2019 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: February 7th, 2020

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, predator exclosures as needed.

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ABSTRACT

In 2019, we continued with the monitoring of the Western Snowy Plover (WSP) population at Coal Oil Point Reserve as in previous years. The number of breeding adults (68) was the highest observed since monitoring began in 2001. The wintering population (132) was below the average for this site. This year, predation, particularly by crows, had a large impact on the fate of nests and chicks, as did high tides. The rate of fledged chicks per male (0.2) was the lowest on record for our site since the program began in 2001. 96% of nests (93) were initiated on the beach, and 4% (4) were initiated on the mudflats of the slough (delta).

INTRODUCTION

Sands Beach at Coal Oil Point Reserve (COPR) is part of the University of California Natural Reserve System. The entire reserve including Sands Beach has an Environmentally Sensitive Area designation by the California Coastal Commission. Sands Beach was also designated a “critical habitat” in the recovery of the threatened WSP (USFWS Western Snowy Plover Recovery Plan). Sands Beach is an important habitat for many species of shorebirds and is considered an Audubon “Important Bird Area." Currently, Sands Beach has an average wintering population of Western Snowy Plover (WSP) of 176 individuals and an average breeding population of 34. The lower beach is open to the public all year, but most of the dry sandy upper beach, where plovers nest and congregate while resting, is protected by a symbolic fence.

Parts of Sands Beach are open to the public for passive recreation (sunbathing, walking, and surfing). Managing public access to the beach has been essential in protecting the wildlife resources of Sands Beach in perpetuity. Active management to protect the Western Snowy Plovers began in 2001 and resulted in the recovery of a breeding population of WSP that had been lost for decades and an increase in the wintering population. The most significant action that led WSP to start nesting at Sands Beach again was to restrict public use on the upper beach habitat used by WSP for resting and nesting. A docent program was initiated to inform people of restricted areas and other reserve regulations. The docents, together with signs and other forms of education, help encourage most beach goers to avoid sensitive

areas. However, there is still some trespassing and vandalism, and only 50% of dog owners arrive to the beach with their dog on leash. Unleashed dogs have been responsible for 3 cases of "take" (WSP fatalities). Enforcement has been sporadic and the it seems like the compliance with the leash law will not improve unless citations are issued on a regular basis at Sands Beach. In 2017, the California Coastal Commission approved an amendment to the UCSB LRDP to prohibit dogs at Sands Beach. This prohibition was an attempt to eliminate the chronic issue of unleashed dogs at Sands Beach. This policy has not yet been enforced.

METHODS AND RESULTS

The reserve staff monitors the WSP population and several aspects of the public use of the beach such as the number of people on the beach and in the ocean and the number of trespassers and dogs per hour. Standard protocols were established at the beginning of 2001 to ensure that staff and regulatory agencies can rely on the data to understand trends, measure performance standards and goals, and evaluate the need for new actions. In summary, COPR staff uses a scientific approach to gather data and uses these data to guide an adaptive management approach that best protects the WSP and other wildlife in conformance with the UC Natural Reserve System mission. The protection of natural resources at Sands Beach is described in detail in the COPR Beach Access Management Plan and Snowy Plover Management Plan (Sandoval, 2019).

Protected Areas

In 2019, we continued with the same management practices established in the 2004 and 2015 Snowy Plover Management Plans (Sandoval, 2004 & 2015). 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 several years, the entire fence had to be removed in the winter due to beach erosion. In these cases, protection of the upper beach habitat from trespassers is provided by a few signs on the dunes and the docents, who request trespassers to leave the area behind the signs.

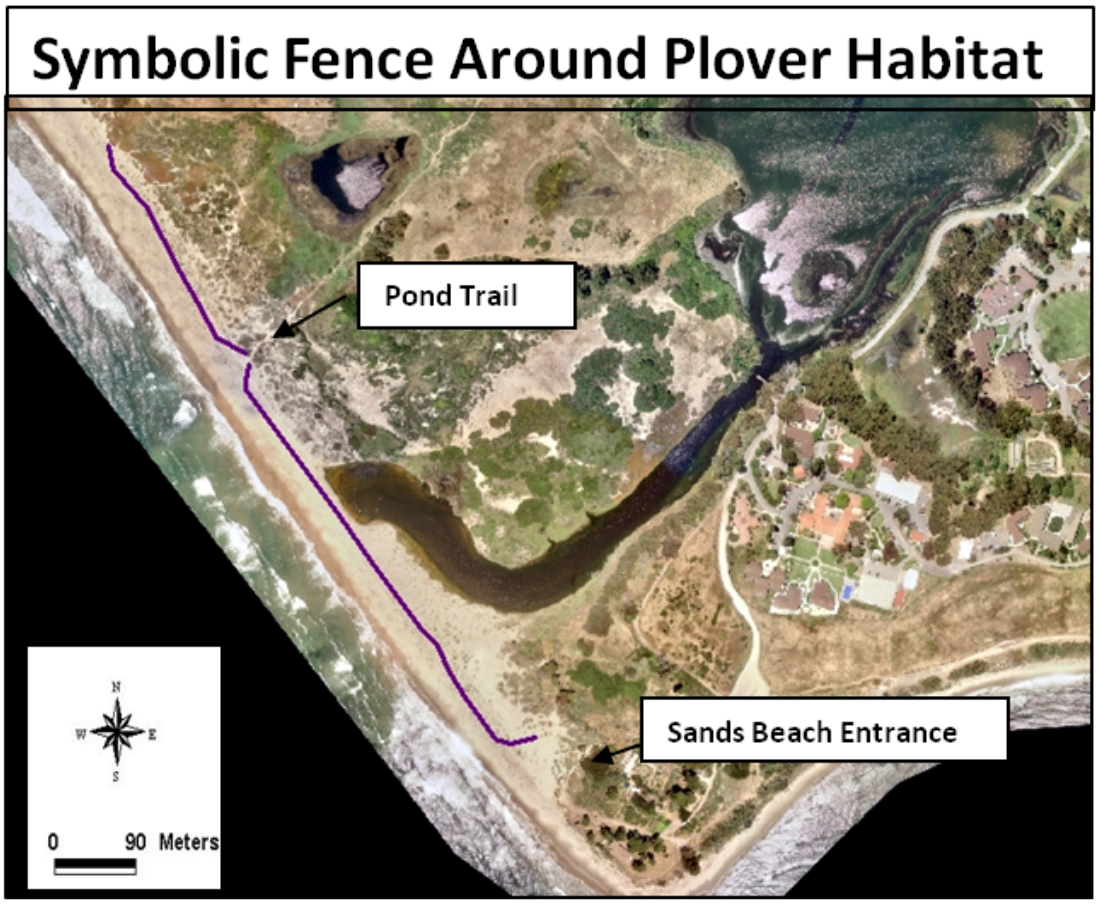

Figure 1. Location of the habitat protected by symbolic fencing for the Western Snowy Plovers during the breeding season on Sands Beach at Coal Oil Point Reserve. The mudflats (not shown in this photo) are also protected. The fence is shown in purple.

Monitoring of the 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 2019 winter window survey, we counted 132 WSP (Figure 2). The average number of wintering WSP at Coal Oil Point Reserve since 2001 is 176 individuals.

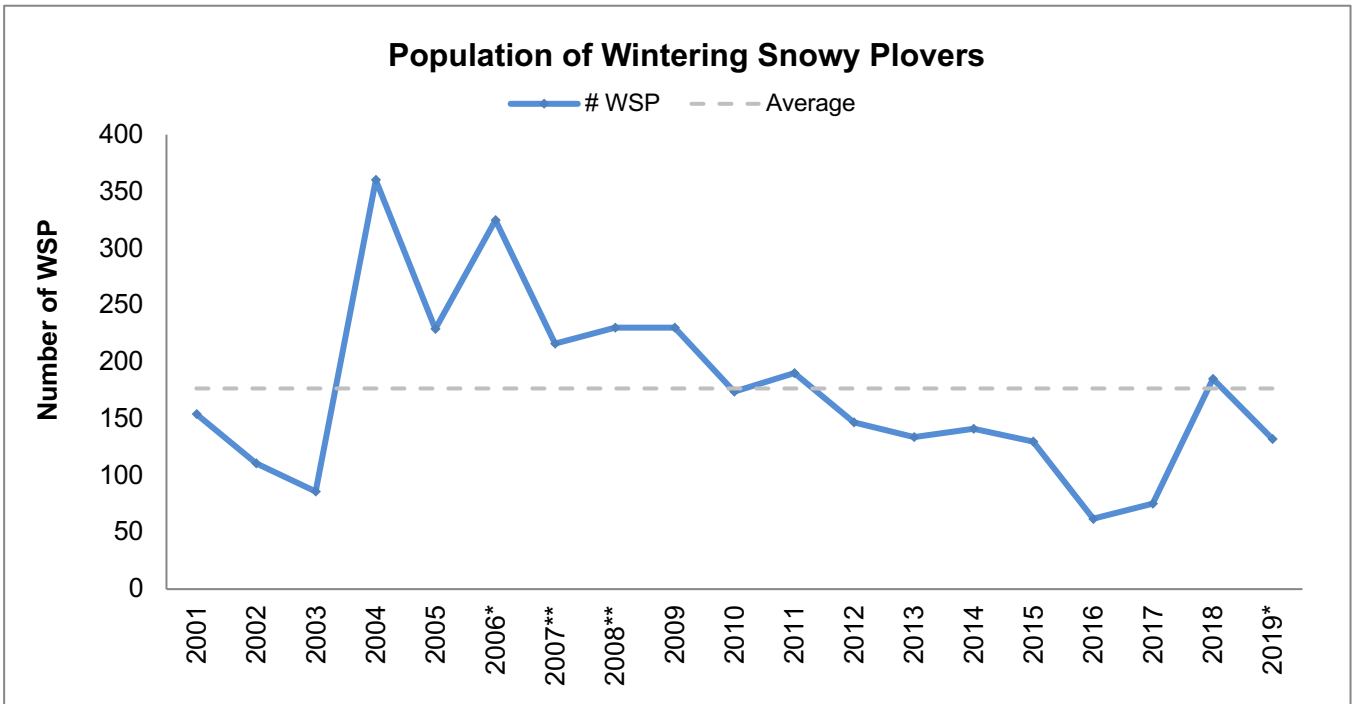

Figure 2. Results of winter window surveys at Coal Oil Point Reserve. *Average line represents the average from 2001-2018.*

Monitoring of the Breeding Population

We surveyed WSP during the breeding season window survey using the same method as for the wintering season window survey. We counted 68 WSP during the 2019 breeding window survey, which is the largest breeding population on record at COPR. The graph below shows that the number of breeding adults increased right after the implementation of the management plan in 2001 and has reached a mean of 33 adults since 2001 (Figure 3). The breeding population at COPR may still be growing and hasn't reached its carrying capacity (Figure 3).

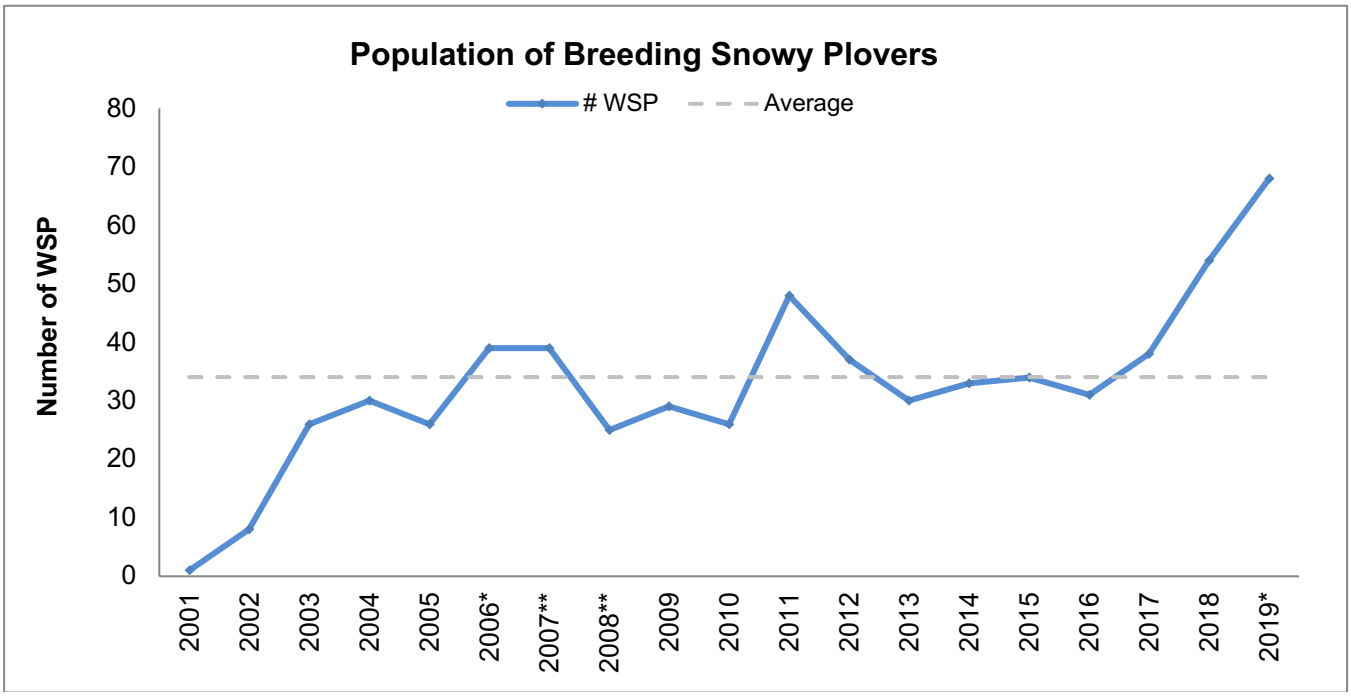

Figure 3. Number of WSP adults counted during the breeding window surveys at Coal Oil Point Reserve.

Average line represents the average from 2003-2018. In 2001 and 2002, the breeding population was still beginning to grow. Note that these years are excluded from the calculation of all breeding averages.

Monitoring of Nest and Chick Fate

During the nesting season in 2019, the numbers and locations of adult plovers, nests, and chicks were counted 3-4 times per week by Jessica Nielsen, Cris Sandoval, and Beau Tindall. Table 1 summarizes the results of breeding success each year. The number of males for the estimation of fledged chicks/male was calculated based on half of the adult number counted in the breeding window survey. Because males can arrive at COPR throughout the season, the number of males per season using the window survey count is likely to be underestimated.

In 2019, 97 WSP nests were initiated at COPR and 27 of them hatched. Figure 5 shows the number of nests laid and the number of nests hatched between 2001-2019. This year, COPR had a below-average hatching rate (28%) (Figure 5). The main cause of nest failure was predators, followed by high tides (Figure 6, Table 2). In July, a combination of high tide and large swell resulted in a loss of 16 nests in the slough mouth in a single night due to flooding of the nesting area.

Detailed discussion of nest and chick fate follow below.

Table 1. Breeding success estimates of WSP at Coal Oil Point Reserve since 2001 until present. Note that 2019 had 3 record numbers: highest number of breeding adults, highest number of nests, and lowest chick survival.

Year	Breeding Window Survey (BWS)	# Nests	# Nests Hatched	Hatching Rate (nests hatched / #nests*100)	# Chicks Fledged	# Fledges Per estimated Male (BWS)	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	13	6	46%	14	2.8	83%
2003	26	24	16	67%	40	3.3	94%
2004	30	52	20	38%	27	1.9	67%
2005	26	64	16	25%	30	2.3	81%
2006*	39	43	22	51%	37	1.9	91%
2007*	39	66	20	36%	17	0.9	55%
2008*	25	57	3	9%	8	0.7	100%
2009	29	65	39	60%	61	4.2	74%
2010	26	75	42	56%	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	34	52%	30	2	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	34	65%	53	2.8	77%
2018	54	81	61	75%	82	3	67%
2019*	68	97	27	29%	8	0.2	18%
COPR AVERAGE	**34.1**	**61.4**	**31.9**	**52.4**	**37.9**	**2.32**	**62.4**
COPR SD	**8.2**	**15.9**	**12.3**	**15.5**	**19.8**	**1.02**	**24.0**

In 2001 and 2002, the breeding population was still beginning to grow. Note that these years are excluded from the calculation of all breeding averages.
**In 2006 and 2019, exclosure cages were used to protect nests from crows. This was a change from the standard protocol at this site and may have affected nest fates. These years are excluded from the calculation of average hatching and fledging rates.*
***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. These years are excluded from the calculation of average hatching and fledging rates.*

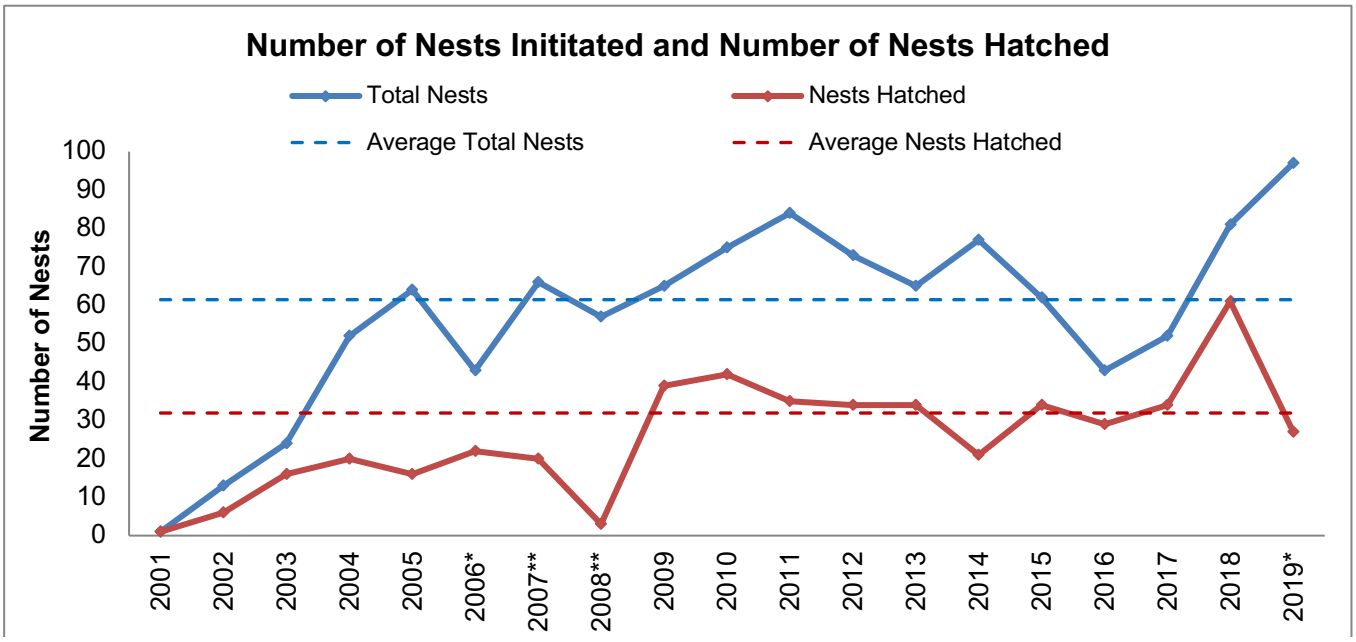

Figure 5. Nests initiated and hatched by year (total number of nests that had at least one egg vs. total number of nests that hatched at least one chick).

In 2001 and 2002, the breeding population was still beginning to grow. Note that these years are excluded from the calculation of all breeding averages.
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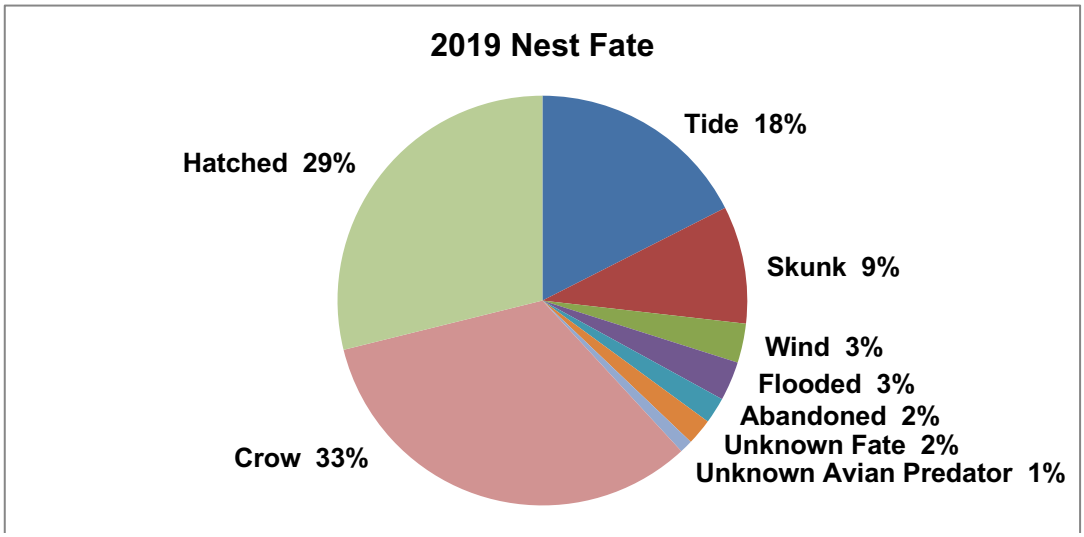

Figure 6. Nest fate at COPR in 2019. Each section in the graph shows the proportion of nests that failed by each cause and the proportion of nests that hatched (data as in Table 2).

Table 2. Number of nests lost by fate from 2002-2019.

Year 20-XX	'02	'03	'04	'05	'06 *	'07 **	'08 **	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19 *
Total nests	**13**	**24**	**52**	**64**	**43**	**66**	**57**	**65**	**75**	**84**	**73**	**65**	**77**	**62**	**43**	**52**	**81**	**97**
Hatched	6	16	20	16	22	20	3	39	42	35	34	34	21	34	29	34	61	28
Skunk	0	0	9	18	2	19	18	10	0	0	0	4	10	15	6	4	3	9
Crow	2	4	8	3	0	0	0	1	1	0	0	0	0	0	0	0	0	32
Abandoned	0	1	1	9	3	1	0	2	3	5	3	4	9	1	2	1	3	2
Abandoned /Owl	0	0	0	0	5	0	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	0
Raccoon	0	0	2	1	0	0	0	1	0	0	2	2	4	0	1	0	0	0
Whimbrel	0	0	1	0	0	0	0	0	0	1	0	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	0
Opossum	0	0	0	1	0	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	0
Unknown Cause	0	0	0	0	0	0	0	0	17	8	4	0	21	0	0	0	0	0
Human	0	0	0	0	0	0	0	0	0	0	1	0	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	1
Wind	1	2	2	6	1	2	2	5	2	10	2	0	0	1	0	3	1	3
Flooded/ Tide	0	0	4	5	2	1	6	2	5	12	16	6	3	5	2	8	6	17
Flooded/ Slough	0	0	0	3	0	0	0	0	4	3	0	0	0	0	0	0	0	3

**Note that in 2006 and 2019, 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.*

Nest Predation

43% of nests (42) were confirmed to be predated in 2019, mostly by crows (32) (Figure 7). Many of the predation events by crows were directly observed during the nest monitoring. This was the first year since 2010 that there has been crow predation on nests at COPR.

Nest monitors and docents harassed all crows observed on the beach using slingshots. Additionally, we implemented crow hazing techniques using crow carcasses to deter the crows from the nesting area. Compared to previous years, crows were unresponsive to harassment and hazing and were present on the beach in larger numbers, sometimes more than 20 individuals. In the past, pairs of nesting crows would occasionally visit the nesting habitat and were deterred by harassment and hazing, but this year the crows came to the beach in dozens and systematically predated all nests on the beach even as nest monitors attempted to harass them away. USDA was contracted to remove crow nests near the plover habitat and remove crows (Appendix E) but the opportunities for removal were rare because COPR is a public beach.

When crows did not respond to harassment techniques, we requested permission from USFWS to modify the nest exclosure to protect nests without jeopardizing adult survival. In the past, nest exclosures at COPR attracted owls and posed a risk of predation to adults incubating inside the exclosure. The round exclosures had 2 walls of 2x4" mesh size and plywood tops. The solid top was intended to prevent owls from observing the adults from above. The inner circle's diameter measured 12" and the outer circle's diameter measured 24", leaving a space of 6" between circles. The goal of the double wall was to prevent owls from predating the adult plovers through the mesh if the plover hit the mesh while attempting to flee the exclosure. Bird spikes were added to the tops of exclosures in the slough mouth area to prevent gulls from sitting on top of the plywood. After deployment of the exclosure, plovers that had been actively incubating returned to the nest after an average of 4 minutes. There were no signs of changes in nesting behavior as a result of the cages. For more details on the design and the monitoring protocol for exclosure deployment, see Appendix A.

In 2019, skunks depredated 9% of nests (9 nests). All skunk predation began in early July, approximately 1 month after we began caging nests. Skunks were able to squeeze through 2x4" mesh and may have keyed in on caged nests. We then removed the exclosures from the remaining nests. USDA was contracted to remove skunks from the reserve. At this point, the crows had been deterred by the cages and had stopped hunting for nests on the beach so we shifted our focus to preventing skunk predation. Of the two nests remaining, one hatched and one was predated by an unknown avian predator.

It continues to be crucial to initiate predator control as soon as there is evidence of potential predators in the vicinity of the nesting area.

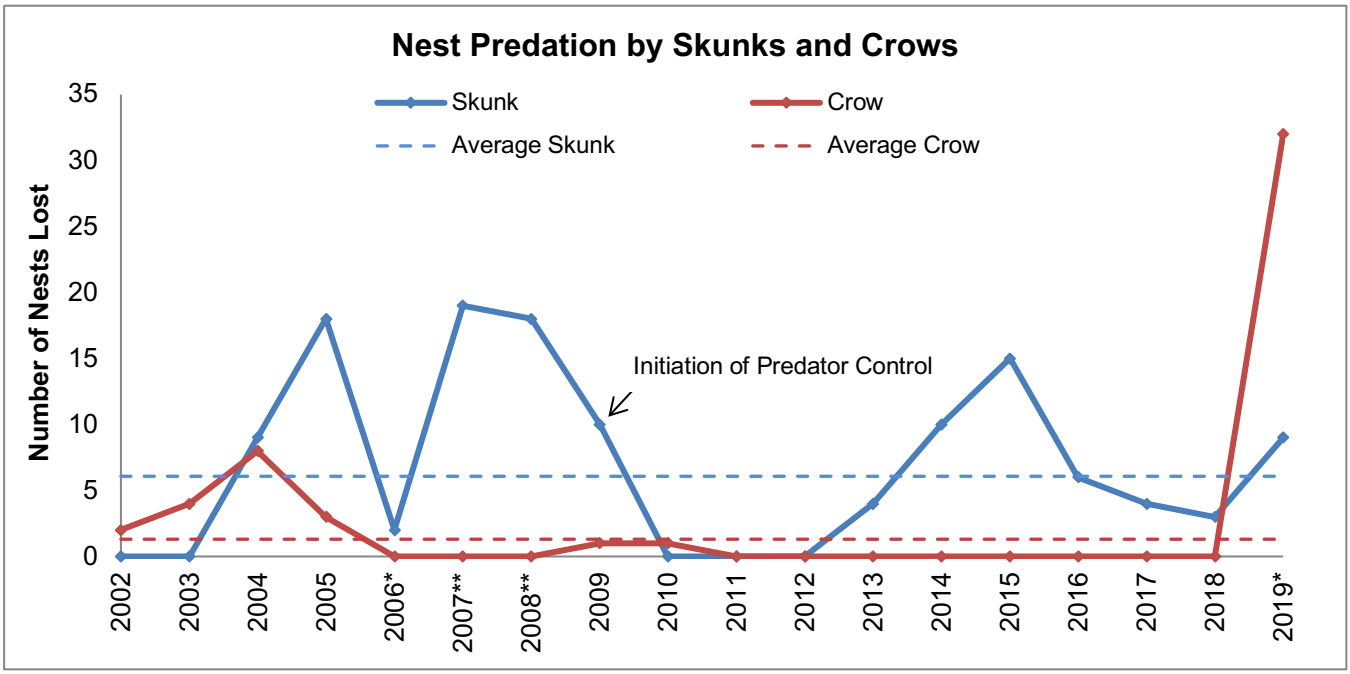

Figure 7. Crow and skunk predation by year.

In 2001 and 2002, the breeding population of WSP was still beginning to grow. Note that these years are excluded from the calculation of all breeding averages.
**In 2006 and 2019, exclosure cages were used to protect nests from crows. This was a change from the standard protocol at this site and may have affected nest fates. These years are excluded from the calculation of average hatching and fledging rates.*
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Infertility

27 unhatched and abandoned eggs were collected and incubated to determine viability. Of those, 12 did not hatch. 8 died during development, and 4 were infertile (Figure 8 and 9). 1.4% of the WSP eggs in 2019 were infertile. 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).

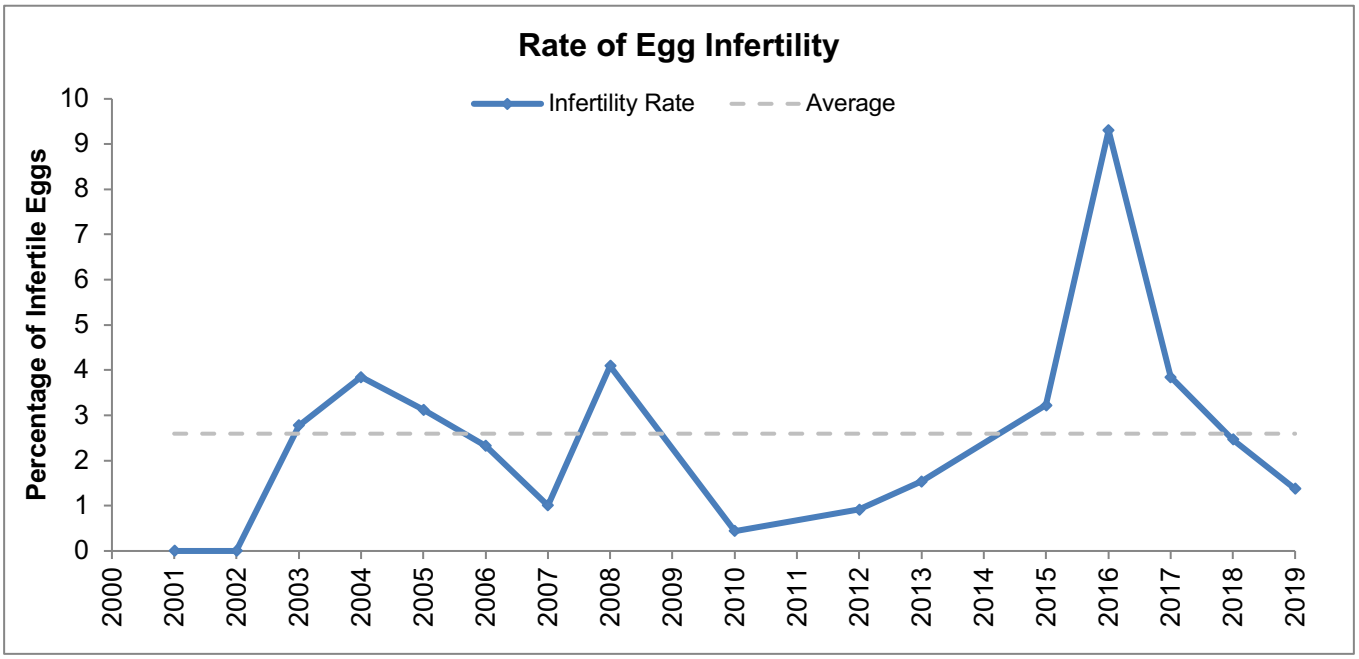

Figure 8. Percentage of infertile eggs by year (# infertile eggs / # total eggs *100).

Average line represents average for 2001-2018. Infertility data were not collected during the years 2009, 2011, and 2014.

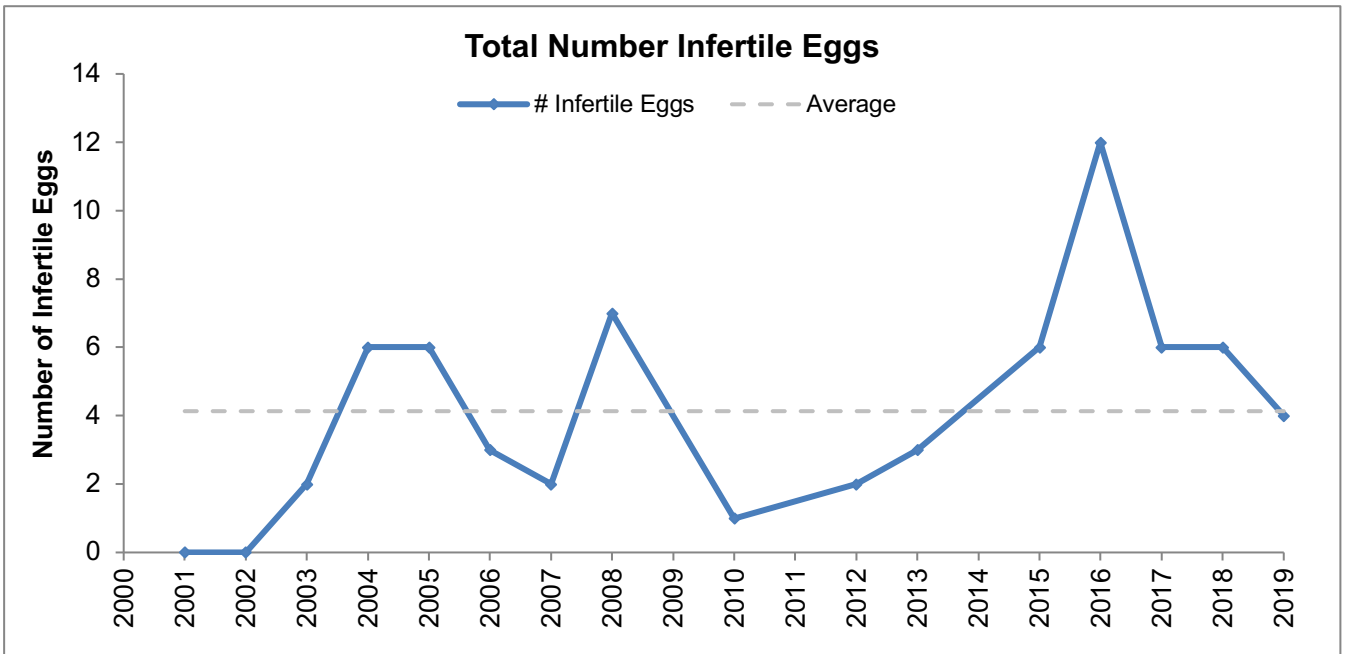

Figure 9. Total number of infertile eggs by year.

Average line represents average for 2001-2018. Infertility data were not collected during the years 2009, 2011, and 2014.

Chick Survival

The survival rate of chicks was very low this year. Only 11% of hatched chicks survived to fledgling age. Unfortunately, it is difficult to know the cause of chick mortality because chicks move around and predation events are very fast and difficult to observe. Some chicks disappeared during times when crows were actively hunting the area for nests. One chick carcass was discovered in the dunes within a two-hour time frame during which 13 crows were actively hunting on the beach. The carcass was fresh, so there is a possibility that the chick was picked up by a crow and dropped. We also observed evidence of owl tracks in the plover habitat on several occasions during times of high levels of chick loss. There were also a number of gulls in the nesting area during the breeding season.

We implemented predator control for crows as described in page 11. To address the owl issue, we installed nocturnal predator control lights (Nite Guard Solar lights) in the dunes facing into the reserve to deter owls within the reserve from hunting on the beach. None of these attempts seem to have improved chick survival.

The average number of WSP chicks fledged each year at COPR since 2001 is 31 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 2019, 8 WSP chicks fledged at COPR. The fledge rate (nests that fledged at least one chick/total nests that hatched at least one chick) was 18% (Figure 11). This year, COPR had a record low of 0.2 chicks fledged per male, which is below the expected rate of 1 chick per year per male (Table 1).

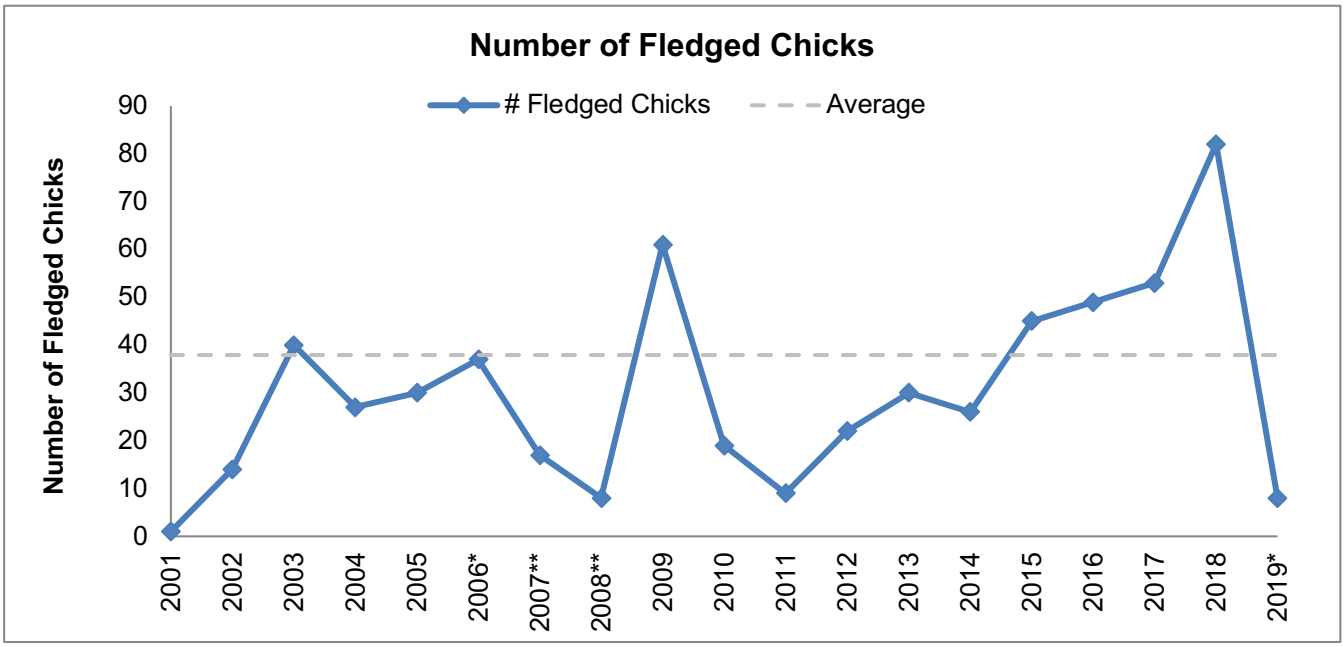

Figure 10. Number of chicks fledged by year.

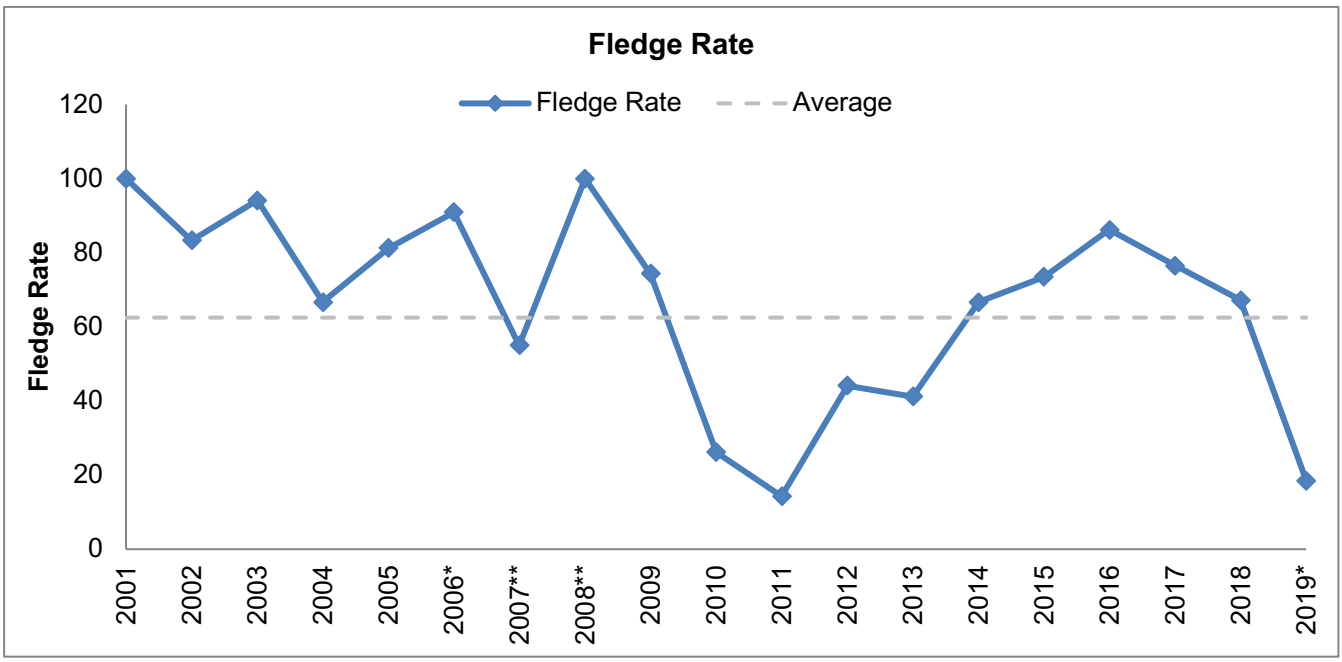

Figure 11. Fledge rate by year (# nests that fledge one chick/# total nests *100).

In 2001 and 2002, the breeding population was still beginning to grow. Note that these years are excluded from the calculation of all breeding averages
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Nest Phenology

In 2019, the first nest was initiated on March 20th and the last chick fledged on June 17th (Table 3). The total breeding season length was 149 days (defined by the number of days between first nest initiation and last observed chick or nest). The length of this year's breeding season was 14 days shorter than the average at COPR. The dates of all nesting events in 2019 fell within the range of previous years' dates (Figure 12). Thus, at COPR, there is no indication that nesting phenology is changing. The peak nesting period fell between May 30th and June 4th.

Table 3. Dates of nesting events in 2019

2019 Nesting Event	Date
First Nest Initiation	3/20/19
Last Nest Initiation	7/29/19
First Hatch	4/16/19
Last Hatch	8/15/19
First Fledge	5/14/19
Last Fledge	6/17/19

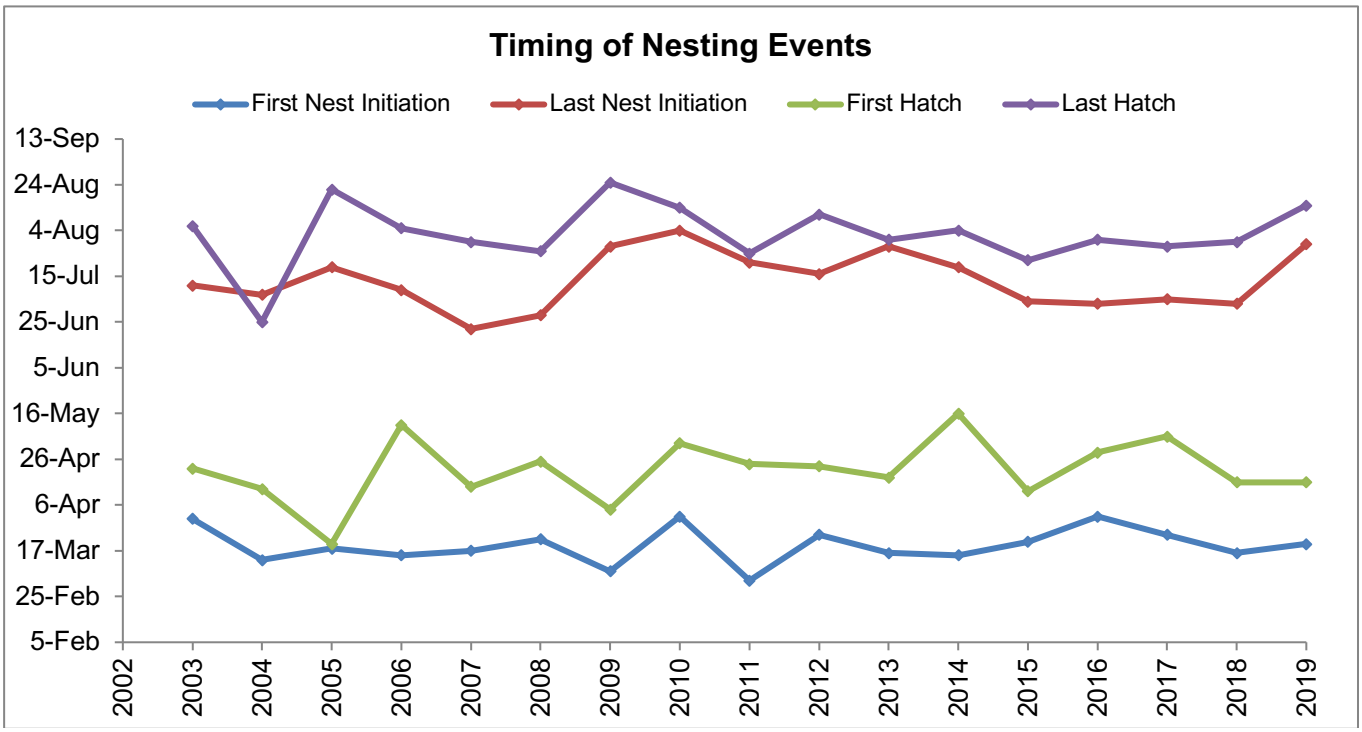

Figure 12. Timing of nest events by year

Location of Nests

GPS coordinates were recorded for each individual WSP nest. We used the mapping data to look for spatial patterns in hatching and fledging success. This year, 96% of all nests (93 nests) were initiated on the beach (Figure 13). The majority of the nests 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. While most of the nests were laid on the slough mouth, this area had the lowest level of hatching success due to crow predation and tides. 24% of the nests initiated on the slough mouth hatched, 50% of nests on the eastern side of the slough mouth hatched, and 33% of nests on the western side of the slough mouth hatched.

This year, 4% of nests (4 nests) were initiated on the mudflats of the slough (delta) and none were successful. Three delta nests were flooded by the slough after rain events in mid-May and one was predated by a skunk. The map of nest location and fate is shown below (Figure 14 & 15).

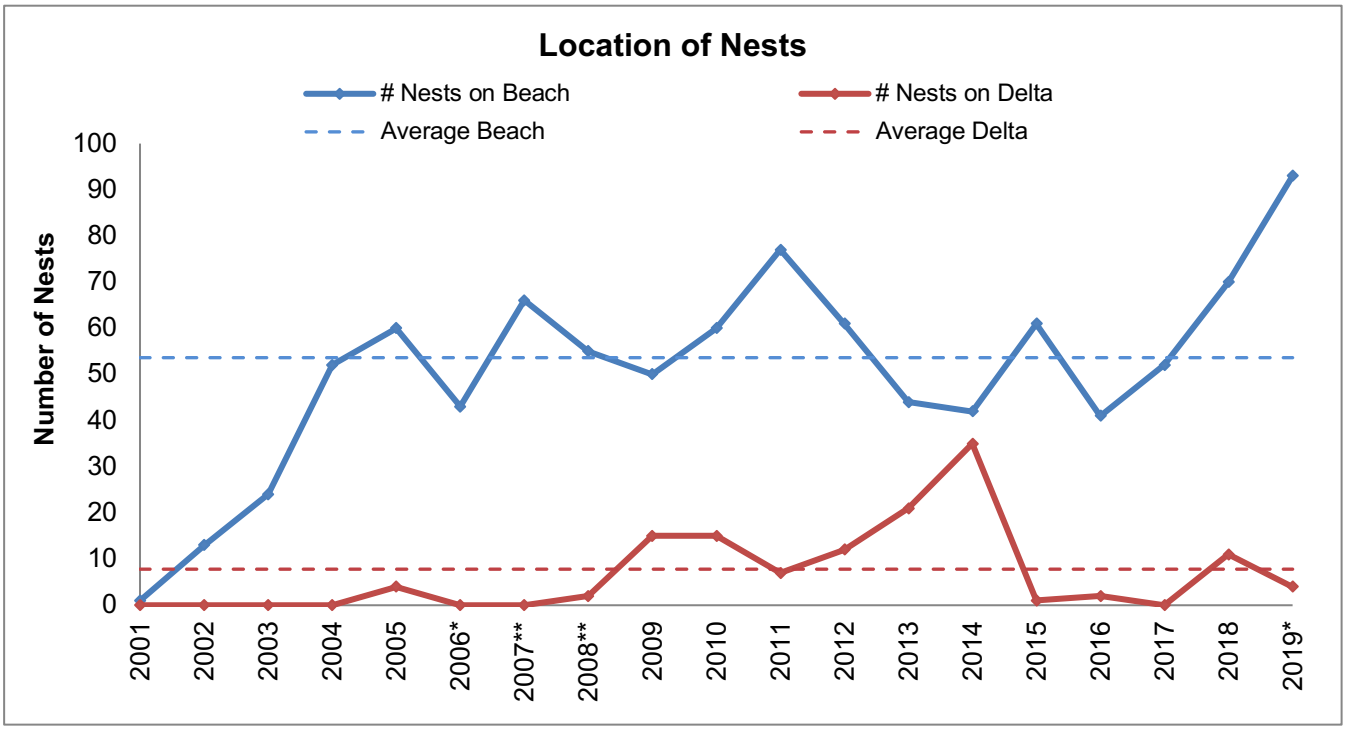

Figure 13. Number of nests on the beach and delta between 2001-2019. *Average lines represent averages from 2003-2018.*

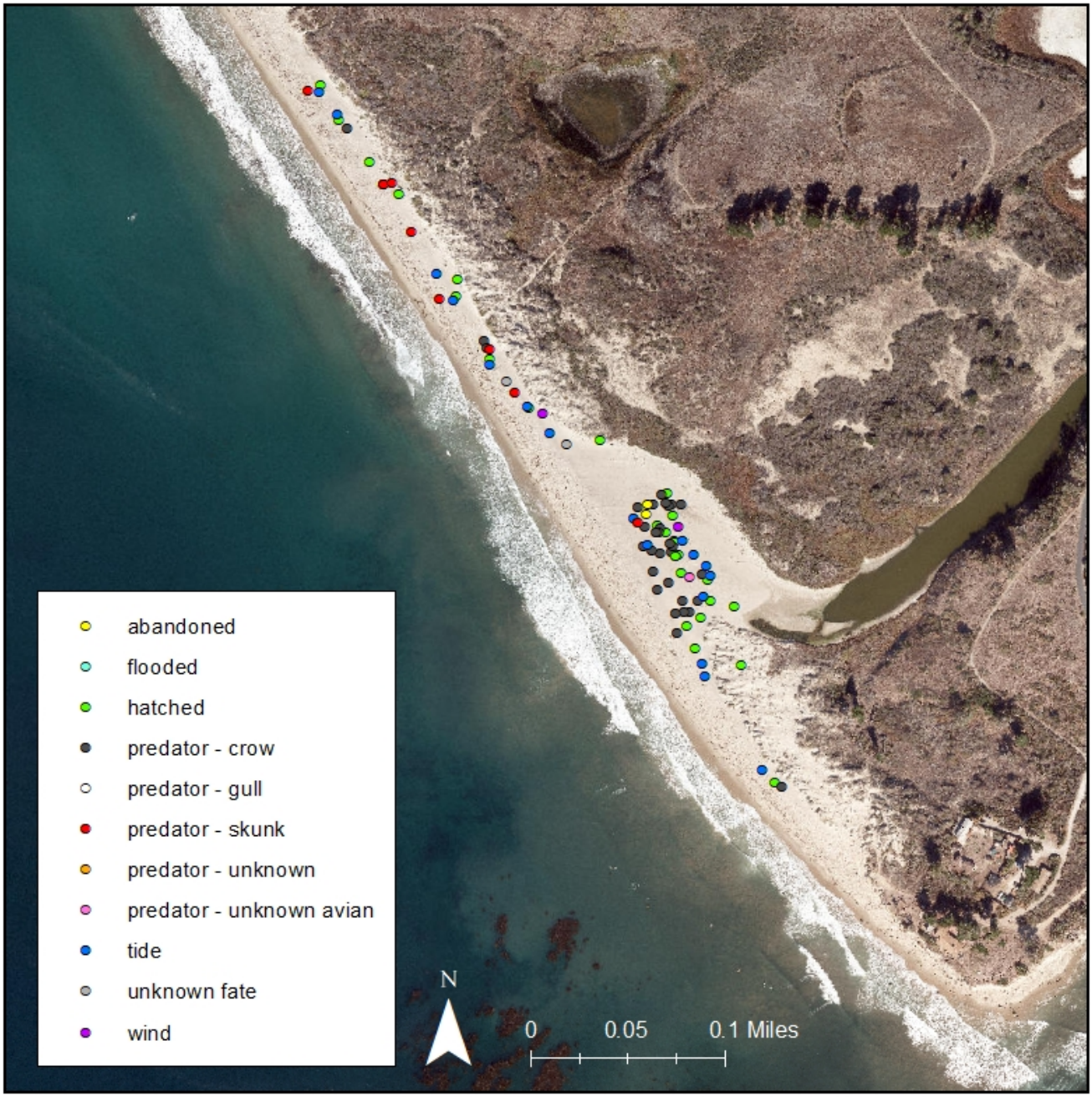

Figure 14. Map of nest fate on beach in 2019. Supplemental maps in Appendix B show nesting areas in more detail.

Figure 15. Map of nest fate on delta in 2019.

Rehabilitation of Abandoned Eggs and Chicks

In 2019, a total of 28 abandoned eggs were collected from Coal Oil Point Reserve to be transferred for rehabilitation at Santa Barbara Zoo. Half of the eggs collected were eggs washed out by a single high tide event on July 2nd. This high tide coincided with large swell and resulted in most of the slough mouth

becoming inundated with seawater. This event was observed by the Reserve Director, Cris Sandoval, and she was able to collect 13 eggs that had been washed out of their nests by the tide. A 14th egg was discovered washed out the next day. All eggs affected by tide were rinsed with freshwater prior to incubation. Additional eggs were rescued because they were abandoned or buried by sand after a windy day.

The collected eggs were placed in the incubator at 98.5 F, with a water dish to achieve adequate humidity. As soon as possible they were transferred in a dish with sand (to avoid rolling over) to Santa Barbara Zoo (SBZ) to hatch. Once hatched, SBZ staff fed the chicks a diet of bloodworms, pinhead crickets, mini mealworms, and beach hoppers. Special care was taken to keep the chicks 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 the chicks' release, plover biologist Doug George, from Point Blue, banded each chick with a unique band combination (Table 4). Each individual satisfied the USFWS requirements of age, health, and minimum size for release prior to the release date.

Two groups of captively reared chicks from COPR were released in the mornings of August 30, 2018 and October 3, 2019. They were released outside of any current nest or brood territories (~200 m west of the start of plover fence). This year, we staged the fledged plover chicks in a release pen on the beach two hours before the scheduled release time to allow them time to acclimate to their new environment before full release. The pen was constructed out of chicken wire with 1" x 1.5" mesh size. The pen was 5' x 5' x 2' and secured to the ground with rebar posts in each corner. We supplemented the pen with kelp wrack and beach hoppers so that the plovers could feed. We covered the top of the pen with blankets to prevent plovers from attempting to fly up into the lid of the pen.

We observed the chicks in the pen while they acclimated to ensure normal behaviors and to ensure that the chicks were not disturbed by predators or humans. All chicks exhibited normal behaviors within minutes of being released into the pen, alternating between feeding, standing, walking, and stretching wings. Wild plovers in the area approached the pen and did not display any territorial behavior toward

the chicks. At release time, we opened up one side of the pen facing toward the fenced plover habitat. Several released chicks successfully took flight within five minutes of opening the holding cage. Others calmly walked out of the pen, but remained in the area in a group on the sand. All released COPR chicks have been sighted at Coal Oil Point Reserve since the release with the exception of two (banded PA:OW and PA:AB). We continue to monitor the band sighting email list for sightings of these two plovers at other sites.

Table 4. Band combinations for all captively reared and released plovers from COPR in 2019.

Bands Left	Bands Right	Date of Collection	COPR Nest #	Reason for Collection	Life Stage at Collection	Hatch Date	Release Date	Release Site	Sightings post-release
PA	GR	6/25/2019	1054	abandoned	Egg	7/21/2019	8/30/2019	COPR	Yes
PA	OY	7/3/2019	unknown	tide	Egg	7/13/2019	10/3/2019	COPR	Yes
PA	OB	7/3/2019	unknown	tide	Egg	7/7/2019	8/30/2019	COPR	Yes
PA	OW	7/3/2019	unknown	tide	Egg	7/8/2019	8/30/2019	COPR	No
PA	RB	7/3/2019	unknown	tide	Egg	7/7/2019	8/30/2019	COPR	Yes
PA	YG	7/3/2019	unknown	tide	Egg	7/9/2019	8/30/2019	COPR	Yes
PA	OR	7/3/2019	unknown	tide	Egg	7/17/2019	8/30/2019	COPR	Yes
PA	GB	7/3/2019	unknown	tide	Egg	7/17/2019	8/30/2019	COPR	Yes
PA	YB	7/3/2019	unknown	tide	Egg	7/14/2019	8/30/2019	COPR	Yes
PA	RW	7/3/2019	unknown	tide	Egg	7/13/2019	8/30/2019	COPR	Yes
PA	YW	7/3/2019	unknown	tide	Egg	7/13/2019	8/30/2019	COPR	Yes
PA	RY	7/3/2019	unknown	tide	Egg	7/28/2019	10/3/2019	COPR	Yes
PA	YR	7/3/2019	unknown	tide	Egg	7/27/2019	10/3/2019	COPR	Yes
PA	AB	7/3/2019	unknown	tide	Egg	7/17/2019	10/3/2019	COPR	No
PA	YY	7/11/2019	unknown	abandoned	Egg	8/11/2019	10/3/2019	COPR	Yes

Enforcement

There is no regular police presence at 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 approved an LRDP amendment that prohibits dogs at COPR. The reserve staff is developing a plan to implement this change in policy.

Docent Program

With higher than average levels of beach use at Sands Beach in the last three years (Appendix D), the docent program continues to be crucial to the success of Western Snowy Plover recovery at Coal Oil Point. The docents teach people about the plovers, request compliance to the leash law, request people to stay away from the symbolic fence and avoid ball games on the beach, request people to move around the plover flock, scare away crows, and inform the staff about birds of prey observed around the nesting area. This year, docent coverage averaged approximately 50 hours per week (Appendix D). However, we have observed a large increase in students visiting the beach as a result of new dorms adjacent to the reserve that opened in 2017. The docents have reported to COPR staff that it is difficult to handle large crowds of people on the beach and their requests for compliance becomes less effective.

The most crucial times for a docent presence on the beach are the breeding season (March 15-September 15), holidays, and weekends. These are precisely the most difficult times to find available volunteers. As a result the COPR staff pays student interns to fill in these gaps. The interns are paid through grants provided by the Coastal Fund and in the last 2 years, we are receiving half of the interns stipends we request because these grants are becoming more competitive.

Although the docents had a huge impact in reducing the number of off leash dogs at the beginning of the program in 2001, the level of compliance has tapered off at about 1,000 off leash dogs per year (Figures 20, 21, and 22). A new enforcement strategy is needed to reduce the number of off leash dogs at Sands Beach.

CONCLUSION

The plover population at COPR has recovered since the implementation of a management plan in 2001. The wintering population at the reserve continues to be below average for this site, but the number of breeding adults has reached record highs over the last 2 years. The docent program continues to be an effective way to reduce human disturbance on the plovers. However, pressure from increasing human population using the beach and a reduction in beach area from sea level rise, are making it more challenging for docents to protect the plovers from human disturbance.

The control of crows and skunks has become a management priority to improve hatching success and the management of activities by beach goers is essential to reduce chronic disturbance that inhibits plovers from breeding or causes plover mortality. The COPR has not yet secured recurrent funds for predator control and thus, employs a minimum number of USDA staff hours each year.

RECOMMENDATIONS

- The predator control program needs to be funded in perpetuity and have more trap hours each season.
- Predator control should be increased during the breeding season and potentially be initiated within the month prior to the start breeding season. Staff and docents should watch for predators, both from the beach and potentially from blinds.
- Only approximately 50% of beach goers leash their dogs. Unleashed dogs disturb breeding and wintering WSP as well as other species of protected migratory birds that use Sands Beach to feed and rest. Without a police officer or similar enforcement entity, the disturbances and take caused by unleashed dogs will continue.
- To reduce the disturbances caused by dogs, there needs to be active enforcement of the leash law or dogs be prohibited from the beach as stated in the LRDP.
- A new plan is needed to address the options to protect the WSP given the increase in the number of people using the beach and a decrease in beach habitat from erosion.

ACKNOWLEDGEMENTS

Jessica Nielsen (Conservation Specialist) and Cristina Sandoval (Reserve Director) conducted plover monitoring. Jessica managed the docent program. Beau Tindall (Cheadle Center for Biodiversity and Ecological Restoration) helped count plovers, locate nests, and determine their fate. We are very thankful to Rick Fellows who 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 70 volunteers and interns over the course of 2019, maintained a presence at the beach every day of the year. Eric Covington and Anthony Nelson (USDA) implemented predator management during

the breeding season.

California Least Terns

Several California Least Terns were observed flying over and stopping through COPR during the breeding season but they did not nest. We did not observe any courtship or mating behavior this year.

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APPENDIX A.

Proposal to install mini exclosures to protect Western Snowy Plover nests at Coal Oil Point Reserve

Prepared by Cristina Sandoval, PhD
Recovery permit TE073205-5 (exp. 09/04/2023)

Introduction

The Coal Oil Point Reserve in Goleta, CA, recovery unit 5, has a successful breeding and wintering population of Western Snowy Plovers. Once human recreation was controlled with fencing, signage, and a docent program, the breeding population quickly grew and continues to expand. In 2018, we had the highest number of breeding adults (54) and fledglings (82) ever observed at this site. In 2019, we reached a new record with 68 breeding individuals counted during the window survey on May 21, 2019.

On May 9th, a group of crows discovered the nesting area on and have been systematically preying on all nests. A total of 20 nests have been predated by crows so far - nearly half of the total number of nests that have been initiated. As of today (May 30, 2019), there is only one nest remaining on the beach. We anticipate that there won't be any more successful nests this year if the crow predation is not managed successfully because the crows continue to visit the beach daily looking for re-nesting attempts.

Our harassment strategy using a dead crow carcass has been successful in keeping crows away from the beach in previous years. However, several attempts to harass and to lethally remove these crows were unsuccessful in deterring the crows from continuing to search the beach for plover nests. We have only been able to lethally remove 2 out of the approximately 10 crows. A group of crows during the breeding season is an unusual situation because crows are usually in pairs at this time of the year. Also unusual is the fact that these crows seem unafraid of people. We suspect they could be a group of fledged juveniles released from a wildlife rehab facility.

To save this year's breeding season, we propose to protect the nests for the next 6 weeks using mini exclosures. We previously used nest exclosures in 2006 but stopped because harassment of crows was sufficient to eliminate predation, and because owls can cue on the exclosures and prey on adult plovers when they flush towards the wire mesh and can't fly away.

I propose to make some improvements to the standard mini exclosure in attempt to reduce the risk of predation by owls. These modifications aim at reducing visual detection by the owls and also reducing vulnerability of the plovers in case the owls detects the plover in the exclosure (they could see the plover from the sides or locate them by hearing).

Methods

The experimental modifications proposed are:

1) Cover the top of the exclosure with an opaque material so the owls are less likely to see the plovers from above while flying or perching on trees.
2) Install a double walled side in case an owl locates the plover in the exclosure, they could not reach them right away, giving the plover a chance to escape.

The top will be made of a piece of plywood, slightly larger than the width of the exclosure to reduce detection from a side view. Another option would be to use a fabric to cover the top. However, with fabric, it would not be possible to make an eave wider than the exclosure.
To further reduce the risk of detection, the top of the mini exclosure will be camouflaged with sand and beach debris (Figure 1).

The double walled sides are basically made of a small exclosure inside of a larger exclosure, with a 6” space between the 2 walls. the walls will be zip tied to a rebar anchored to the ground to prevent the exclosure from blowing in case of strong wind.

Monitoring

This design has not been used in nest exclosures, so it is important to observe if these modifications deters the plovers from returning to their nest and to follow a protocol to avoid take due to the presence of the exclosure. The proposed protocol is as follows:

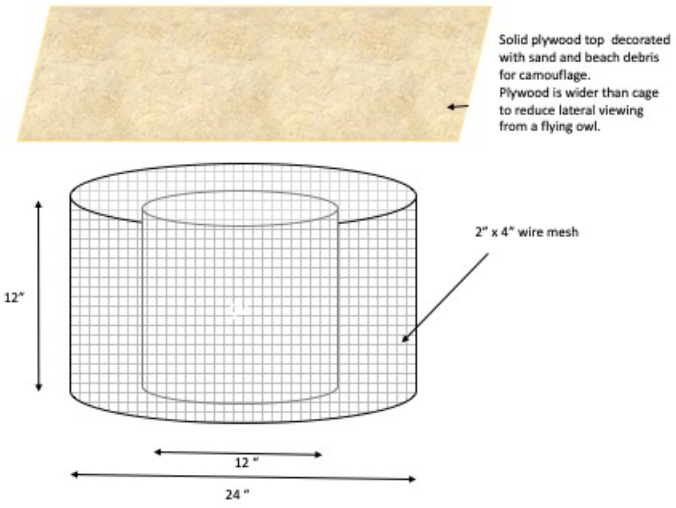
1) Install the mini exclosure on a nest that is already incubating. Choose an incubating nest rather than a starting nest because we know that incubating plovers typically return to their nest within minutes after being disturbed while nests that have not been finalized are not attended by the parents.
2) Observe the nest continuously from a minimum distance of 25 meters and record the length of time that the plover takes to return after the monitors leave the nest site.
3) IF THE PLOVER DOES NOT RETURN WITHIN 25 MINUTES, remove the exclosure.
4) Continue to observe and again record the length of time that the plover takes to return after the monitors leave the nest site. Repeat the procedure on a 2nd nest in case the reason for not returning to the nest is independent of the mini-exclosure.
5) IF THE PLOVER RETURNS TO THE NEST IN LESS THAN 25 MINUTES, then install the second exclosure and repeat the observation procedure.

During this procedure, the weather should be calm and ideally the manipulations should be done during the day, with sufficient daylight to observe the behavior of the plovers for at least 2 hours.

For the first week, all nests with exclosures should be monitored daily and 3 times a week thereafter. If there is evidence of owl predation on the adult plover, seen from footprints near the exclosure, feathers, or a missing adult, the use of mini exclosures will be discontinued.

On nests not visible from public view, a camera trap will be installed 6 ft from the nest to capture mini videos or any animal approaching the exclosure. This will help us further understand how plovers and predators react to the modified mini exclosure.

Figure 1. Concept design of the mini-exclosure with a solid top and double walls.



APPENDIX B.

Supplemental maps of nesting areas with high density of nests.

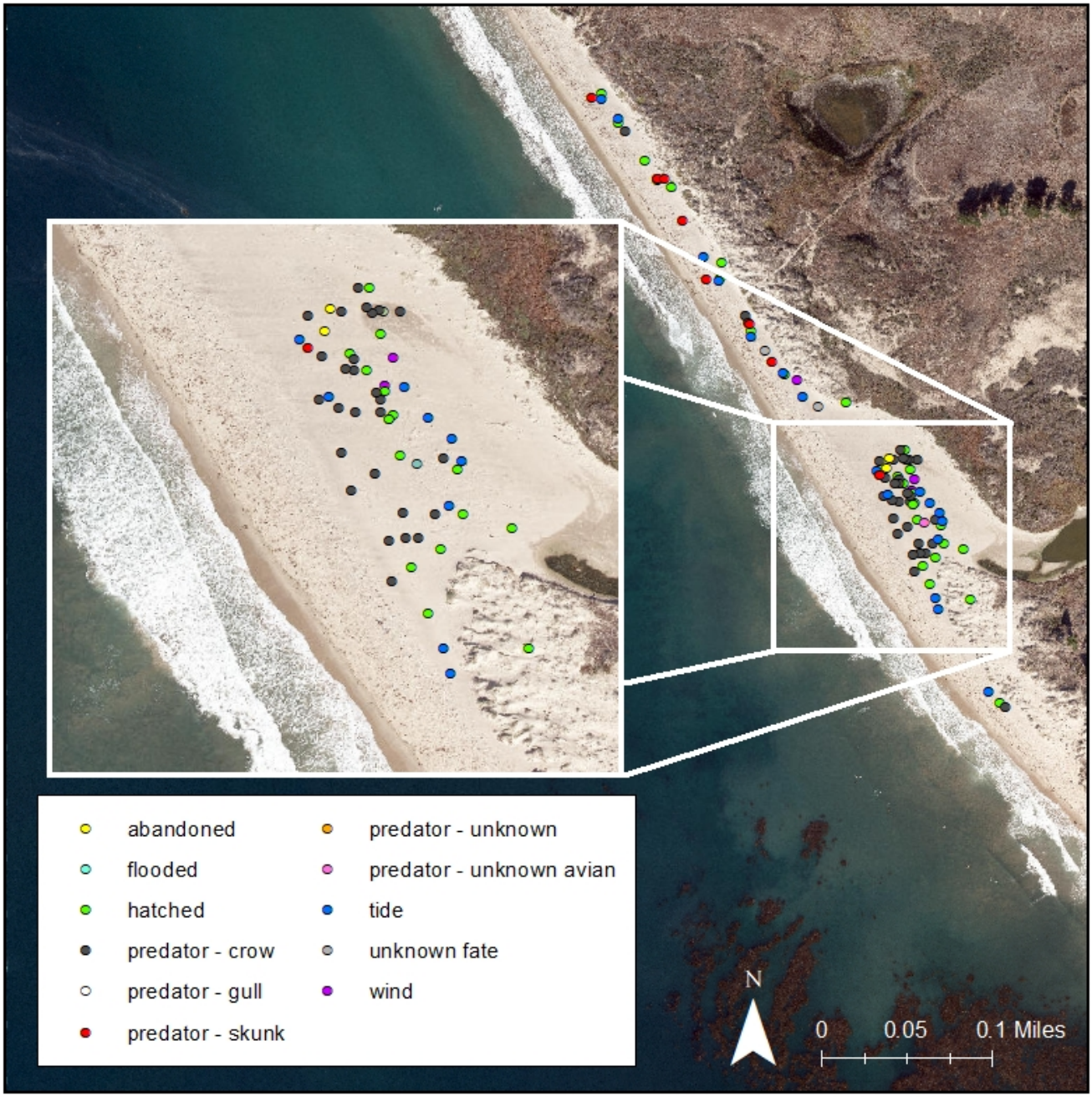


Figure 16. Zoomed view of the nest locations on the slough mouth on Sands Beach.

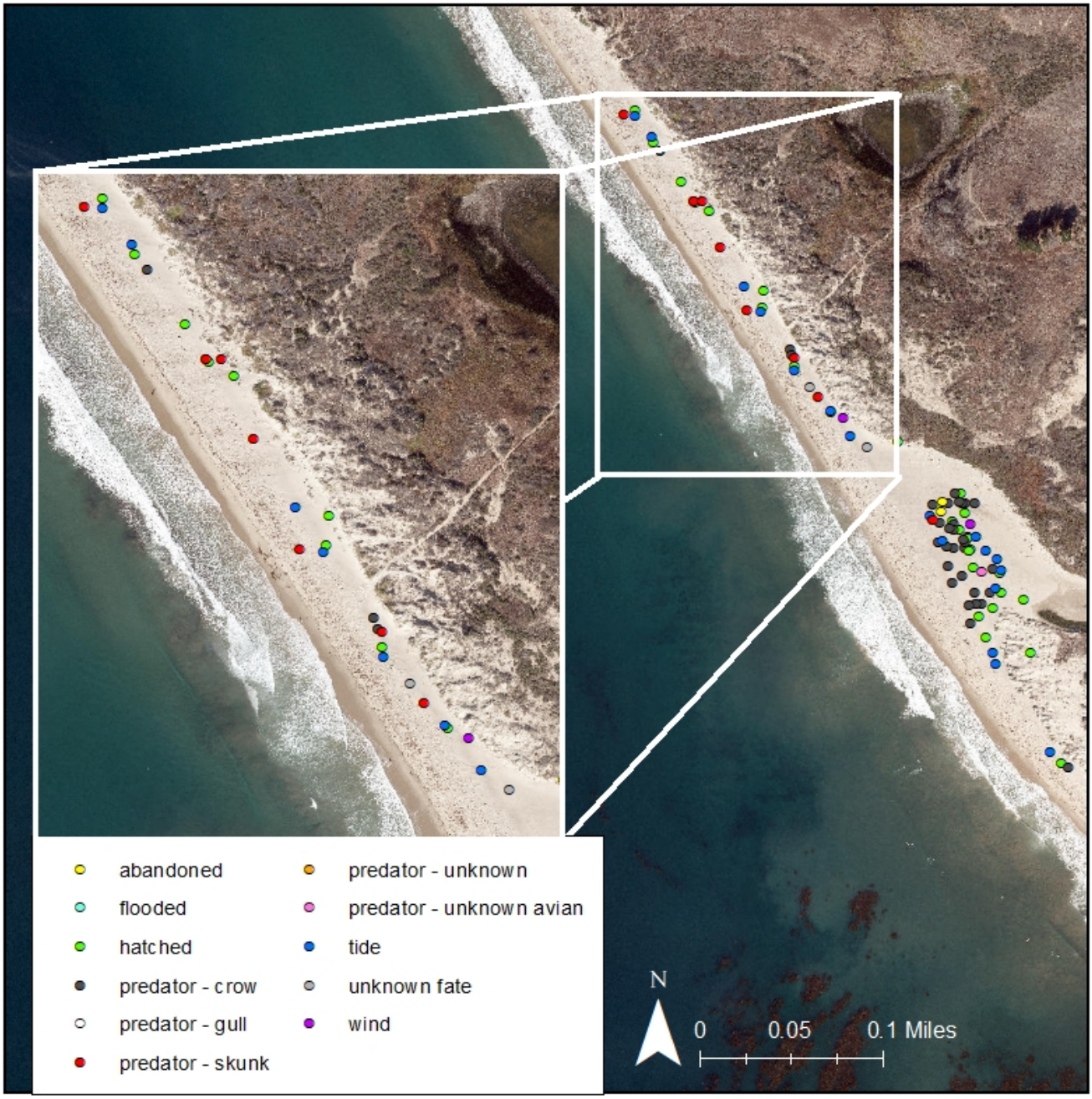


Figure 17. Zoomed view of the nest locations on the west side of Sands Beach.

APPENDIX C.

Band sightings by COPR staff at Sands Beach

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

Table 5. Sightings of banded WSP at COPR

Date	Bands Left	Bands Right	Plover Activity	Time	Remarks	Band Origin (if known)
1/23/2019	A	RW	.	7:30	missing foot	VAFB (2014)
2/6/2019	A	L/O/L	.	13:30	likely A:G/O/G	VAFB
2/19/2019	VN	AL	.	7:30		unknown
2/19/2019	N/Y	WG	.	7:30		VAFB
2/19/2019	A	RW	.	7:30	missing foot	VAFB (2014)
2/19/2019	W	G/W/G	.	7:30		unknown
2/19/2019	GN	NR	.	7:30		VAFB (2017)
2/19/2019	YW	XX	.	7:30		unknown
3/11/2019	AN	YW	.	10:00		VAFB
3/20/2019	GA	PB	.	12:00		Oceano (2016 or 2017)
3/25/2019	A	RW	.	14:00	missing foot	VAFB (2014)
4/18/2019	AN	WY	.	8:00		VAFB
4/24/2019	A	RW	inc. nest	7:45	missing foot	VAFB (2014)
5/3/2019	AN	WY	.	8:30		VAFB
5/14/2019	WY	AN	.	9:00		unknown
5/15/2019	A	Pa	.	7:10		unknown
5/21/2019	AN	WY	.	9:28		VAFB
5/31/2019	AN	WY	.	8:30		VAFB
6/13/2019	NW	LR	.	6:40		unknown
6/17/2019	A	RW	.	10:00	missing foot	VAFB (2014)
6/24/2019	KB	WB	.	13:30		NB Coronado
7/22/2019	AN	OO	.	10:00		unknown
7/22/2019	AN	RO	.	10:00		unknown
7/22/2019	AN	WY	.	10:00		VAFB
7/22/2019	LN	RW	.	10:00		unknown
7/22/2019	VV	WO	.	10:00		Oceano (2019), raised at SBZ, released at COPR
7/23/2019	VV	BO	.	6:50		Oceano (2019), raised at SBZ, released at COPR
7/23/2019	VV	WV	.	7:20		Ormond (2019), raised at SBZ, released at COPR
7/23/2019	VV	WA	.	7:20		Oceano (2019), raised at SBZ, released at COPR
7/23/2019	AN	OO	.	7:20		unknown
7/25/2019	VV	WO	.	9:00		Oceano (2019), raised at SBZ, released at COPR
7/25/2019	VV	BO	.	9:00		Oceano (2019), raised at SBZ, released at COPR
7/25/2019	A	G/O/G	.	9:00		VAFB
7/30/2019	AN	YW	.	13:00		VAFB

8/1/2019	VV	BO	.	9:00		Oceano (2019), raised at SBZ, released at COPR
8/1/2019	AN	BW	.	9:00		unknown
8/6/2019	VV	YV	.	8:00		Ormond (2019), raised at SBZ, released at COPR
8/6/2019	AN	YW	.	8:00		VAFB
8/12/2019	AN	WY	.	10:00		unknown
9/13/2019	AN	YW	.	7:30		VAFB
9/13/2019	BN	WY	.	7:30		unknown
9/13/2019	PA	OB	.	7:30		COPR (2019), raised at SBZ, released at COPR
9/19/2019	PA	OR	.	9:00		COPR (2019), raised at SBZ, released at COPR
9/19/2019	PA	YG	.	9:00		COPR (2019), raised at SBZ, released at COPR
9/19/2019	AN	WY	.	9:00		unknown
9/30/2019	A	RW	.	9:00	missing foot	VAFB (2014)
9/30/2019	PA	YB	.	9:00		COPR (2019), raised at SBZ, released at COPR
9/30/2019	KS	WB	.	9:00	likely KB:WB, with anodized band faded	NB Coronado
10/3/2019	PA	OR	.	7:30		COPR (2019), raised at SBZ, released at COPR
10/3/2019	A	L/O/L	.	7:30	likely A:G/O/G	VAFB
10/3/2019	AN	WY	.	7:30		unknown
10/3/2019	KS	WB	.	7:30	likely KB:WB, with anodized band faded	NB Coronado
10/3/2019	PA	YB	.	7:30		COPR (2019), raised at SBZ, released at COPR
10/3/2019	PA	GB	.	7:30		COPR (2019), raised at SBZ, released at COPR
10/10/2019	VV*	VL*	.	11:00	likely misread : either VG:VV or VV:LV	Oceano
10/10/2019	PA	YR	.	11:00		COPR (2019), raised at SBZ, released at COPR
10/10/2019	PA	RY	.	11:00		COPR (2019), raised at SBZ, released at COPR
10/17/2019	NY	WL	.	9:15		unknown
10/17/2019	PA	YR	.	9:15		COPR (2019), raised at SBZ, released at COPR
10/17/2019	A/Y	B	.	9:15		South Overlook Douglas City, Oregon
10/17/2019	LN	NR	.	9:15		unknown
10/17/2019	AN	WN	.	9:15		unknown
10/17/2019	VV	LV	.	9:15		Oceano (2019), raised at SBZ, released at COPR
10/17/2019	A	RW	.	9:15	missing foot	VAFB (2014)
10/17/2019	PA	OB	.	9:15		COPR (2019), raised at SBZ, released at COPR
10/28/2019	PA	RY	.	9:15		COPR (2019), raised at SBZ, released at COPR
10/28/2019	PA	YR	.	9:15		COPR (2019), raised at SBZ, released at COPR
10/28/2019	PA	GB	.	9:15		COPR (2019), raised at SBZ, released at COPR
10/28/2019	NR	LN	.	9:15		unknown
10/28/2019	AN	YW	.	9:15		VAFB
11/5/2019	AN	YW	.	7:30		VAFB
11/5/2019	PA	GB	.	7:30		COPR (2019), raised at SBZ, released at COPR
11/5/2019	NY	WL	.	7:30		unknown

11/5/2019	AN	YW	.	7:30		VAFB
11/15/2019	VG	VV	.	8:20		Oceano
12/12/2019	YY	WG	.	7:15		unknown
12/12/2019	PA	OY	.	7:15		COPR (2019), raised at SBZ, released at COPR
12/12/2019	PA	OR	.	7:15		COPR (2019), raised at SBZ, released at COPR
12/12/2019	PA	PX	.	7:15		unknown
12/12/2019	AN	RG	.	7:15		VAFB (2016)
12/20/2019	NY	WG	.	9:45		VAFB
12/20/2019	AN	YW	.	9:45		VAFB
12/20/2019	PA	OR	.	9:45		COPR (2019), raised at SBZ, released at COPR
12/20/2019	GN	NR	.	9:45		VAFB (2017)
12/31/2019	PA	GB	.	10:20		COPR (2019), raised at SBZ, released at COPR

APPENDIX D.

Docent-collected data on beach use at the reserve.

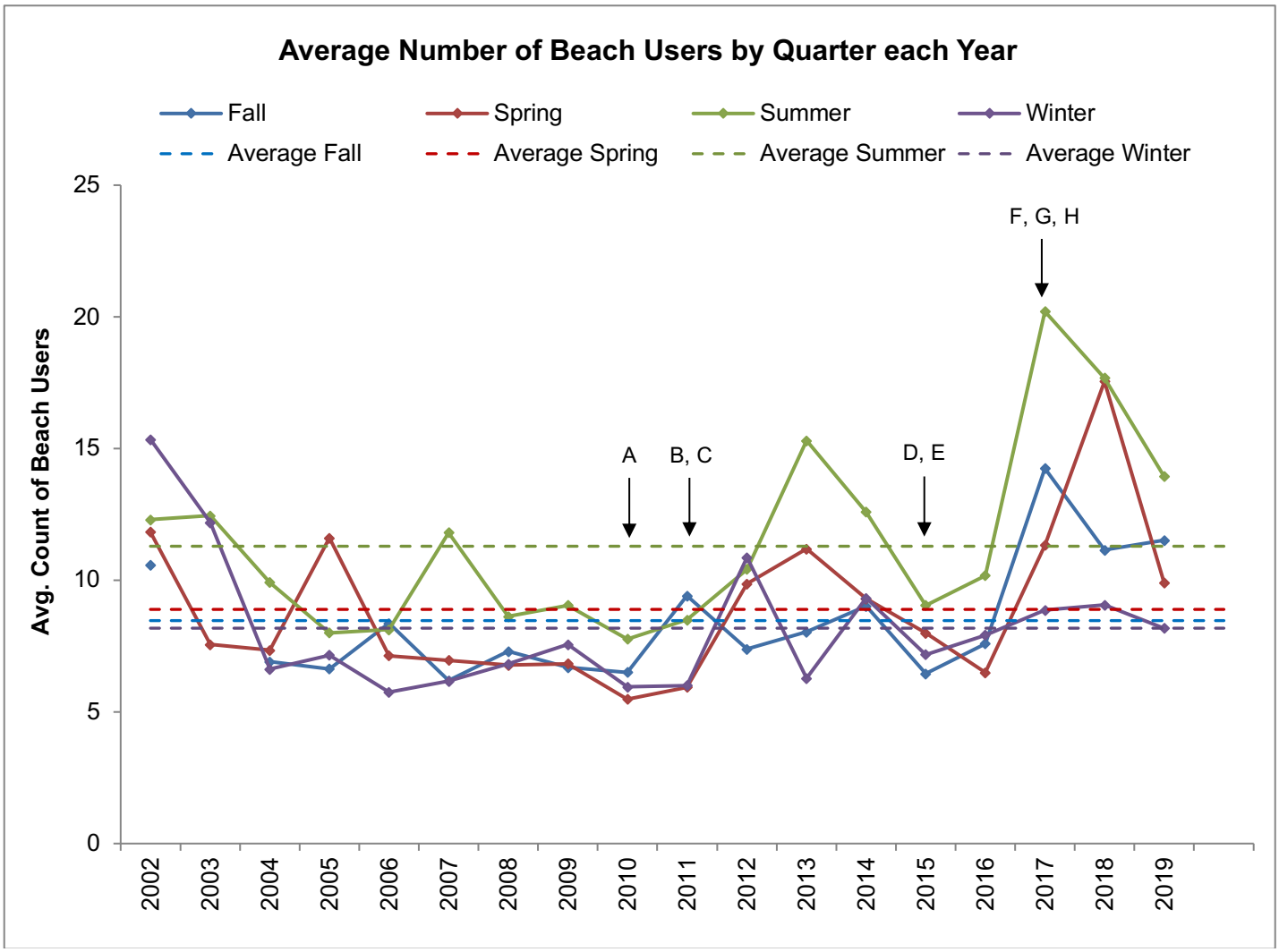


Figure 18. The number of beach users was counted at the beach on snapshot surveys. These data do not include people surfing. This graph shows the frequency of "busy beach" days by quarter, since 2002. The arrows correspond to various events that may have influenced changes in beach use: (A) 2010: A gate was installed at the end of Slough Road to reduce illegal beach parking, (B) 2011: A new beach parking lot (Lot 45) opened on West Campus, (C) Summer 2011: UCSB started offering Summer sessions, (D) Summer 2015 Oil spill closed the beach for 4 weeks, (E) Fall 2015: Opening of Sierra Madre Dormitory, 506 students, (F) Fall 2017: Opening of San Joaquin Dormitory, 1,300 students, (G) Fall 2017: Opening of Sierra Madre Apartments, 36 units, and (H) 2017 Opening of Santa Catalina renovations, 1,500 students.

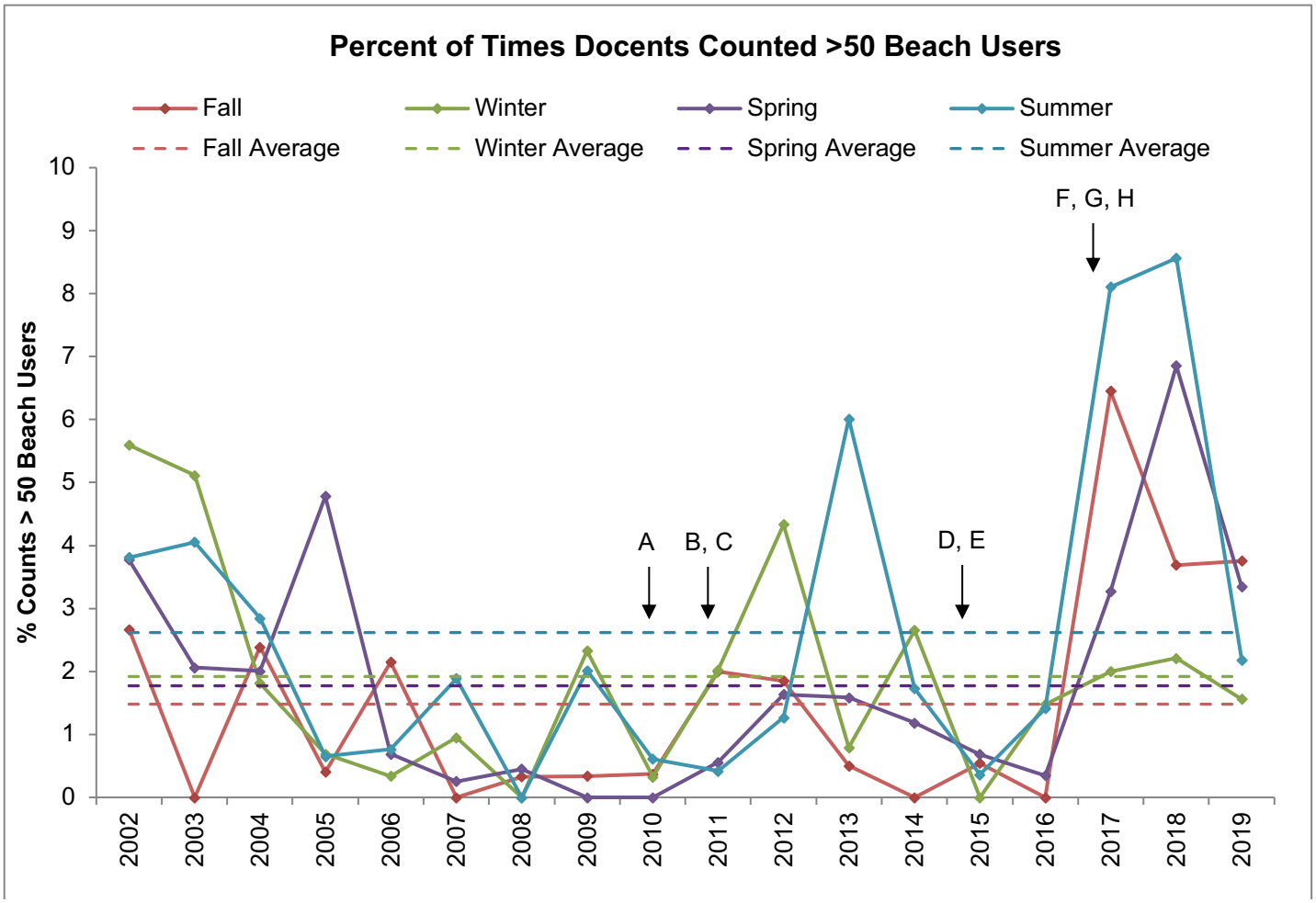


Figure 19. The number of beach users was counted at the beach on snapshot surveys. These data do not include people surfing. This graph shows the frequency of "busy beach" days by quarter, since 2002. The arrows correspond to various events that may have influenced changes in beach use: (A) 2010: A gate was installed at the end of Slough Road to reduce illegal beach parking, (B) 2011: A new beach parking lot (Lot 45) opened on West Campus, (C) Summer 2011: UCSB started offering Summer sessions, (D) Summer 2015 Oil spill closed the beach for 4 weeks, (E) Fall 2015: Opening of Sierra Madre Dormitory, 506 students, (F) Fall 2017: Opening of San Joaquin Dormitory, 1,300 students, (G) Fall 2017: Opening of Sierra Madre Apartments, 36 units, and (H) 2017 Opening of Santa Catalina renovations, 1,500 students.

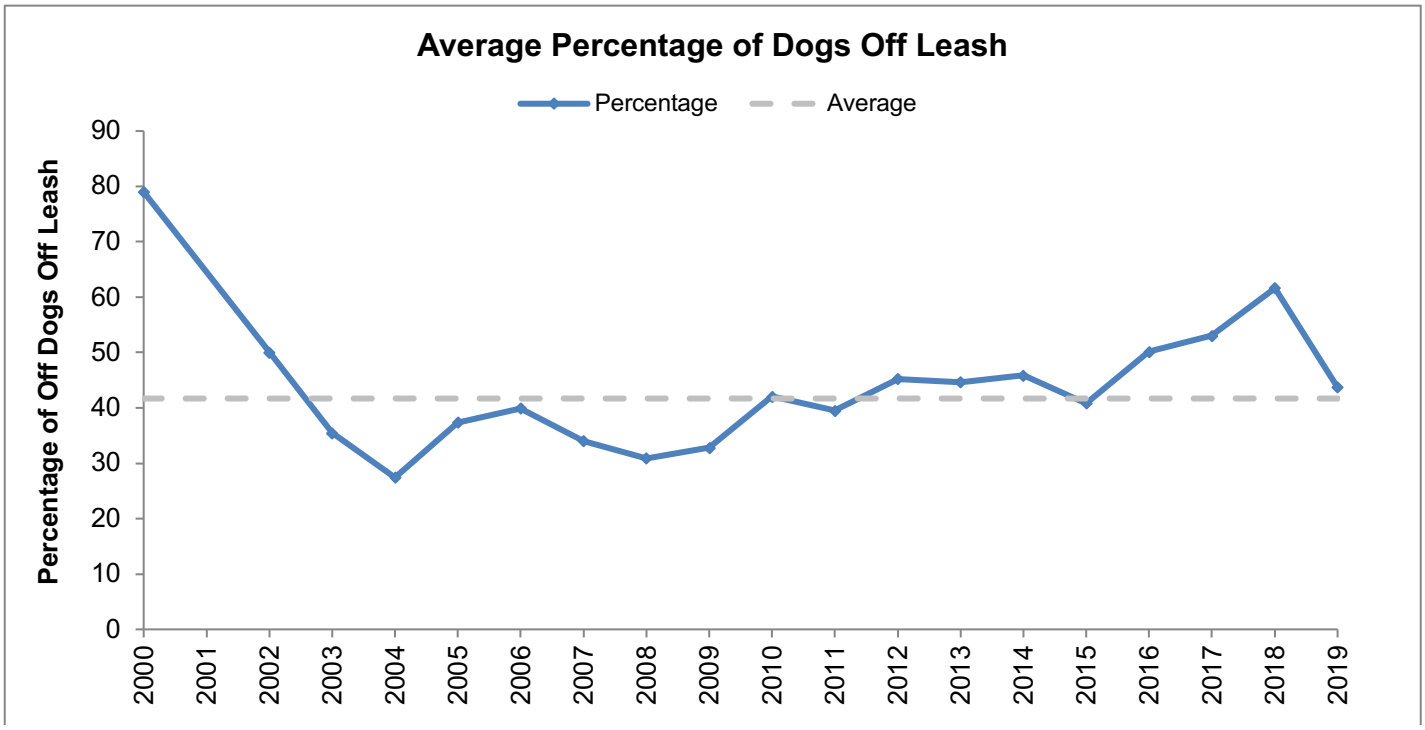


Figure 20. Average percentage of dogs arriving at Sands Beach without a leash.

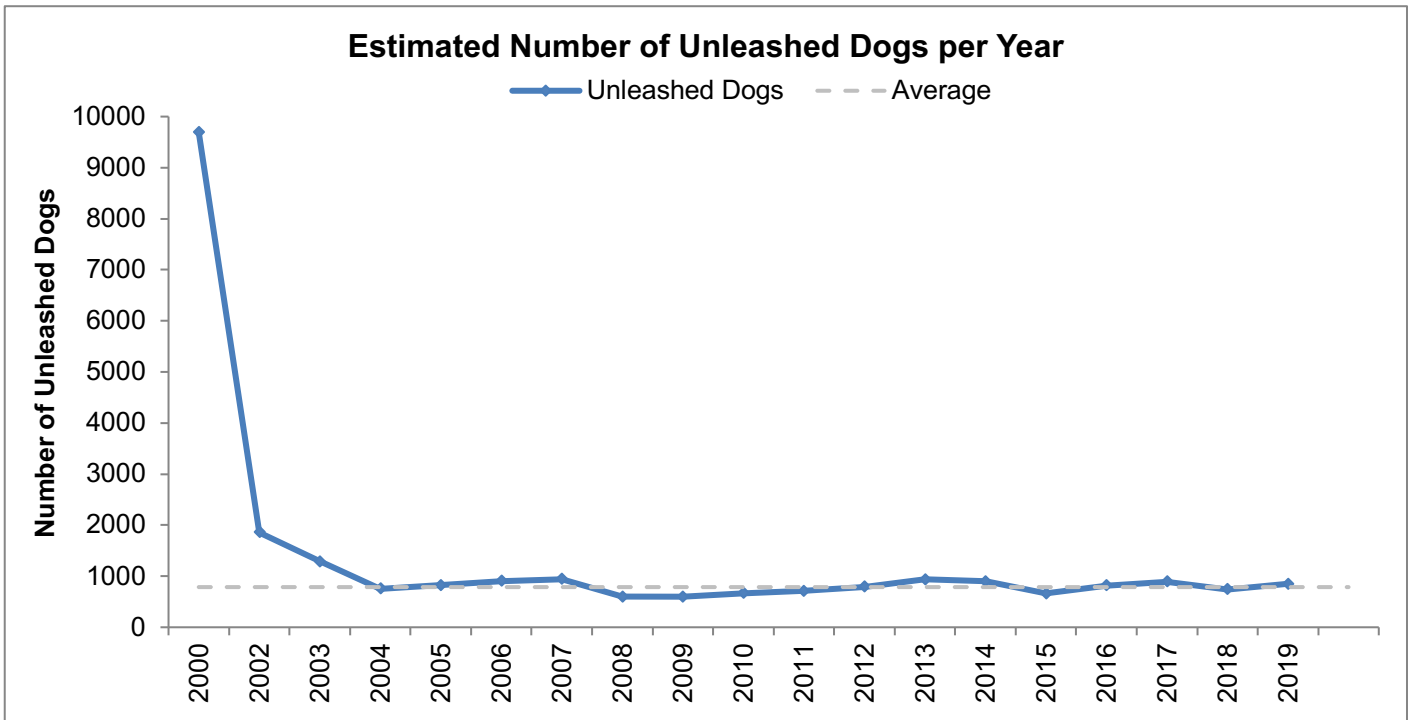


Figure 21. Estimated total number of unleashed dogs at Sands Beach each year. Estimates based on the hourly rate of unleashed dogs observed by docents ((# unleashed dogs/hr)*(12 hrs/day)*(365 days/yr)). Note the positive effect of docents, which protecting the Sands Beach in 2002 in reducing the number of dogs off leash.

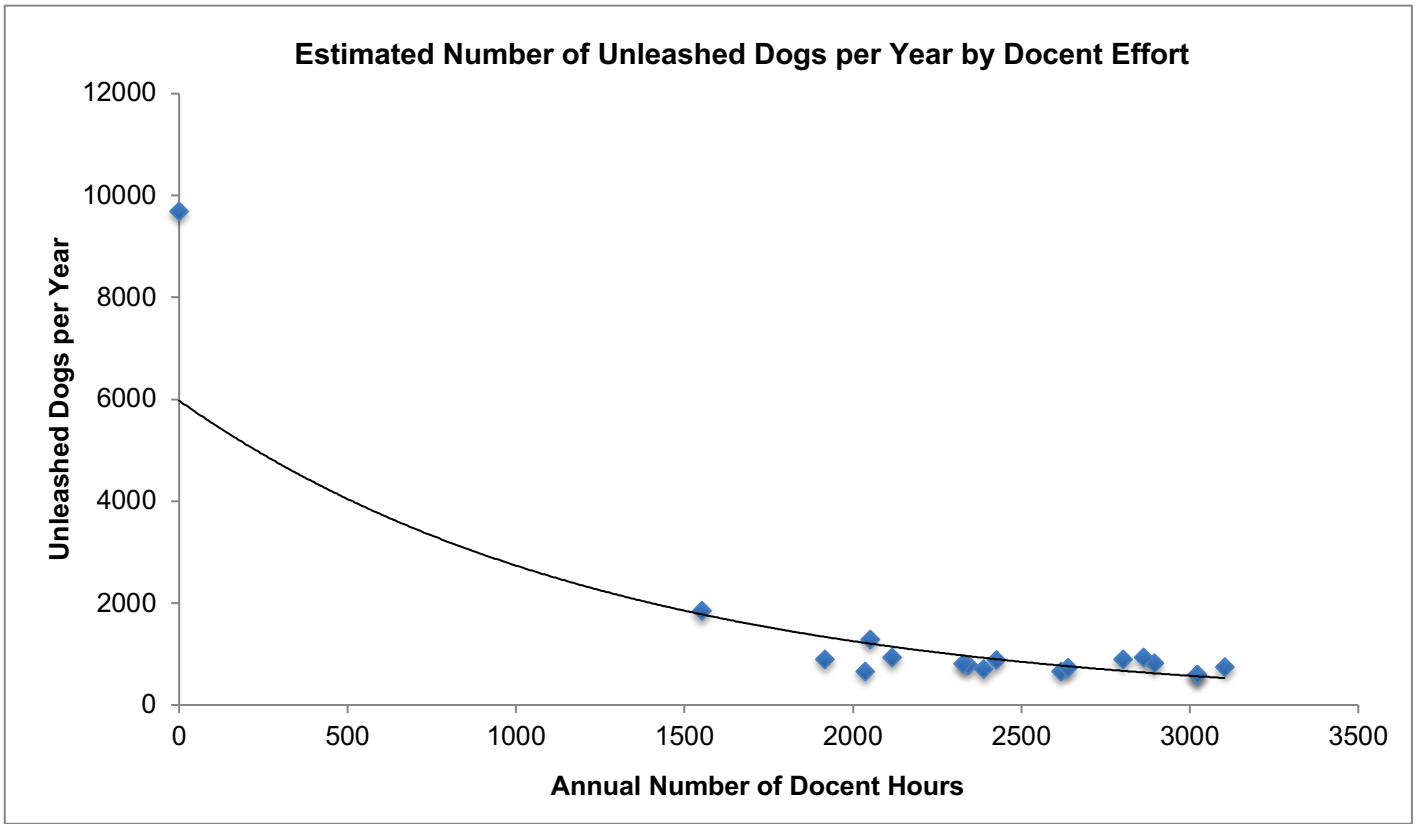


Figure 22. Estimated total number of unleashed dogs at Sands Beach each year by annual number of docent hours worked. Notice that the docents had an strong initial impact on unleashed dogs, but their effort tapered off at about 1,000 dogs per year. This data suggests that these dog owners do not respond to docents. Enforcement by a police officer may be necessary to achieve better compliance with these dog owners.

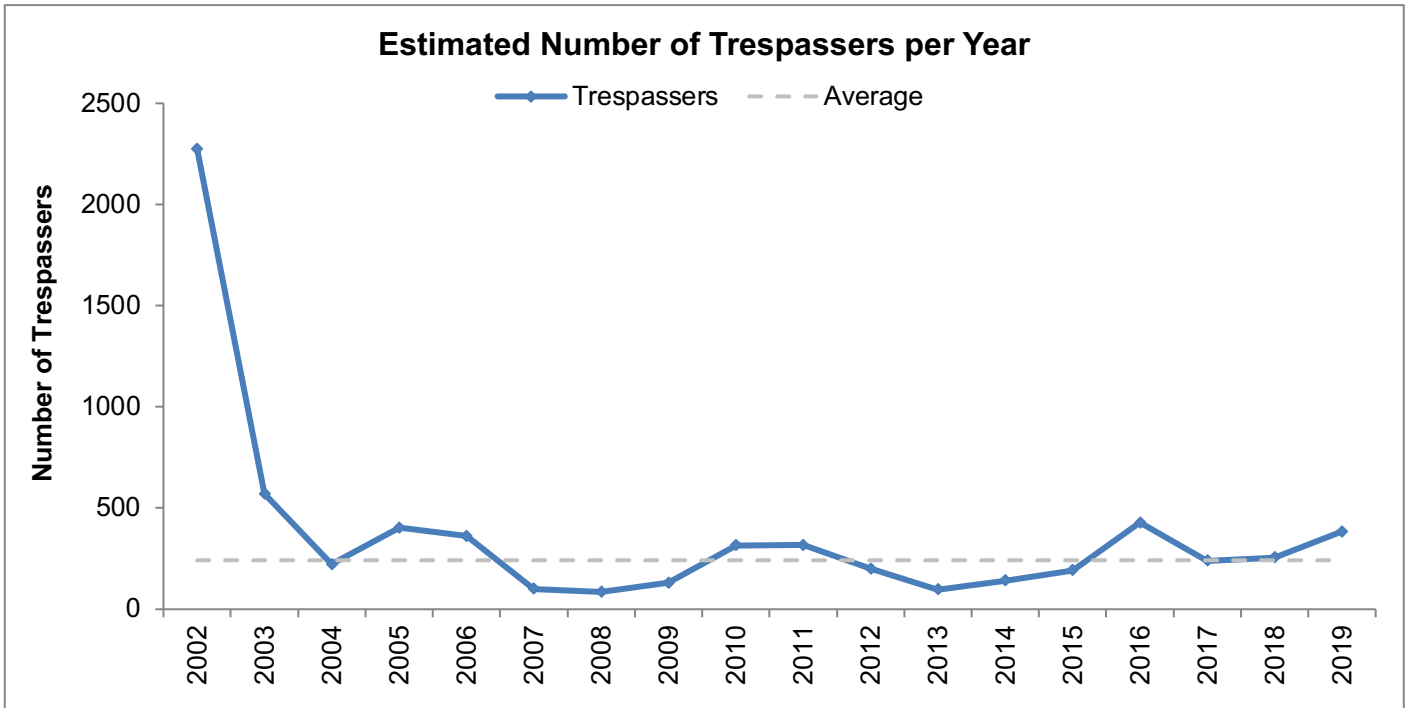


Figure 23. Estimated total number of visitors trespassing into protected habitat each year. Estimates based on the hourly rate of trespassers observed by docents ((# trespassers/hr)*(12 hrs/day)*(365 days/yr)).

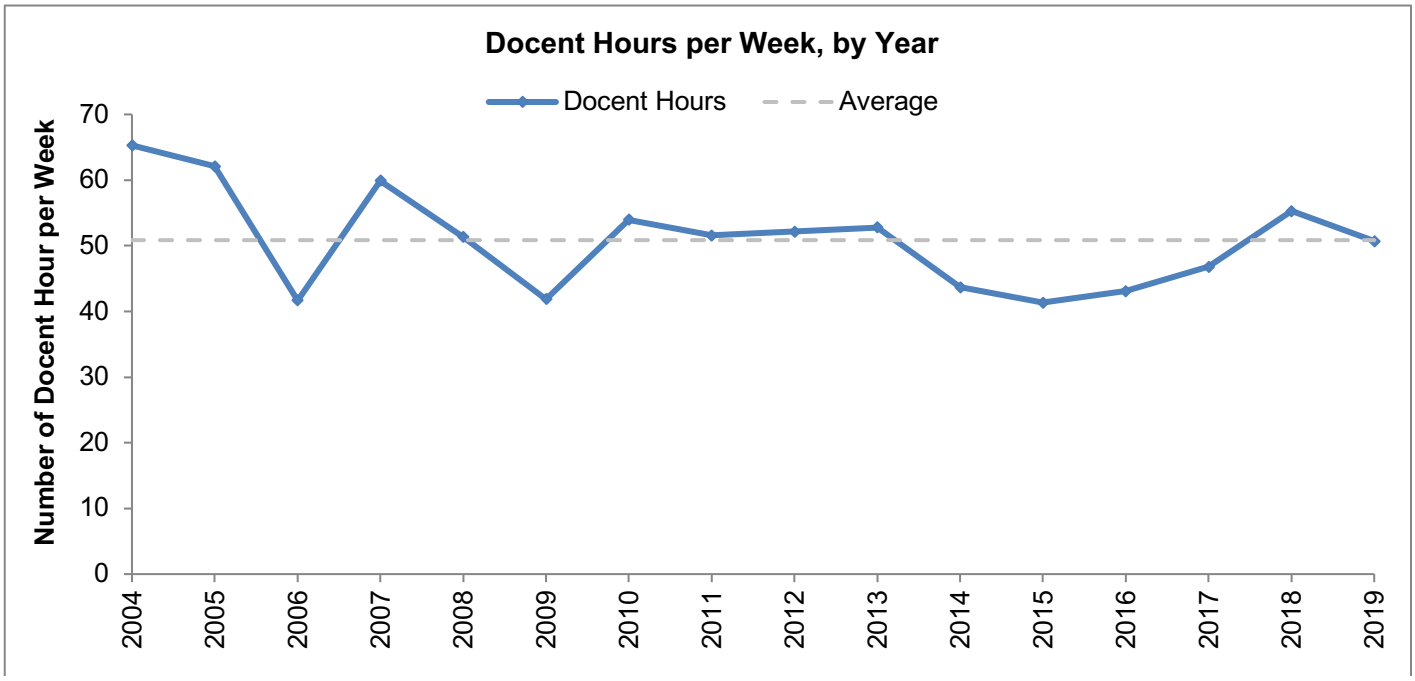


Figure 24. Average weekly coverage by Snowy Plover docents.

APPENDIX E
USDA Predator Management Report

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San Luis District
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Cristina Sandoval
Director, Coal Oil Point Reserve
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2 December 2019

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 avian and mammalian predators during the 2019 nesting season. Predator removal activities began on 30 April 2019 and ended 2 August 2019.

Striped skunks and American Crows were the target predators during the 2019 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. Four striped skunks were removed by trapping during the 2019 Western Snowy Plover nesting season.

Six American Crows were removed during the 2019 nesting season. Removal was conducted with a 22 caliber air rifle. Shooting was focused mainly on 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 all applicable Wildlife Services Directives, all state and local policies and the American Veterinary Medical Association's Guidelines for the Euthanasia of Animals: 2013 Edition (See references at the end of the report).

Wildlife Services spent 173.5 hours on predator removal activities, carcass disposal, and associated administrative duties at Coal Oil Point Reserve during the 2019 season. A total of 32 trap nights with cage traps and 36 trap nights with padded jaw leg-hold traps were spent trapping and removing mammalian 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.

USDA Wildlife Services recommends beginning predator removal activities prior to pairing and breeding season in 2020. 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.

Feel free to contact me if you have any questions.

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USDA Wildlife Services
San Luis District Supervisor
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References:

https://www.avma.org/KB/Policies/Documents/euthanasia.pdf.

https://www.aphis.usda.gov/wildlife_damage/directives/pdf/2.430.pdf

https://www.aphis.usda.gov/wildlife_damage/directives/pdf/2.505.pdf

https://www.aphis.usda.gov/wildlife_damage/directives/pdf/2.515.pdf

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https://govt.westlaw.com/calregs/Document/ICDB9D4B2F75F4D8D9CA4BD408AD7C38A?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=FGC&sectionNum=4004.

21 CFR 1308 – Schedules of Controlled Substances, Section 1308.03 – Administration Controlled Substances Code Number, Sections 1308.11 – 1308.15 Schedules I-V.

APPENDIX F

Nesting Data from Adjacent WSP habitat

Table 6. Nesting Data from UCSB North Campus Open Space (NCOS).

Year	# nests	# nests hatched	# nests predated by skunks	# nests predated by crows
2018	1	0	0	1
2019	3	0	2	1

Table 7. Nesting Data from Ellwood Beach, Goleta.

Year	# nests	# nests hatched	# nests predated by skunks	# nests predated by crows
2019	1	0	0	1