has created a large nesting habitat for plovers in the slough mouth. 14% of nests (11 nests) were initiated on the mudflats of the slough (delta) and they all hatched. The map of nest location and fate is shown below (Figure 14 & 15).

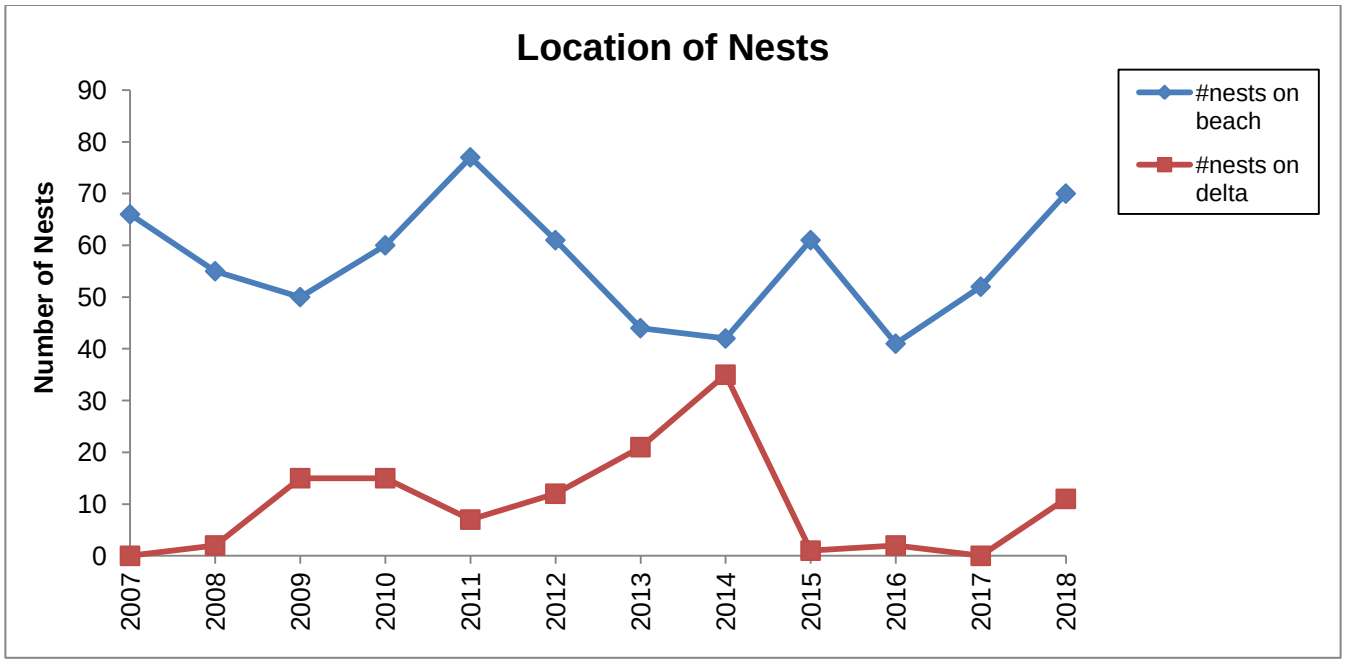



Figure 13. Number of nests on the beach and delta between 2007-2018

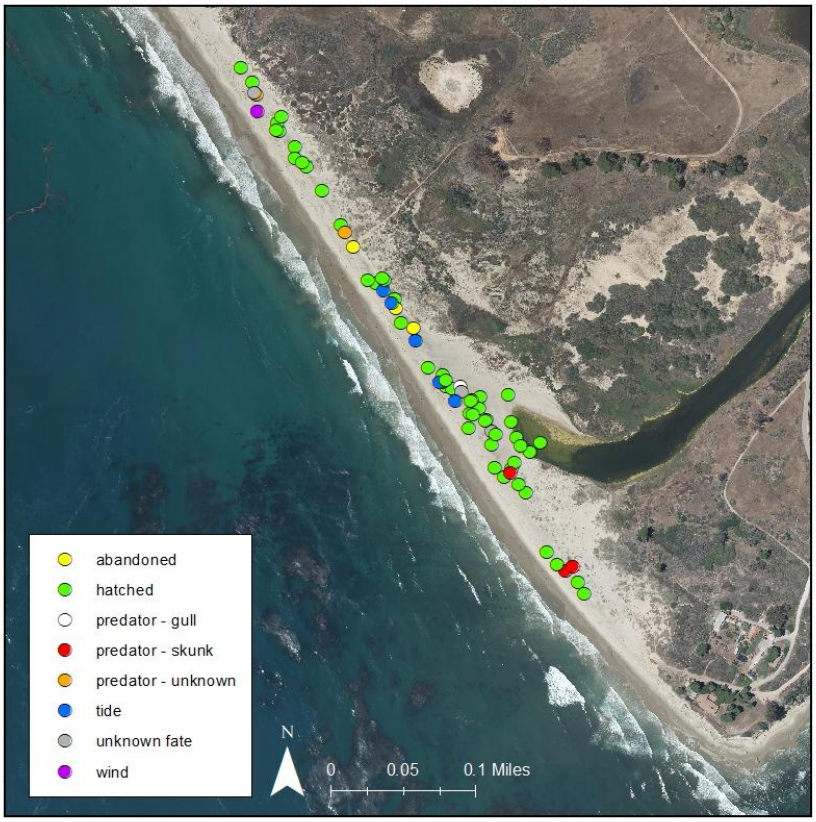



Figure 14. Map of nest fate on beach in 2018. Supplemental maps in Appendix A show nesting areas in more detail.

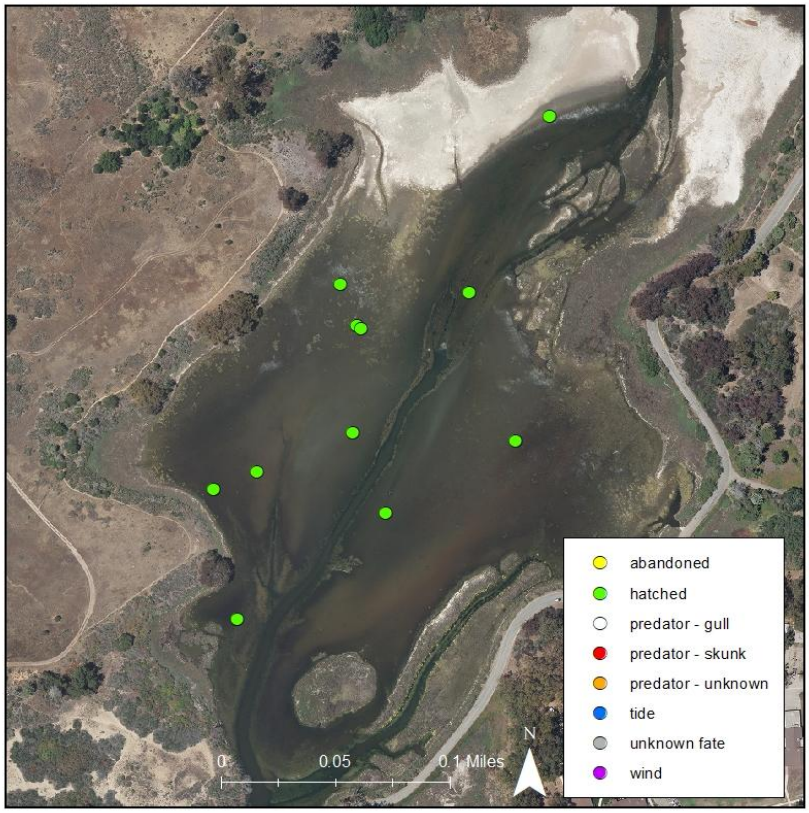



Figure 15. Map of nest fate on delta in 2018. Note that the aerial photo was taken on a different season when the slough was full. During the summer, the mudflats where the nests are located was dry.

**Rehabilitation**

In 2018, a total of 23 eggs were collected from Coal Oil Point Reserve (Table 4). Over half of the eggs collected were abandoned eggs. In most cases of abandonment, the first two chicks of the clutch hatched and the parent did not return to the nest to care for the remaining egg. 30% of collected eggs were washed out of the nest by high tide and 13% of collected eggs were buried in the sand by wind.

Once eggs were collected at COPR, they were transferred to Santa Barbara Zoo (SBZ) to hatch. Once hatched, SBZ staff fed the chicks a diet of bloodworms, pinhead crickets, and mini mealworms. Special care was taken to keep the birds from imprinting on humans; the terrarium was placed in an isolated area of the zoo's veterinary hospital and plover care was limited to only the SBZ bird team. When the chicks reached about 14 days old, they were moved from the terrarium to a flight pen.

Prior to their release, plover biologist Doug George, from Point Blue, banded each chick with a unique band combination (Table 4). This year, the application of leg bands caused irritation and infection on some of the plovers' legs. In these cases, bands were removed to avoid any further health issues to the birds. Each individual satisfied the USFWS requirements for release prior to the release date.

On October 19, 2018, the 3 chicks from COPR (one banded_:GW and two unbanded) were released along with 1 chick originally from Monterey Bay (banded_:RY). They were released outside of any current nest or brood territories (~100 m west of the start of plover fence). Each chick successfully took flight within five minutes of release. The plover banded _:RY was observed in the plover habitat at Coal Oil Point Reserve the day after the release and the plover banded _:GW was observed the following month. It is not possible to determine the presence of the unbanded birds.

| Nest # | Life Stage at Collection | Date of Collection | Reason for Collection | Band Combo | Actual Hatch Date | Location of Hatch | Notes |
|---|---|---|---|---|---|---|---|
| 938 | Egg | 6/4/2018 | abandoned | **no bands - blue mark on crown** | 6/23/18 | SBZ | bird is not banded - cannot confirm presence or absence at COPR |
| 956 | Egg | 7/5/2018 | abandoned | **_:GW** | 7/11/18 | SBZ | last observed at COPR on 11/11/2018; only right leg banded |
| 968 | Egg | 7/12/2018 | tide - washed out nest | **no bands - green mark on crown & blue mark on nape** | 7/28/18 | SBZ | bird is not banded - cannot confirm presence or absence at COPR |
| 902 | Egg | 4/20/2018 | wind - buried in sand | N/A | did not hatch | SBZ | Dead Embryo |
| 902 | Egg | 4/20/2018 | wind - buried in sand | N/A | did not hatch | SBZ | Unknown Fertility |
| 902 | Egg | 4/20/2018 | wind - buried in sand | N/A | did not hatch | SBZ | Unknown Fertility |
| 903 | Egg | 5/8/2018 | abandoned | N/A | did not hatch | SBZ | Dead Embryo |
| 914 | Egg | 5/10/2018 | abandoned | N/A | did not hatch | SBZ | Dead Embryo |
| 934 | Egg | 5/21/2018 | abandoned | N/A | did not hatch | SBZ | Infertile |
| 934 | Egg | 5/21/2018 | abandoned | N/A | did not hatch | SBZ | Infertile |
| 913 | Egg | 5/23/2018 | abandoned | N/A | did not hatch | SBZ | Unknown Fertility |
| 312 | Egg | 5/23/2018 | abandoned | N/A | did not hatch | SBZ | Unknown Fertility |
| 938 | Egg | 6/4/2018 | abandoned | N/A | did not hatch | SBZ | Dead Embryo |
| 938 | Egg | 6/4/2018 | abandoned | N/A | did not hatch | SBZ | Dead Embryo |
| 944 | Egg | 6/4/2018 | abandoned | N/A | did not hatch | SBZ | Dead Embryo |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 931 | Egg | 6/6/2018 | abandoned | N/A | did not hatch | SBZ | Dead Embryo |
| 931 | Egg | 6/6/2018 | abandoned | N/A | did not hatch | SBZ | Dead Embryo |
| 952 | Egg | 6/12/2018 | tide - washed out nest | N/A | did not hatch | SBZ | Dead Embryo |
| 946 | Egg | 6/13/2018 | tide - washed out nest | N/A | did not hatch | SBZ | Dead Embryo |
| 946 | Egg | 6/13/2018 | tide - washed out nest | N/A | did not hatch | SBZ | Dead Embryo |
| 955 | Egg | 6/14/2018 | tide - washed out nest | N/A | did not hatch | SBZ | Dead Embryo |
| 948 | Egg | 6/14/2018 | tide - washed out nest | N/A | did not hatch | SBZ | Dead Embryo |
| 954 | Egg | 6/14/2018 | tide - washed out nest | N/A | did not hatch | SBZ | Dead Embryo |

Table 4. Description of collected plover eggs and chicks in 2018.

**Enforcement**

There is no regular enforcement of Sands Beach. Officers enforce the leash law and other pertinent ordinances at COPR when they are called by the docents. In December 2017, the California Coastal Commission prohibited dogs at COPR. The reserve staff is developing a plan to implement this change in policy.

**Docent Program**

With an increase in beach use at Sands Beach in the last two years (Appendix C), the docent program continues to be crucial to the success of Western Snowy Plover recovery at Coal Oil Point. The docents have been instrumental in reducing the impact of beach users to the Snowy Plovers. The docents' main duties include educating people about the plovers, requesting compliance to the leash law, requesting people to stay away from the symbolic fence, requesting people to move around the plover flock, scaring away crows, and informing the staff of birds of prey observed around the nesting area. This year, docent coverage averaged approximately 55 hours per week. However, we have observed a large increase in students visiting the beach as a result of dorms that opened in 2017 that house 4,000 new students near the reserve. The docents have noted that it is difficult to handle large crowds of people on the beach.

## CONCLUSION

The plover population at COPR has recovered since the implementation of a management plan in 2001. The control of skunks has become a management priority to improve hatching success. Because the density of nests is relatively high compared to other beaches, a nest predator can cause a large impact in a single day. In previous years we concluded that we cannot use hatching success as a predictor of fledging success, thus we will continue to count the number of chicks until fledging age. The wintering population at the reserve had previously been in a downward trend and is beginning to increase. The docent program continues to be an effective way to reduce human impact on the plovers, but the increase of human population in the area needs to be addressed to prevent an impact to the plover population at Sands Beach.

## RECOMMENDATIONS

- The USDA trapping program worked well and should be continued.
- The mudflats should be included as part of the plover nesting habitat and be regularly monitored.
- Predator control should be increased during the breeding season. Docents should watch for predators, both from the beach and potentially from blinds.
- A designated ranger would be useful in enforcement of the dog leash law at COPR and Ellwood.
- The university and COPR should work together to start implementing the prohibition of dogs at COPR, as per the new LRDP amendment by the California Coastal Commission.

## ACKNOWLEDGEMENTS

Jessica Nielsen (Conservation Specialist) and Cristina Sandoval (Reserve Director) conducted plover monitoring. Jessica managed the docent program. We are very thankful to Katelyn Nyberg who helped count plovers, locate nests and determine their fate. Rick Fellows donated over 200 hours towards the Snowy Plover Docent Program this year, in addition to countless additional hours spent conducting restoration work and maintaining the reserve. The docents, over 50 volunteers and interns over the course of 2018, maintained a presence at the beach every day of the year.

**California Least Terns**

Several California Least Terns migrated through COPR during the breeding season but they did not nest. We did not observe any courtship or mating behavior this year.

**Bibliography of other Snowy Plover studies at COPR**:

Lafferty, K.D. 2000. "Status, trends and conservation of the western snowy plover with a focus on the Devereux Slough population at Coal Oil Point Reserve, Santa Barbara County, CA." Museum of Systematics and Ecology, University of California, Santa Barbara, Santa Barbara, CA.

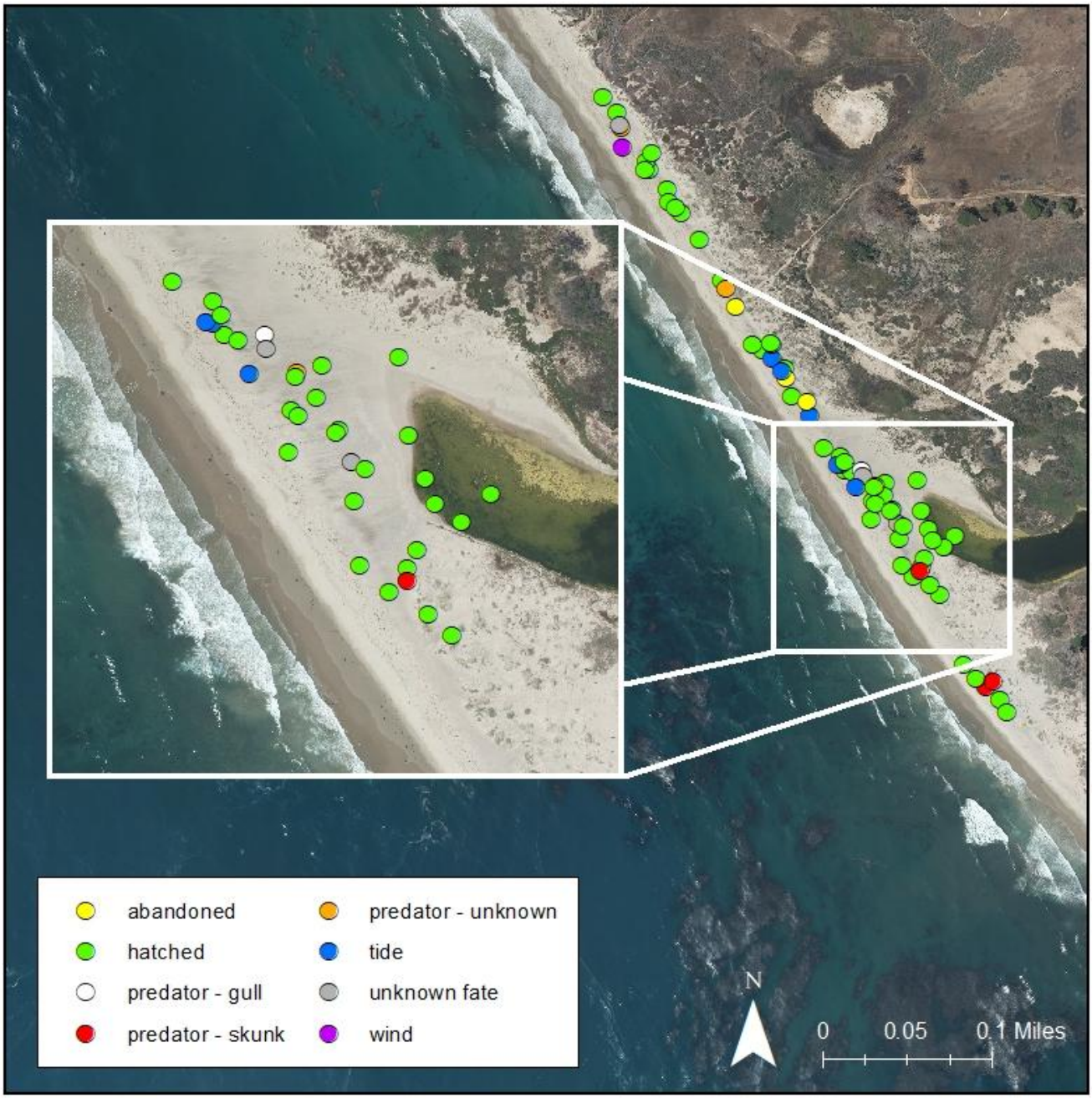
Lafferty, K.D. 2001a. "Birds at a southern California beach: seasonality, habitat use and disturbance by human activity." Biodiversity and Conservation 10: 1-14.

Lafferty, K.D. 2001b. "Disturbance to wintering western snowy plovers." Biological Conservation 101: 315-325.

Lafferty, K.D., Goodman, D., & Sandoval, C.P. 2005. "Restoration of breeding by snowy plovers following protection from disturbance." Biodiversity and Conservation. Online at: http://www.kluweronline.com/issn/0960-3115

Nielsen, J., Hampton, S. & Sandoval, C. 2017. "Cooperation between Response Crews and Land Managers Protects Snowy Plovers during the Refugio Oil Spill." International Oil Spill Conference Proceedings. 2017. 618-633. 10.7901/2169-3358-2017.1.618.

**APPENDIX A.**
Supplemental maps of nesting areas.



abandoned
hatched
predator - gull
predator - skunk
predator - unknown
tide
unknown fate
wind
N
0
0.05
0.1 Miles

**APPENDIX B.**

Band sightings by COPR staff at Sands Beach

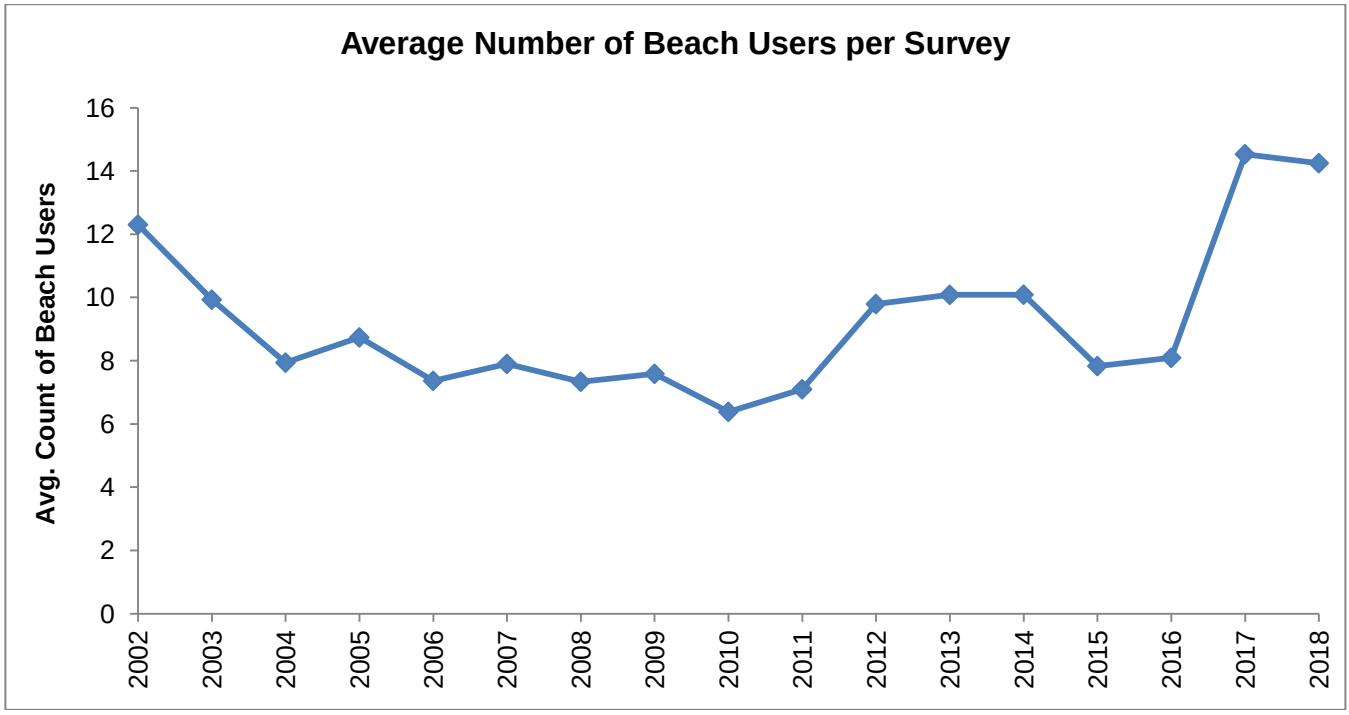
*Note: "--" represents unknown band, i.e. when plover is standing on one leg and observer can only view bands on exposed leg.*

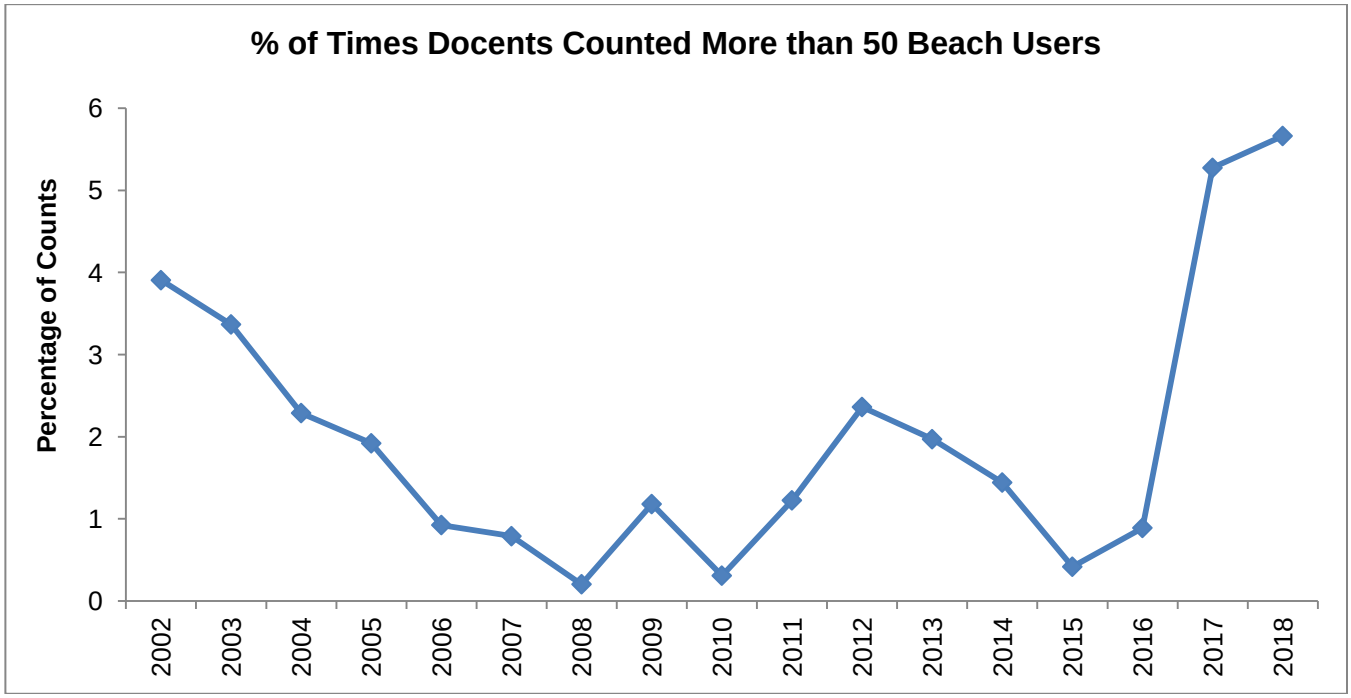
| Date | Band Sightings | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1/2/2018 | NO:RG | LN:BY | PV:VW | NY:WL | PV:OB | | | | | |
| 1/12/2018 | PV:PL | AN:RW | | | | | | | | |
| 1/23/2018 | O:WLS | A:L/O/L | W:W/R/W | LW:BY | AN:YW | PV:PL | NY:WL | | | |
| 2/1/2018 | AN:YW | LA:YB | | | | | | | | |
| 2/9/2018 | AN:RW | Y:WL | WA:WV | | | | | | | |
| 2/14/2018 | AY:YW | Pa:RR | PN:YW | NO:RL | PV:-- | W/L:-- | | | | |
| 3/26/2018 | A:L/O/L | PV:RL | | | | | | | | |
| 3/29/2018 | NY:WG | YL:RL | GN:BY | PA:RG | AN:RW | | | | | |
| 4/2/2018 | Pa:RR | | | | | | | | | |
| 4/18/2018 | AB:AP | SB #78:WB | | | | | | | | |
| 4/20/2018 | GA:PB | RG:PV | | | | | | | | |
| 4/25/2018 | KB:WB | | | | | | | | | |
| 5/4/2018 | Pa:RR | | | | | | | | | |
| 5/7/2018 | YW:YW | | | | | | | | | |
| 5/22/2018 | Pa:RR | | | | | | | | | |
| 5/30/2018 | Pa:RR | YN:YW | | | | | | | | |
| 6/1/2018 | LN:BY | | | | | | | | | |
| 6/4/2018 | A:RW | | | | | | | | | |
| 6/6/2018 | AK:RW | GA:PB | YN:YW | | | | | | | |
| 6/8/2018 | LN:BY | | | | | | | | | |
| 6/11/2018 | AN:WY | | | | | | | | | |
| 6/19/2018 | GN:BY | A:RW - missing foot | | | | | | | | |
| 6/21/2018 | A:RW | B:G/W/G | | | | | | | | |
| 7/12/2018 | YS:RG | B:G/W/G | | | | | | | | |
| 7/3/2018 | AT:WY | | | | | | | | | |
| 7/13/2018 | A:RW - missing foot | | | | | | | | | |
| 8/16/2018 | LL:YY | VL:AL | | | | | | | | |
| 8/17/2018 | YO:OG | Pa:RR | | | | | | | | |
| 9/4/2018 | PV:PL | | | | | | | | | |
| 9/27/2018 | NY:WL | | | | | | | | | |
| 10/9/2018 | AN:WY | _RW: | B:G/W/G | NY:GW | A:YW | NY:WL | AR:AY | KB:WB | Pa:RR | WA:WV |
| 10/9/2018 (cont'd) | A:G/O/G | L/R:K | | | | | | | | |
| 10/10/2018 | LN:BY | AN:WY | AN:YW | NR:NY | _:RY | | | | | |
| 11/5/2018 | AN:WY | | | | | | | | | |
| 11/9/2018 | _:GW | | | | | | | | | |
| 11/11/2018 | _:GW | | | | | | | | | |
| 11/30/2018 | AN:YW | _:RW | | | | | | | | |
| 12/12/2018 | B?:WY | LN:BY | KA:WV | LN:NR | --:WB | --:WL | --:YW | A:-- | --:RG | |
| 12/18/2018 | NR:GN | A:RW | | | | | | | | |

**APPENDIX C.**

Data on beach use at the reserve.

These data represent snapshot counts of beach users is collected at the start of each docent shift.



**APPENDIX D.**

**United States Department of Agriculture**

Animal and Plant Health Inspection Service

Wildlife Services

San Luis District

P.O. Box 957, Taft, CA 93268-0957

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1 November 2018

Report of Predator removal for Coal Oil Point Reserve:

Predator management activities were conducted on the Coal Oil Point Reserve in an effort to protect the threatened Western Snowy Plover against predation by mammalian predators during the 2018 nesting season. Predator removal activities began on 25 April 2018 and ended 22 June 2018. Predator removal efforts in 2018 was conducted as an on-call system where predator removal was done only at the request of Coal Oil Point Reserve.

Striped skunks and American Crows were the target predators during the 2018 snowy plover nesting season. Trapping was the method used to remove mammalian predators. Traps used to capture mammalian predators were 10” X 12” X 32” Tomahawk cage traps. All target mammals captured in traps were given an injection of sodium pentobarbital as a means of euthanasia. Two striped skunks were removed by trapping during the 2018 Western Snowy Plover nesting season.

Lethal doses of sodium pentobarbital were administered through the use of a syringe or syringe pole. The injections were placed in the intraperitoneal cavity. The typical dosage rate is 1 cc for every 10 pounds of body weight. 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, 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

One American Crows was removed during the 2018 nesting season. Removal was conducted with a sound suppressed 22 caliber rifle. Shooting was focused mainly on

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human safety and humane euthanasia. All Wildlife Services employees must go through rigorous training in the safe and proper use of firearms before using them in the field.

All euthanasia of wildlife conducted by Wildlife Services is done in accordance with the American Veterinary Medical Association's Guidelines for the Euthanasia of Animals: 2013 Edition. These guidelines can be found at https://www.avma.org/KB/Policies/Documents/euthanasia.pdf.

Wildlife Services spent 73 hours on predator removal activities, carcass disposal, and associated administrative duties at Coal Oil Point Reserve during the 2018 season. A total of 56 trap nights with cage traps and two trap nights with padded jaw leg-hold traps were spent trapping and removing predators. A trap night is where one trap is set for one night. Two traps set for one night would be two trap nights, etc.

Wildlife Services recommends beginning predator removal activities prior to pairing and breeding season in 2019. Each year the cost of conducting predator removal increases. Coal Oil Point Reserve should consider this and secure sufficient funding to conduct the desired amount of predator removal.

Spotlight and scent station surveys should be conducted during the non-nesting season to identify predator species that inhabit the nesting area.

Predator management should be continued each year to help ensure fledging success of the threatened Western Snowy Plover.

Wildlife Services was able to hire an employee in September who will be available to work Coal Oil Point in 2019.

Feel free to contact me if you have any questions.

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