
2016 Final Report on the Western Snowy Plovers

Coal Oil Point Reserve
University of California
Santa Barbara, CA

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Permit Number TE-73205-4



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 daily in the spring and summer.

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

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ABSTRACT

In 2016, we continued with the monitoring of the WSP population at Coal Oil Point Reserve as in previous years. The count of wintering plovers was the lowest ever recorded since monitoring began in 2001. This year, the number of chicks that fledged was higher than average. Nest predation by skunks was a problem until predator control was initiated in late March. The rate of infertile eggs was higher than average. Nesting activity on the mudflats was low.

INTRODUCTION

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

METHODS AND RESULTS

In 2016, 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.

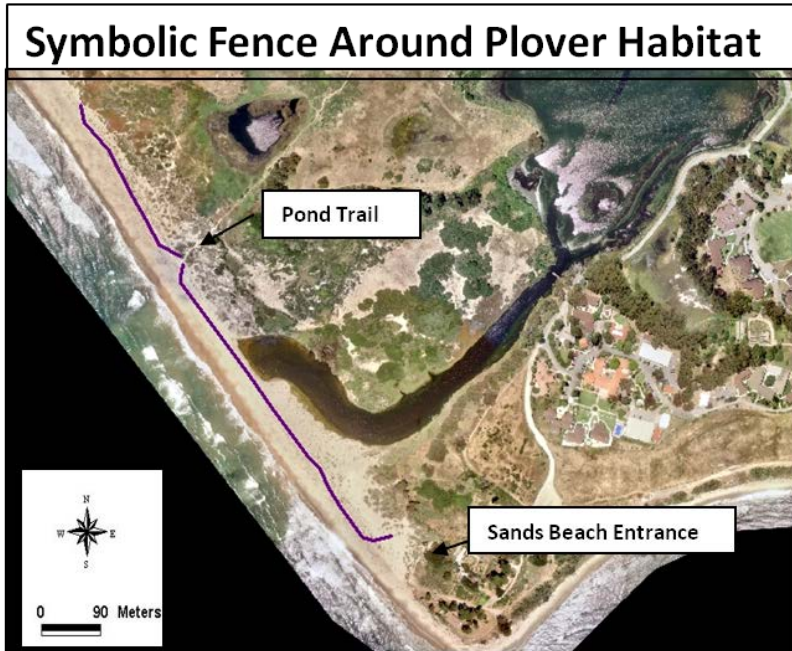


Figure 1. Location of the habitat protected for the Western Snowy Plovers (year round) on Sands beach at Coal Oil Point Reserve. The mudflats not shown in this photo area also protected. The fence is shown in purple.

Wintering Population

To count individuals of the WSP, we walked along the wet sand from the eastern boundary of Sands beach to the western boundary of the Reserve and observed all individuals with binoculars. On the way back, we stopped at groups of individuals to look for color bands on the legs. During the 2016 **winter window survey**, we counted 62 WSP. The number of wintering plovers at the reserve has been lower than average for the last 7 years (Figure 2). This year, the wintering population of WSP was one third the size of the average winter plover population at COPR and the lowest ever recorded at this site. We do not know what accounts for this trend, but we suspect that this year's low wintering population was partially the result of significant beach and dune erosion caused by El Niño storms.

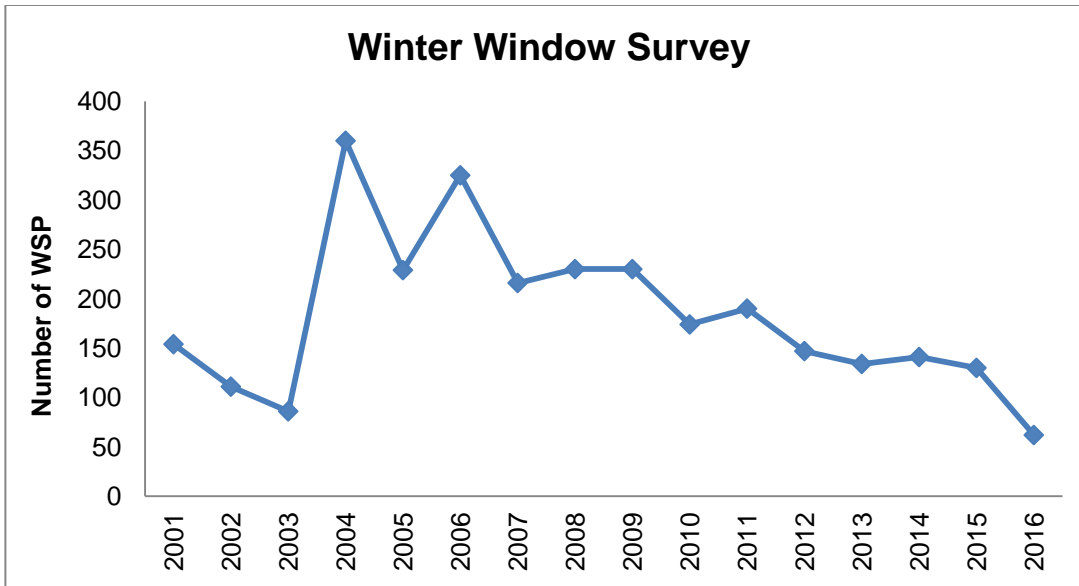


Figure 2. Winter window surveys of Snowy Plovers at Coal Oil Point Reserve

Breeding Population

We surveyed the breeding population in the same way as the wintering population. We counted 31 WSP during the 2016 **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 32 adults since 2003 (Figure 3).

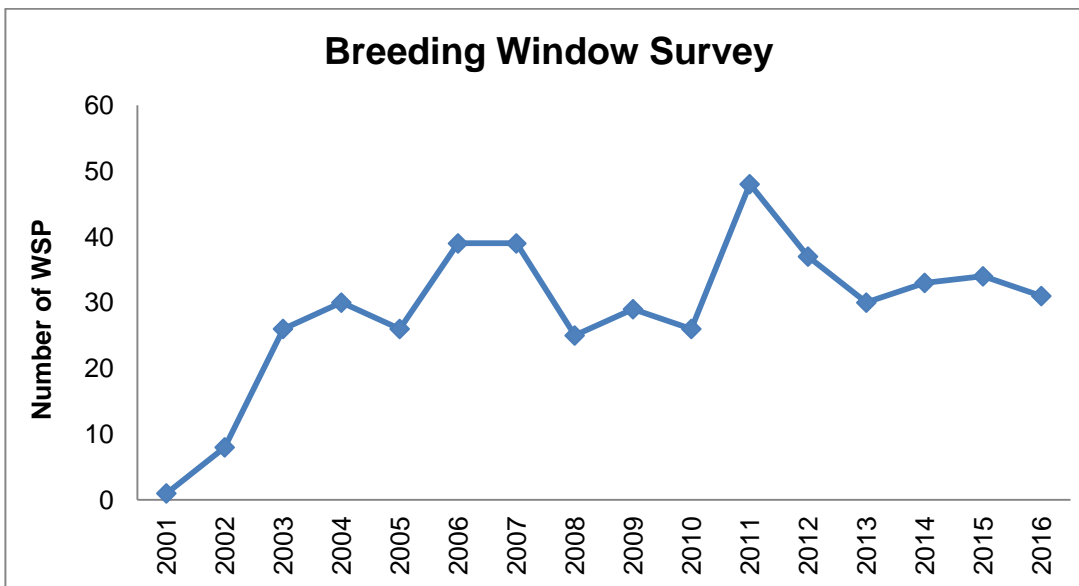


Figure 3. Winter window surveys of Snowy Plovers at Coal Oil Point Reserve

Nesting

During the nesting season in 2016, the numbers and locations of adult plovers, nests, and chicks were counted 3-4 times per week by Cristina Sandoval, Jessica Nielsen, and Pat Walker. 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 males can move around 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	24	56%	48	2.5	96%
2007	39	66	20	30%	17	0.9	50%
2008	25	57	22	38%	39	2.8	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%

Table 1. Changes in breeding measurements at Coal Oil Point Reserve since 2001.

Nest Fate

In 2016, 43 WSP nests were initiated at COPR and 29 of them hatched. Figure 5 shows the number of nests laid and the number of nests hatched between 2001-2016. This year, COPR had an above-average hatching rate of 67% (Figure 6).

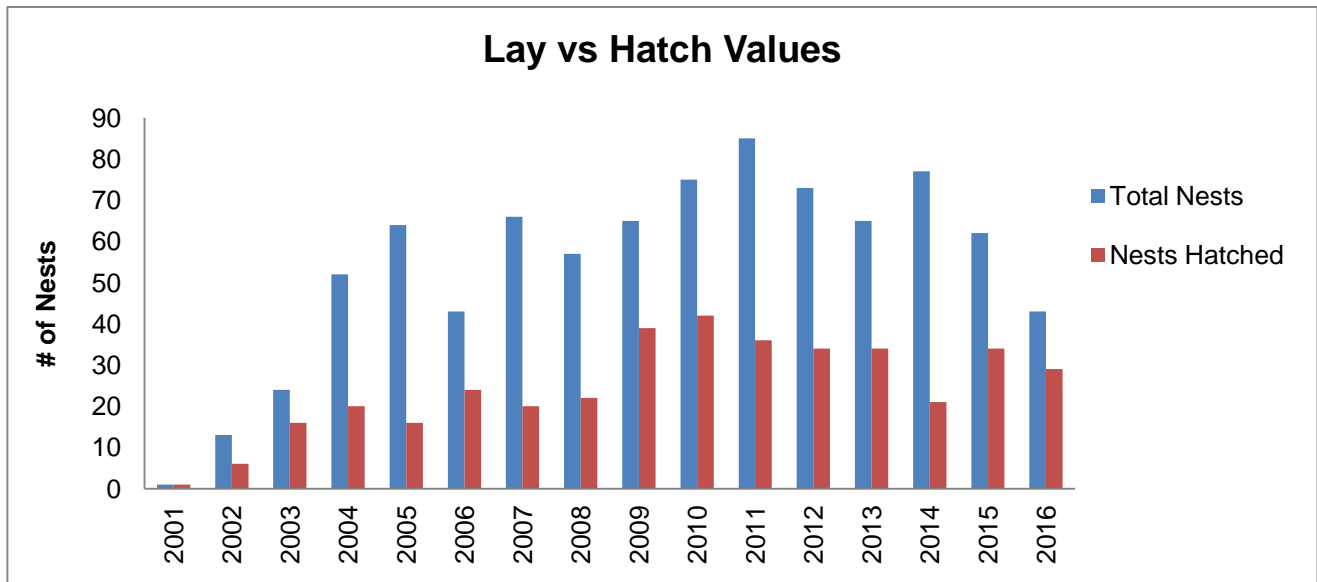


Figure 5. Nests initiated and hatched by year (total number of nests that had at least one egg vs. total number of nests that hatched at least one chick).

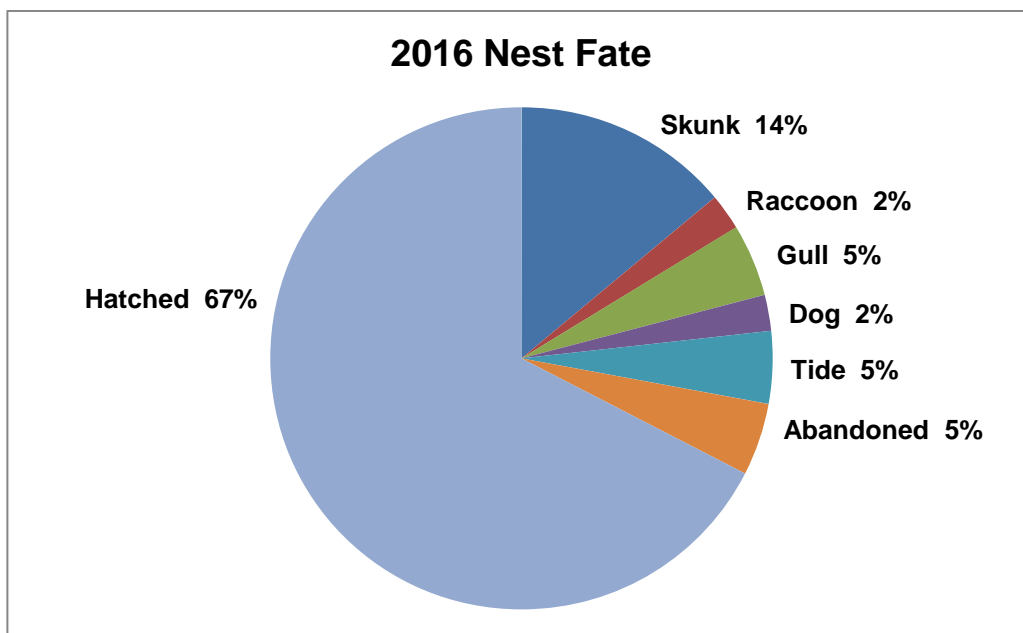


Figure 6. Nest fate at COPR in 2016

Table 2, below, shows a complete representation of nest fate over the years.

Year 20-XX	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16
Total nests	9	24	51	64	43	66	57	64	74	84	73	65	77	62	43
Hatched	6	17	20	16	25	30	22	39	42	35	34	34	21	34	29
Skunk	0	0	10	18	2	19	18	10	0	0	0	4	10	15	6
Crow	2	4	8	3	0	0	0	1	1	0	0	0	0	0	0
Wind	1	3	2	6	1	1	2	5	2	10	2	0	0	1	0
Tide	0	0	5	5	2	0	7	1	5	12	16	6	3	5	2
Abandoned	0	0	0	9	3	0	0	1	3	5	3	4	9	1	2
Abandoned Owl	0	0	0	0	6	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
Raccoon	0	0	2	1	0	0	0	1	0	0	2	2	4	0	1
Whimbrel	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Gull	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
Opossum	0	0	0	1	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	0	1
Unknown cause	0	0	0	1	3	11	0	0	15	8	11	0	21	3	0
Unk pred	0	0	0	1	1	1	0	4	0	10	5	15	9	3	0
Unk fate	0	0	0	0	0	4	4	2	0	0	0	0	0	0	0

Table 2. Number of nests lost by fate from 2002-2016

Predation

Note that there was an increase in nest survival (nests hatched) between 2008 and 2009 (Figure 5), which coincides with the initiation of our predator control program (USDA appendix). Historically, crows and skunks have been the most significant nest predators at COPR. However, since the implementation of crow harassment in 2005 and 2006, crow predation on nests has only been observed twice at COPR. In 2009, levels of skunk predation on nests dropped significantly after the initiation of a USDA predator control program (Figure 6).

In March 2016, a pair of crows was nesting in Cypress trees on the bluffs above the beach. Immediate implementation of predator control in this area helped to prevent any predation of nests by crows. In

2016, there were 6 documented nest failures due to skunk predation (Figure 7). All 6 nests were predated over 3 consecutive days in early May. Immediate implementation of skunk trapping and repairs to the skunk fence resolved this issue for the remainder of the breeding season. Thus, it is crucial to maintain the skunk fence and begin predator control as soon as there is evidence of predation.

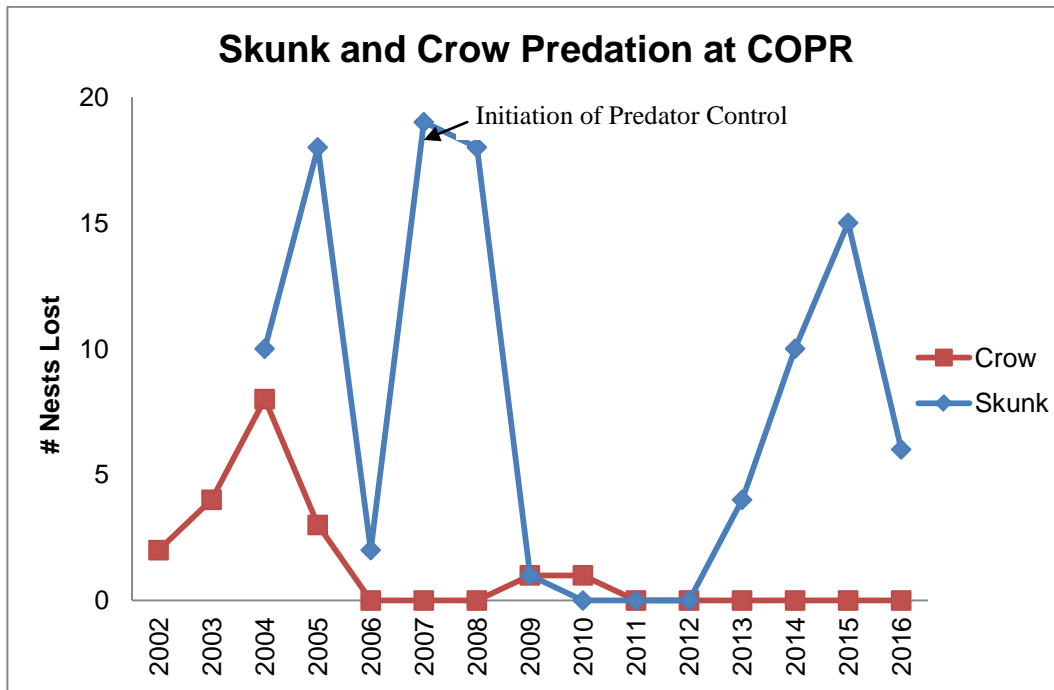


Figure 7. Crow and skunk predation by year

Infertility

All unhatched and abandoned eggs were collected and incubated to determine viability. Of the eggs that did not hatch, 12 were infertile and none were dead embryos. The rate of infertile eggs fluctuates from year to year at COPR. At 9.3%, the egg infertility rate in 2016 was about four times the average (Figure 8). In 2016, the number of nests with at least one infertile egg was 23% and it was also higher than average (Figure 9). The increased levels of infertile eggs may represent effects of the 2015 Refugio Oil Spill. Previous studies have shown a negative relationship of external oiling of Santa Barbara crude oil on long-term fertility in shorebirds (Fry et al. 1986).

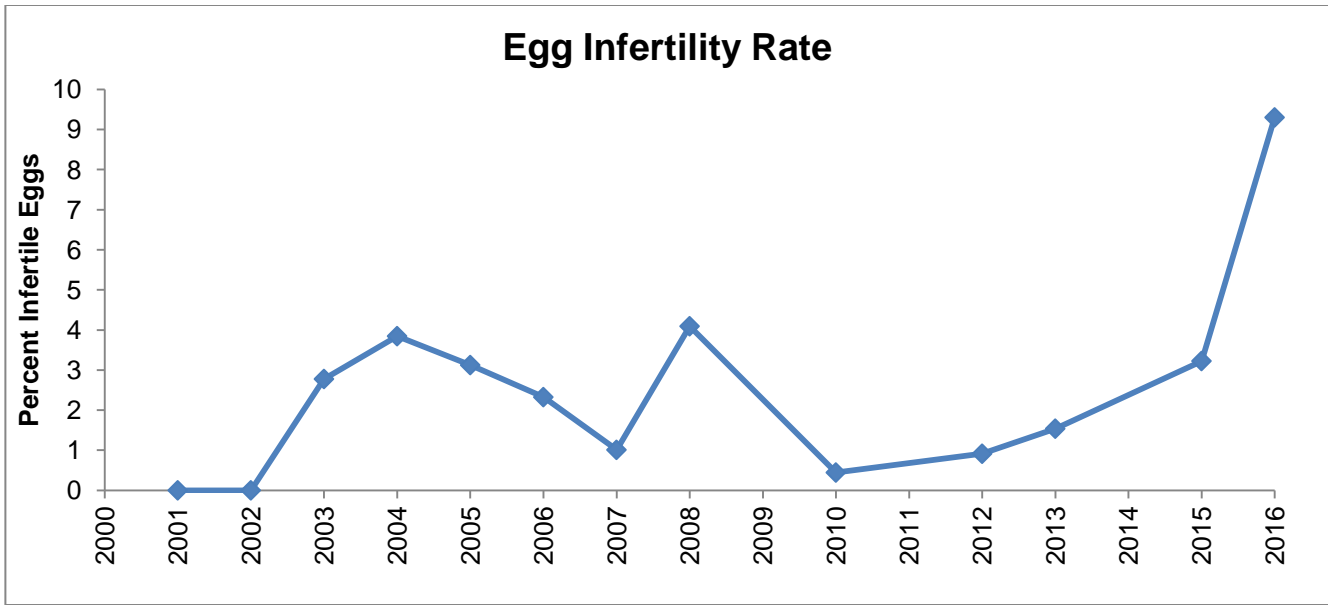


Figure 8. Percentage of infertile eggs by year (# infertile eggs/# total eggs *100)

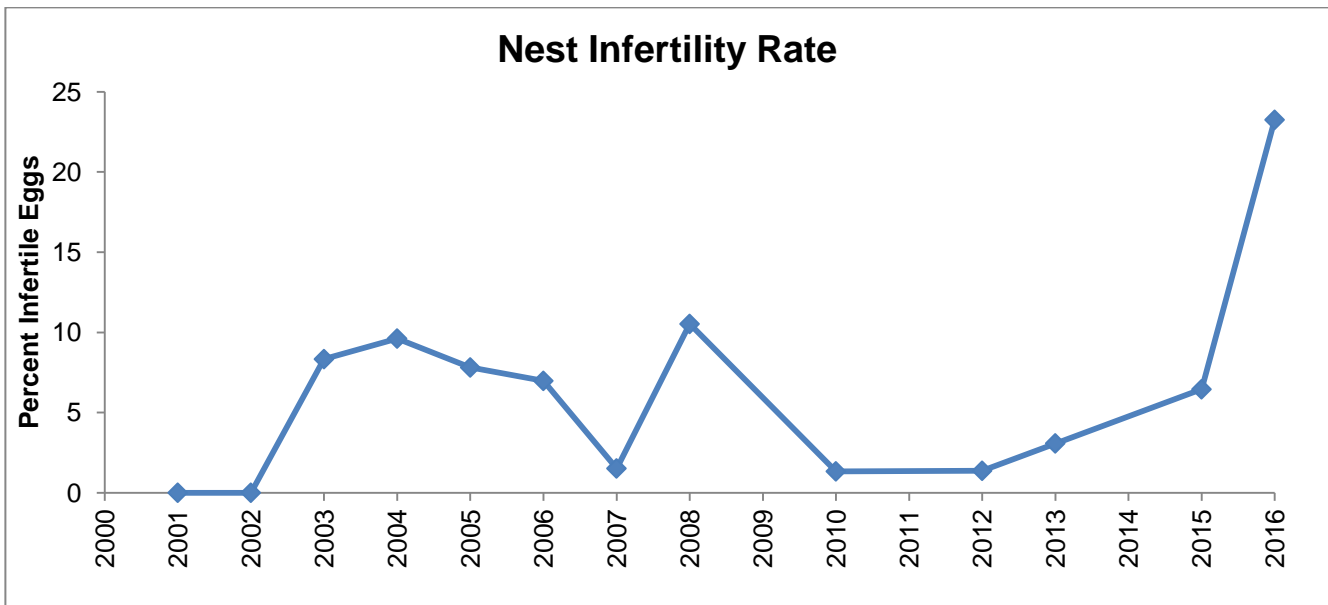


Figure 9. Percentage of infertile nests by year (#nests with at least 1 infertile egg/# total nests *100)

Chick Survival

The average number of WSP chicks fledged each year at COPR since 2001 is 31 and has varied between 1 individual in 2001 (beginning of the WSP management program) and 61 in 2009 (Figure 10). In 2016,

49 WSP chicks fledged at COPR. The fledging rate (nests that fledged at least one chick/total nests that hatched at least one chick) was 86%, the highest that it has been since 2008 (Figure 11). This year, COPR had 3.2 chicks fledged per male (Table 1).

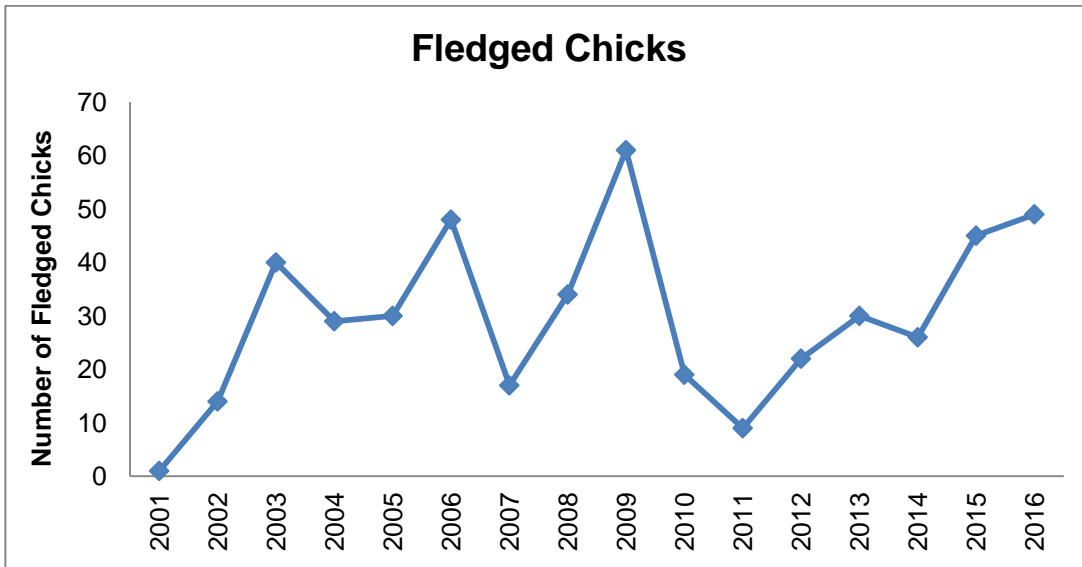


Figure 10. Number of chicks fledged by year

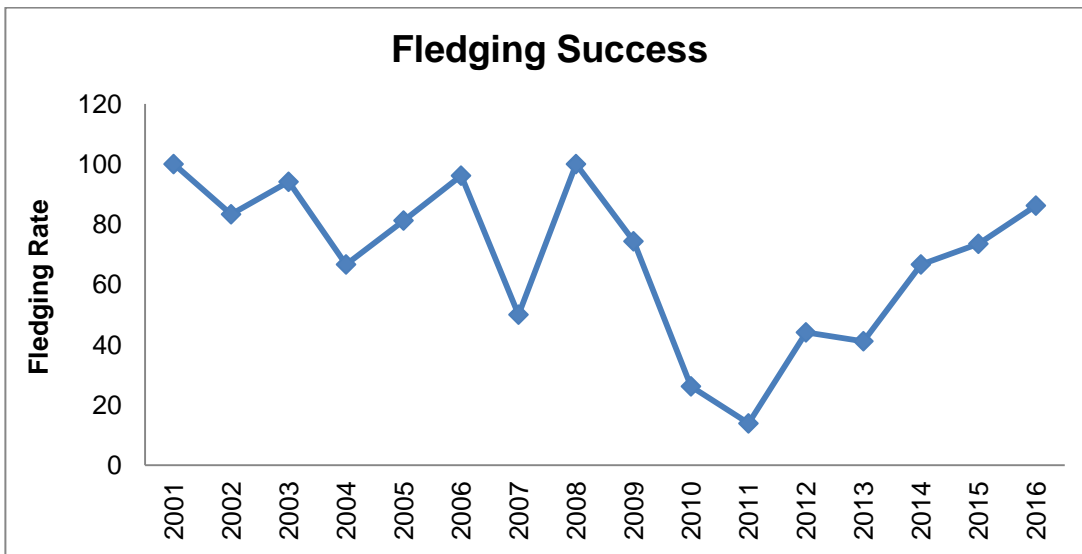


Figure 11. Fledging rate by year (# nests that fledge one chick/# total nests *100)

Timing of Nests

In 2016, the first nest was initiated on April 1st and the last chick fledged on August 28th for a total breeding season length of 149 days (Table 3). The length of this year's breeding season was only 1 day less than the average over the previous ten years. The dates of all nesting events in 2016 fell within the range of previous years' dates (Figure 12).

2016 Nesting Event	Date
First Nest Initiation	4/1/16
Last Nest Initiation	7/3/16
First Hatch	4/29/16
Last Hatch	7/31/16
First Fledge	5/27/16
Last Fledge	8/28/16

Table 3. Dates of nesting events in 2016

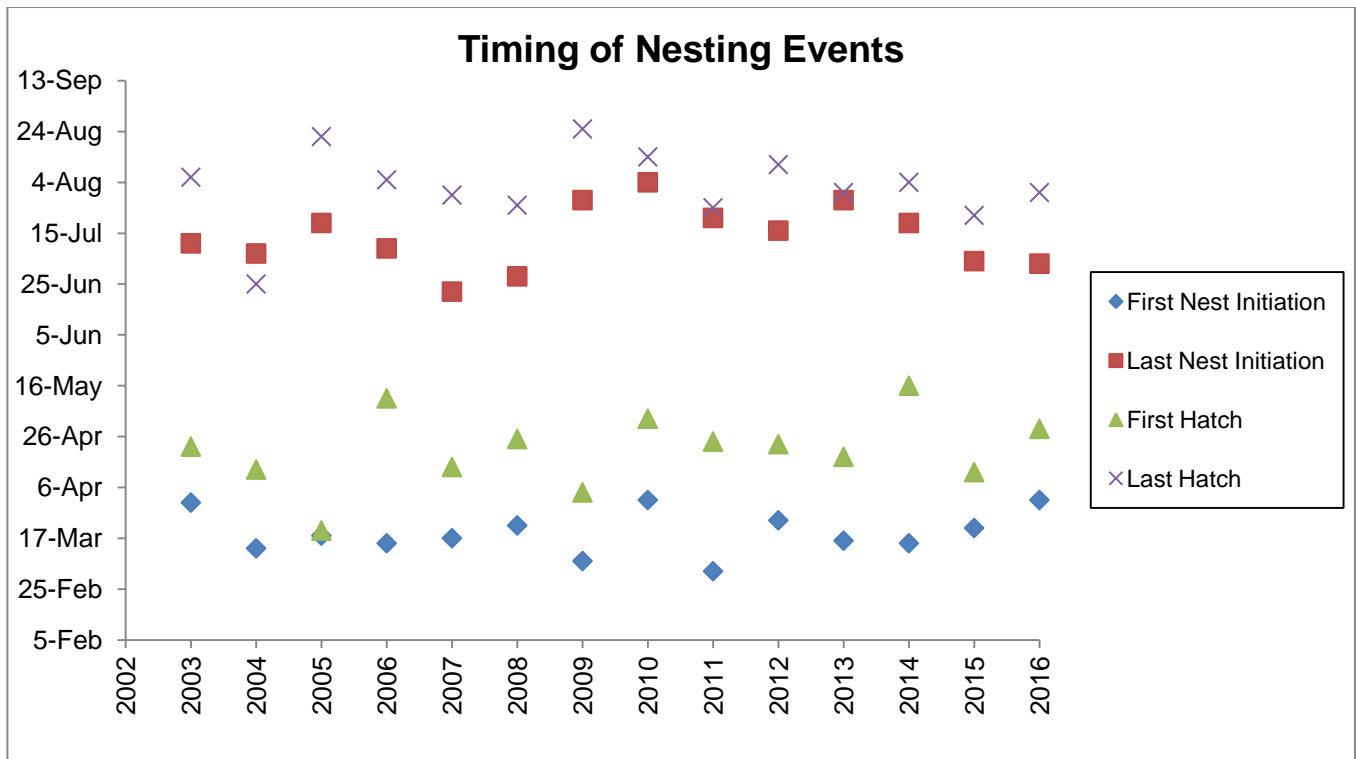


Figure 12. Timing of nest events by year

Location of Nests

GPS coordinates were taken for all of the WSP nests. For monitoring purposes, the nest locations were estimated using the numbered posts along the beach. For the nest on the mudflats (delta), we used a detailed description to identify location for monitoring purposes. We used the mapping data to look for spatial patterns in hatching and fledging success. The majority of the nests on the beach were concentrated on the wide sandy beach at the slough mouth. The map of nest location and fate on the beach and on the mudflats is shown below (Figure 13).



Figure 13. Map of nest fate on beach and mudflats

In 2015 and 2016, there was much lower nesting activity on the delta than in previous years (Figure 14). In 2016, only 4.7% of the nests were on the delta as compared to the 16.7 % average of the previous 9

years. The lack of nests on the delta may have been influenced by the presence of an active Great Blue Heron rookery.

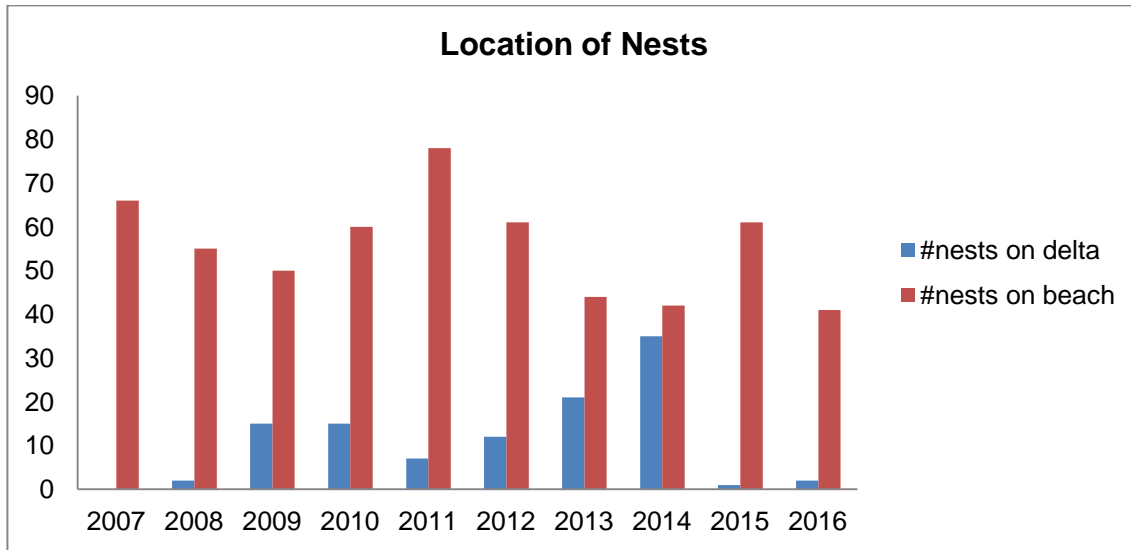


Figure 12 Nesting on the beach and delta between 2007-2014

Rehabilitation

On April 29, 2016, Jessica Nielsen discovered a single abandoned egg from a WSP nest from which two chicks had already hatched. The first two chicks hatched early in the morning on April 29 and the parent did not return to the nest to care for the remaining egg. The egg was then incubated in captivity and hatched on the same day at approximately 17:00. For the first 6 days, the chick was cared for by COPR staff. On May 5, the chick was transferred to the Santa Barbara Zoo (SBZ).

Another abandoned egg was discovered by Jessica on May 10, 2016. This nest had been predated by a skunk, and one egg had rolled out of the nest unharmed. The egg hatched in captivity on May 15 and was transferred to SBZ staff on May 17.

While under the care of COPR, each chick was kept in an open-top plastic terrarium with a heat lamp. Staff at COPR collected live beach hoppers from the kelp wrack at Sands Beach and fed chicks every 1-2 hours during the day. Once transferred to 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 PRBO, banded the older chick as Pa:RR and the younger chick as WW:Pa. The top band on Pa:RR's left leg and WW:Pa's right leg were placed on the upper leg segment.

On the last weigh-in on June 17, both chicks weighed 34g, exceeding the minimum weight required by USFWS release criteria (32 grams). On this date, they were flying well in the flight pen. Since the chicks had bonded with each other in captivity, they were released together. On the date of release, the older chick was 55 days old and the younger chick was 29 days old.

The chicks were released on June 23, 2016 at 9:15 am outside of any current nest or brood territories (~100 m west of the start of plover fence). Once released, Pa:RR immediately flew east over the dunes towards the slough mouth. WW:Pa remained standing on the beach near the enclosure for about 10 minutes before taking flight. He then flew west towards the 0 m marker of the plover habitat. Jessica Nielsen and Cristina Sandoval returned to the beach once in the morning and again in the afternoon to look for the released chicks and although neither chick was seen that day, they were both spotted 2 days later.

Staff and volunteers at COPR have observed both Pa:RR and WW:Pa consistently in the months following their release. The plovers have been observed at COPR beach, Ellwood Beach, and the Devereux Slough delta north of the COPR beach. The last date Pa:RR was recorded at COPR was November 22, 2016. The last date WW:Pa was recorded at COPR was July 9, 2016.

Enforcement

Officers enforce the leash law and other pertinent ordinances at COPR when they are called by the docents.

Docent program

The docent program continues to be crucial to the success of Western Snowy Plover recovery at Coal Oil Point. This year, docent coverage averaged approximately 42 hours per week. This is the same weekly average as 2015, and 6 hours per week more than 2014. 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.

CONCLUSION

The plover population at COPR appears to have 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 night. 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 is in a downward trend and we do not have an explanation for this pattern. The docent program continues to be an effective way to reduce human impact on the plovers.

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 monitoring 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.

ACKNOWLEDGEMENTS

Jessica Nielsen, the Conservation Specialist, and Cristina Sandoval, Reserve Director, conducted plover monitoring. Jessica managed the docent program. We are very thankful to Pat Walker who helped count plovers, locate nests and determine their fate and constructed and maintained the fences. Steve Ferry also continued to assist with fence maintenance. Rick Fellows donated 195 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 60 volunteers and interns over the course of 2016, kept a presence at the beach every day of the year.

California Least Terns

Several California Least Terns migrated through COPR during the breeding season. We observed one pair of terns doing courtship, mating, and making nest scrapes on June 16, but they did not lay eggs.

References

Fry, D.M., Swenson, J., Addiego, L.A., Grau, C.R., & Kang, A. 1986. "Reduced reproduction of wedge-tailed shearwaters exposed to weathered Santa Barbara crude oil." *Archives of Environmental Contamination and Toxicology* 15.4: 453-463.

Bibliography of other Snowy Plover studies at COPR:

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APPENDIX 1. Band sightings at the reserve

Date	Band Sightings						
3/31/2016	BN:RW						
4/25/2016	RR:BG						
5/9/2016	WB:GB						
5/14/2016	AN:RW						
5/28/2016	AN:RW	WB:GB	B:G				
6/5/2016	AN:RW	WB:GB					
6/11/2016	AN:RW	WB:GB					
6/23/2016	WB:GB						
6/25/2016	WW:PA						
6/29/2016	WW:PA						
7/3/2016	WW:PA	PA:RR					
7/7/2016	WB:GB	NB:YR					
7/9/2016	NB:YR	PA:RR	WW:PA				
7/11/2016	BB:RR						
7/13/2016	PA:RR	WA:GA	WW:RA				
7/19/2016	SA:RY						
7/24/2016	BB:NW	NO:YR	PV:VW	WB:GB			
7/30/2016	AN:RG	SN:WO	NB:YR	AN:RW	PV:VW	GB:WB	PA:RR (Ellwood)
8/1/2016	GA:OA						
8/4/2016	PA:AW						
8/7/2016	WB:GB	NB:YR	PA:RR	GA:OR	PV:VW	?:BG	GB:OR (Ellwood)
8/8/2016	WB:GB	AN:RW	AN:NY				
8/11/2016	PB:BW	A:GW	WW:NW	AN:RW	WB:GB		
8/13/2016	AN:RW	WB:GB	PV:VW	NB:YR	AP:RR		
8/20/2016	WB:GB	A:GWG	P:GWG	PV:VW	AN:RW	PA:RR	
8/26/2016	NB:YR						
9/1/2016	AN:RW	A:WG	YY:WB				
9/28/2016	AN:PW	Pa:RR					
10/17/2016	Pa:RR	PV:YG					
10/26/2016	Pa:RR	AN:Rw	L?:YG				
11/3/2016	Ny:NW						
11/16/2016	GA:YR	Pa:RR	NW:??				
11/22/2016	GA:YR	AN:RG	Pa:RR	YY:NW	PV:VW	WB:GB	AN:RG
11/29/2016	BB:Aw	WB:??					
12/6/2016	GA:YR						
12/19/2016	WB:GB						
12/28/2016	NY:NW	NR:NY	PV:YL	Pa:??	AN:RW		

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14 March 2017

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 2016 nesting season. Predator removal began on 4 April 2016 and ended August 2016.

Striped skunks, raccoons and American Crows were the target predators during the 2016 snowy plover nesting season. Trapping was the method used to remove the predators. Traps used to capture mammalian predators were Victor #1½ padded jaw traps and 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 American Crows were removed by shooting with a 22 caliber pellet rifle. A total of two striped skunks and three raccoons were captured in padded leg-hold traps and euthanized. Two raccoons were also trapped in cage traps and euthanized. 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 83.5 hours on predator removal activities, carcass disposal, and associated administrative duties at Coal Oil Point Reserve during the 2016 season. A total of forty eight padded leg-hold trap nights and forty six cage trap nights 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 2017. 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.



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Agriculture**

Animal and
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Wildlife Services

San Luis District

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CA 93268-0957

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 Kevin or myself if you have any questions.

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