



NESTING OF THE SNOWY PLOVER IN THE MONTEREY BAY AREA, CALIFORNIA IN 2014



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SYNOPSIS

Researchers and associates of Point Blue Conservation Science (Point Blue), the U.S. Fish and Wildlife Service (USFWS), and the California Department of Parks and Recreation (CDPR) monitored nesting Snowy Plovers at Monterey Bay in Monterey and Santa Cruz counties in 2014 to assess the plover's response to management efforts by the government agencies to enhance the species' breeding success and increase its population size. Management actions undertaken by federal and state agencies included:

- ❑ Roping-off upper beach and riverine spit habitat to minimize disturbance of nesting birds by the public.
- ❑ Exclosures to protect individual nests from predators when needed (Table 1).
- ❑ Predator removal by the Wildlife Services Division of the U.S. Department of Agriculture (USDA) and the Ventana Wildlife Society.
- ❑ Water management to provide nesting and feeding habitat in the managed ponds of the Moss Landing Wildlife Area (MLWA).

The estimated 419 plovers that nested in 2014 exceeded the estimate of 382 breeders the previous year (Fig. 1) and significantly exceeded the target of 338 breeders recommended for the Monterey Bay area in the USFWS Recovery Plan. No plovers were detected nesting on northern Santa Cruz County pocket beaches for the fifth consecutive year. The 2014 nesters consisted of 224 males and 195 females, all of which were uniquely color banded except for 19 males and 20 females which were unbanded. Among the uniquely color marked breeders were 20 males and 12 females produced from nesting attempts in the Monterey Bay area in 2013. Among the female nesters were 2 banded as chicks at Vandenberg, 3 at Oceano Dunes and 1 in Oregon.

Return rates of breeders of both sexes were approximately 20% above average in 2014. Of color banded adults that nested in 2013, 81% of males and 75% of females returned and bred in 2014. This compares with average return rates of 68% for males and 64% for females in the prior 15 years (Fig. 2).

We found 463 nests and 34 broods from undetected nests indicating at least 497 nesting attempts in the Monterey Bay area in 2014 (Table 2). In 2014 both the beach and pond clutch hatching rates were below their respective averages from 1999-2013. The 51% hatching rate of nests on the beaches was 16% below the 61% average of the previous 15 years and the salt pond rate of 50% was 24% below the 66% average of the previous 15 years (Fig. 3).

Predators were likely responsible for at least 58% of the 226 nest losses in 2014 (Tables 3 and 4). Of the 131 losses attributed to predators, 55.0% were attributed to avian predators, 32.1% to mammalian predators and 13.0% to unknown predators. Ravens, gulls and raven were the avian species identified depredating nests (Table 4). Skunks, canines, and raccoons were deemed responsible for 41 of the 42 nest losses attributed to mammalian predators (Table 4). One nest categorized as lost at hatch was undoubtedly also destroyed by avian or mammalian predators but we could not be sure if the loss occurred in the egg or chick phase.

Among nest losses attributed to other causes were 5 nests destroyed by humans and 23 by natural elements such as wind, tide and rain (Table 4). Nineteen nests were deserted and 4 had non-viable eggs.

No cause of loss could be attributed for 18.6% of the 226 nests categorized as failed but most of these were probably taken by predators rather than other causes listed in Table 4.

This year the chick fledging rate of 34.2% on beaches was 16% below the 1999-2013 average of 40.6% whereas the salt pond fledging rate of 52.3% was 43% above the 1999-2013 average of 36.6% (Fig. 4).

The total of 241 fledged young for the Monterey Bay area in 2014 was slightly above the 228-bird average from 1999-2013 and ended the steady decline from 2009 to 2013 (Fig. 5). The number of fledglings from the beaches was 24% above the prior 15-year 180-bird average whereas the 17 fledges from the salt ponds was 62% below the 45-bird average.

The 2014 fledging rate of 1.1 young per male was 21% lower than the 1.4 bird average of the past 15 years (Fig. 6) but sufficient to maintain population stability (USFWS Recovery Plan). The consequence of the 1.1 fledglings per male in 2014 should be a stable breeding population in the Monterey Bay area in 2015.



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INTRODUCTION

Staff and research associates of Point Blue Conservation Science (formerly PRBO), with the assistance of staff and/or interns of the U.S. Fish and Wildlife Service and the California Department of Parks and Recreation, have monitored nesting Snowy Plovers annually on the shores of Monterey Bay since 1984, and on small pocket beaches in northern Santa Cruz County since 1988, to assess the number of breeding plovers, number of nests, clutch hatching rate, chick fledging rate, and causes of egg and chick loss. Here we summarize the results of the monitoring effort in 2014.

STUDY AREA

The study area includes the beaches of Monterey Bay, former salt ponds in Elkhorn Slough (hereafter Salt Ponds), and pocket beaches in northern Santa Cruz County. For reporting purposes we divide up the study area as follows:

Monterey Bay Area

South Beach Subregion

Del Monte: Beach between the City of Monterey and Tioga Road, Sand City. Most of it is adjacent to Sand City. The beach is managed by CDPR.

Sand City: Beach between Tioga Road, Sand City and the south boundary of Fort Ord.

South Fort Ord: Beach between the south boundary of Fort Ord and the site of former Stilwell Hall. It is managed by CDPR.

North Fort Ord: Beach between the Stilwell Hall site and the Lake Court beach access to Marina State Beach. It is managed by CDPR.

Reservation Road: From the Lake Court beach access for Marina State Beach to Reservation Road. It is managed by CDPR.

Marina: The entire beach from Reservation Road to the north border of the Salinas River National Wildlife Refuge. It is managed by CDPR and the Monterey Peninsula Regional Park District. It is subdivided into four segments, all of which are completely or partly bordered by private property (Table 1).

Salinas River National Wildlife Refuge: The entire beach on the Salinas River National Wildlife Refuge (NWR), which is owned and managed by USFWS.

Salinas River North: The entire beach from the south border of the Salinas River NWR to the mouth of Elkhorn Slough. It is owned and managed by CDPR. It is further divided into three segments – the north spit of the Salinas River, Monterey Dunes, and Molera/Potrero road segments (Table 1). The Monterey Dunes segment is backed by a beach front housing development. The Molera/Potrero segment is backed by dunes, the Old Salinas River channel, salt marsh, and, east of the river channel, by agricultural fields south of and by development north of Potrero Road.

North Beach Subregion

Jetty Road to Beach Road: All the beach between Jetty Road (mouth of Elkhorn Slough) and Beach Road. It is divided into 3 segments all managed by CDPR (Table 1). The north end of the Pajaro Spit is bounded by a beach front development.

Sunset/Manresa: The entire beach from Beach Road to the north boundary of Manresa State Beach. The south end of this subregion is backed by a beach front development. The beach is managed by CDPR.

Salt Pond Region

It includes approximately half of the former salt ponds in Elkhorn Slough that have been converted to managed, diked wetlands and are now encompassed within the California Department of Fish and Wildlife's (DFW) Moss Landing Wildlife Area.

Northern Santa Cruz County Pocket Beach Region

We sporadically covered the four beaches known to have formerly supported nesting Snowy Plovers in northern Santa Cruz County. **Wilder Creek Beach** and **Laguna Creek Beach** are owned and managed by CDPR. **Scott Creek Beach** is owned and managed by the County of Santa Cruz and **Waddell Creek Beach** is owned by the CDPR and by a private party.

MONITORING

We attempt to find all plover nests initiated in the study area. Unique color band combinations are used to individually mark plover adults and chicks. For color banding, adults are usually trapped on the nest. Chicks are captured in or near the nest at the time of hatching. Clutch hatching dates are estimated from egg laying dates, when known, or from egg flotation. They are further refined by examination of eggs for cracked shells, tapping chicks, or peeping chicks just before the estimated hatching date. Chicks are considered fledged if they survive 28 or more days after hatching. Monitors look for fledglings when they have reached 28 days of age by watching banded males known to have broods and by monitoring flocks of roosting plovers during the latter part of the nesting season. Fledging success for specific sites is always categorized by nest location, even in cases where broods move to adjacent areas before fledging. In 2014, we recorded the longitude and latitude of all nests with Global Positioning Units. These locations are depicted in Appendices 1-13. Monitoring is conducted under U. S. Fish and Wildlife Service Permit TE 807078-15.

MANAGEMENT

A variety of techniques are used to improve the breeding success of the Snowy Plover in the study area. The upper beach at Salinas River NWR and the salt ponds are closed to the public to protect nesting plovers from human disturbance. On California state beaches symbolic fencing, consisting of signed, roped-off upper beach areas, is used to protect most nests (Table 1) and limit human disturbance of brood-rearing birds during the nesting season.

Mini enclosures, 24-36 inches in diameter and 24 inches high, were used to protect 16 nests from predators at Pajaro Dunes 2014. Fourteen were deployed at Pajaro nests a few days from hatching to protect them from skunks and ravens. Two nests that were enclosed early in the incubation period were deserted. One of the two deserted nests was possibly a dumped egg. Selective removal of problem mammalian and avian predators by Wildlife Service biologists also was conducted in 2014.

Biologists from the Ventana Wildlife Society captured a second-year female Peregrine Falcon at Salinas River NWR on June 9, 2014 and it was released at the Sacramento NWR by USFWS staff. It had been observed hunting in Snowy Plover habitat from Marina to the Salinas River from late March to June. It was observed taking a shorebird chick at Salinas River NWR and suspected of taking multiple adult and young Snowy Plovers during this timeframe. Fledgling production was extremely low during its presence. An adult Great Horned Owl was trapped at Ford Ord Dunes State Park by a Ventana Wildlife Society biologist and moved and released at Antioch NWR by USFWS staff on June 26, 2014. Owls were suspected to be responsible for low chick fledging rates at Fort Ord.

We continued to manage water levels at the Salt Ponds to create dry nesting substrate and associated wet foraging areas for Snowy Plovers. Water is drawn down rapidly from some ponds at the beginning of the season to provide dry nest sites. Thereafter, flooding of remnant-wet areas is undertaken several times per month throughout the nesting season to maintain foraging habitat for adults and chicks.

Table 1. Nest protection measures for Snowy Plovers at Monterey Bay in 2014.

Location	Total Nests	Large Excl. Only	Min Excl. Only	Symb. Fence Only	Fence & Mini Excl.	Fence & Large Excl.	Fence & Gull Excl.	Sign Only	None	Found Broods Only
Sand City	1	0	0	1	0	0	0	0	0	0
Fort Ord	33	0	0	33	0	0	0	0	0	0
Reservation Road	17	0	0	17	0	0	0	0	0	1
Marina										
<i>Marina South</i>	15	0	0	15	0	0	0	0	0	1
<i>Marina Middle</i>	38	0	0	38	0	0	0	0	0	2
<i>Marina North</i>	11	0	0	10	0	0	0	0	1	2
<i>Martin</i>	11	0	0	11	0	0	0	0	0	1
Salinas River NWR	57	0	0	57	0	0	0	0	0	7
Salinas River North										
<i>Salinas River N. Spit</i>	38	0	0	38	0	0	0	0	0	1
<i>Monterey Dunes</i>	20	0	0	20	0	0	0	0	0	4
<i>Molera/Potrero</i>	23	0	0	22	0	0	0	0	1	3
Jetty to Beach Roads										
<i>Moss Landing</i>	48	0	0	48	0	0	0	0	0	5
<i>Zmudowski Beach</i>	32	0	0	32	0	0	0	0	0	1
<i>N. Pajaro R.M.</i>	86	0	0	70	16	0	0	0	0	3
Sunset/Manresa	12	0	0	12	0	0	0	0	0	1
Seascape	1	0	0	1	0	0	0	0	0	0
Salt Ponds	20	0	0	19	0	0	0	0	1	2
Total	463	0	0	444	16	0	0	0	3	34

RESULTS

The 2014 Nesting Season

Number of Breeders

The estimated 419 plovers that nested in 2014 exceeded the estimate of 382 breeders of the previous year (Fig. 1) and substantially exceeded the target of 338 breeders recommended for the Monterey Bay area in the USFWS Recovery Plan. Again, no plovers were detected nesting on the northern Santa Cruz County pocket beaches in 2014 (Table 2).

The 2014 nesters consisted of 224 males and 195 females. Nineteen of the males and 20 of the females were unbanded. Among the remaining 205 uniquely color marked male breeders were 20 birds produced from nesting attempts in the Monterey Bay area in 2013. Among the 175 uniquely marked female nesters were 12 produced from nesting attempts in the Monterey Bay area in 2013. In addition to the recruitment of locally-hatched plovers into the Monterey Bay area were 2 females fledged from Vandenberg, 3 from Oceano, and 1 from Oregon

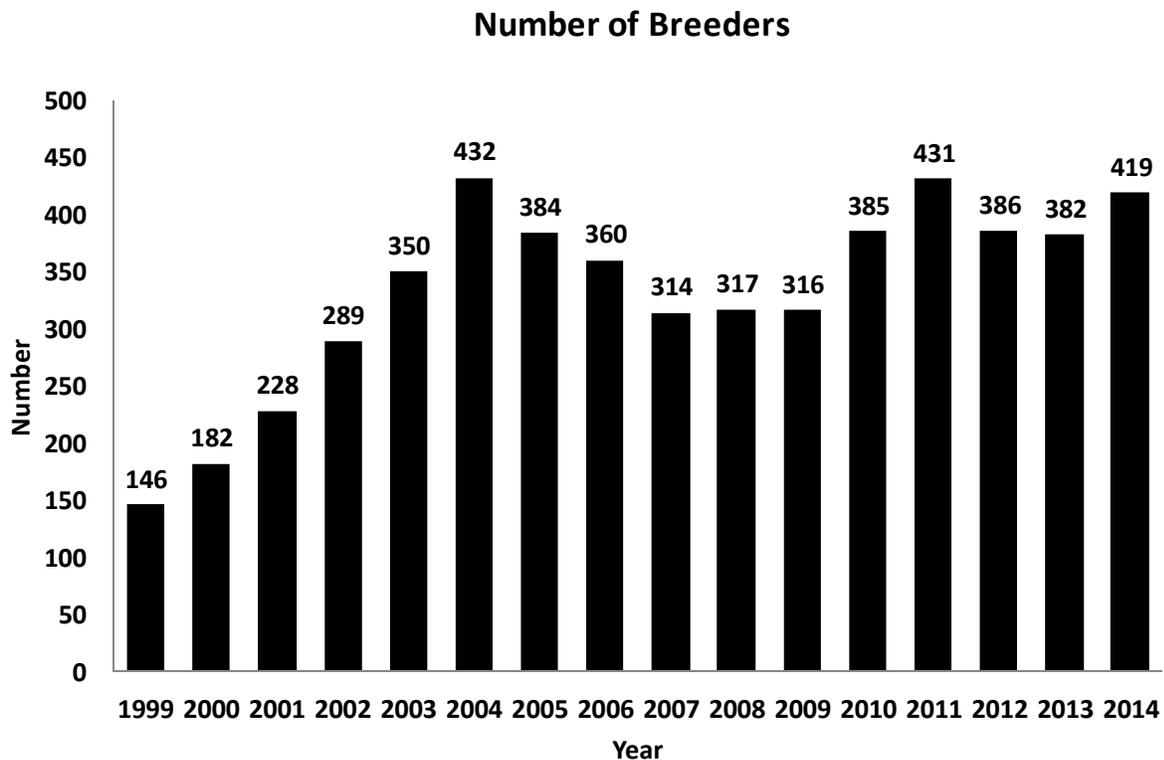


Figure1. Number of nesting Snowy Plovers at Monterey Bay, 1999-2014.

Return Rates

Return rates of breeders of both sexes were approximately 20% above average in 2014. Of color banded adults that nested in 2013, 81% of males and 75% of females returned and bred in 2014. This compares with average return rates of 68% for males and 64% for females in the prior 15 years (Fig. 2).

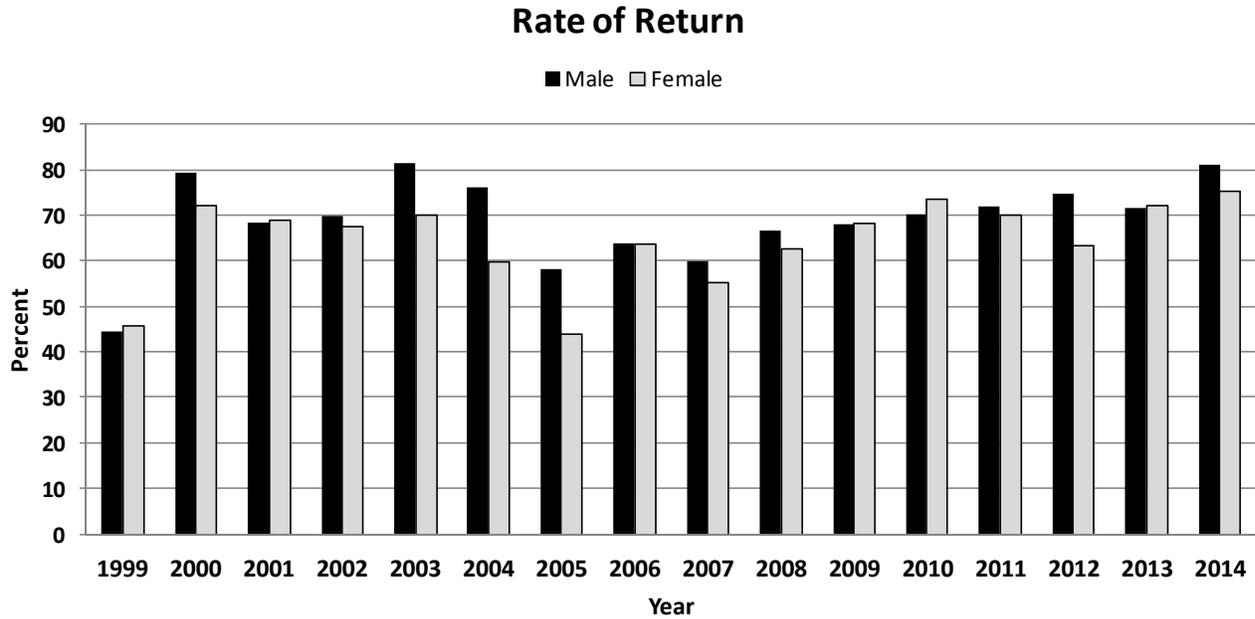


Figure 2. Return rates of nesting Snowy Plovers at Monterey Bay.

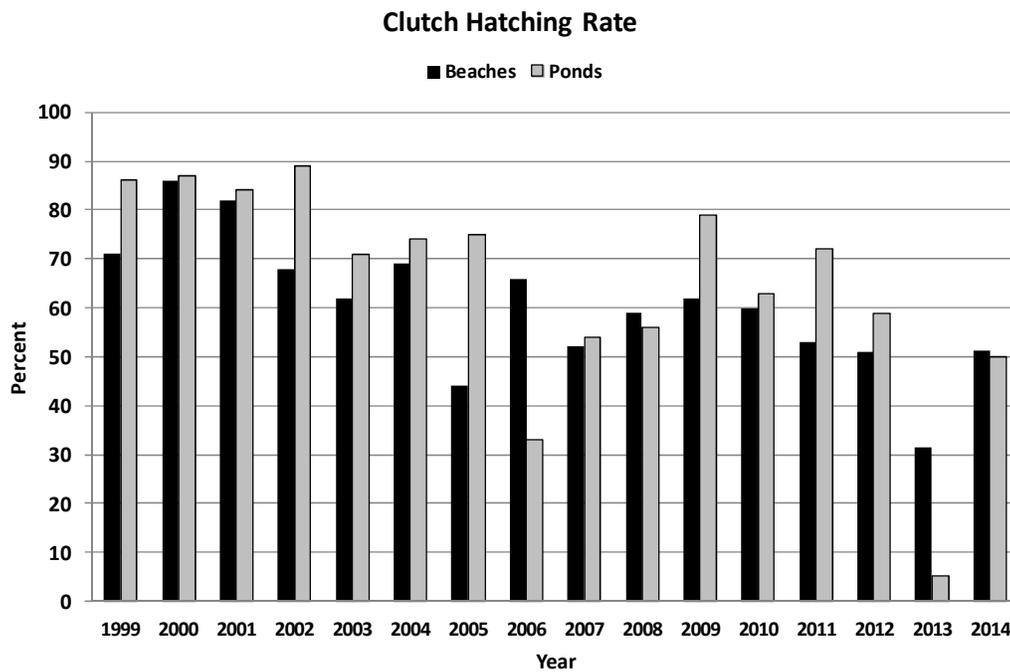


Figure 3. Clutch hatching rates of Snowy Plovers at Monterey Bay.

Clutch Hatching Rates

We found 463 nests and 34 broods from undetected nests indicating at least 497 nesting attempts in the Monterey Bay area in 2014 (Table 2). Our calculations of the clutch hatching rates of these nests exclude all nesting attempts documented only from the detection of broods.

The 2014 hatching rate of clutches on the beaches and the salt ponds was below their respective averages from 1999-2013. The 51% hatching rate on the beaches was 16% below the 61% average of the previous 15 years and the salt pond rate of 50% was 24% below the 66% average of the previous 15 years (Fig. 3).

Table 2. Snowy Plover nesting success at Monterey Bay in 2014. Juv. is Juvenile and Att. is Attempt.

Regions	Nest Attempts		Chicks		Juv.	% Nests	% Chicks Fledge		Juv. Per	Hatch	Failed
	Nests	Broods	Low	High		Hatch	High	Low	Nest Att.	Nests	Nests
Del Monte-Res. Rd.											
<i>Sand City</i>	1	0	0	0	0	0.0	0.0	0.0	0.00	0	1
<i>Fort Ord</i>	33	0	62	63	24	66.7	38.7	38.1	0.73	22	11
<i>Reservation Road</i>	17	1	28	34	10	70.6	35.7	29.4	0.56	12	5
Marina											
<i>Marina South</i>	15	1	15	17	4	40.0	26.7	23.5	0.25	6	9
<i>Marina Middle</i>	38	2	55	67	15	63.2	27.3	22.4	0.38	24	14
<i>Marina North</i>	11	2	23	27	8	72.7	34.8	29.6	0.62	8	3
<i>Martin</i>	11	1	22	24	6	72.7	27.3	25.0	0.50	8	3
Salinas NWR	57	7	86	99	29	49.1	33.7	29.3	0.45	28	29
Salinas River N											
<i>N. Salinas River</i>	38	1	52	54	9	50.0	17.3	16.7	0.23	19	19
<i>Monterey Dunes</i>	20	4	45	47	16	65.0	35.6	34.0	0.67	13	7
<i>Molera/Potrero</i>	23	3	50	52	21	78.3	42.0	40.4	0.81	18	5
Jetty-Beach Rds.											
<i>Moss Landing</i>	48	5	67	72	18	45.8	26.9	25.0	0.34	22	26
<i>Zmudowski Beach</i>	32	1	36	38	10	43.8	27.8	26.3	0.30	14	18
<i>Pajaro Spit</i>	86	3	78	83	53	34.9	67.9	63.9	0.60	30	56
Sunset/Manresa	12	1	6	9	1	16.7	16.7	11.1	0.08	2	10
Seascape	1	0	2	2	0	100.0	0.0	0.0	0.00	1	0
TOTAL BEACHES	443	32	627	688	224	51.24	35.7	32.6	0.47	227	216
SALT PONDS	20	2	32	33	17	50.0	53.1	51.5	0.77	10	10
GRAND TOTAL	463	34	659	721	241	51.2	36.6	33.4	0.48	237	226

Note: One Reservation Road nest of unknown fate is treated as a failed nest for these calculations.

Table 3. Total Snowy Plover clutches lost and percent attributed to different causes from 1999 to 2014. Unk. is unknown.

Year	Total Nest Losses	Mammal Predator	Avian Predator	Unknown Predator	Human	Wind Tide Rain	Desertion	Non-Viable	Unk. Cause	Lost at Hatch	Unk Fate
1999	31	13	3	13	6	23	29	13	0	0	0
2000	27	0	19	26	0	15	30	11	0	0	0
2001	51	2	45	6	4	2	22	8	12	0	0
2002	87	13	39	2	3	17	17	1	7	0	0
2003	91	10	25	4	1	9	13	3	34	0	0
2004	129	6	23	12	8	20	11	2	19	0	0
2005	216	16	47	5	3	9	6	1	14	0	0
2006	123	33	12	25	0	10	9	2	9	0	0
2007	162	12	37	14	2	10	10	5	9	0	0
2008	138	11	37	20	1	17	1	4	7	2	0
2009	113	11	33	9	2	19	4	11	12	0	0
2010	153	8	18	22	3	20	9	3	16	1	0
2011	193	8	33	16	1	11	11	1	20	0	0
2012	197	2	40	14	4	9	6	0	25	0	0
2013	340	7	36	20	0	4	3	0	28	1	0
2014	226	19	32	8	2	10	8	2	19	0	0
Mean	142	11	30	13	3	13	12	4	14	0	0

At least 58% of the 226 nest losses in 2014 were caused by predators (Tables 3 and 4). Of the 131 losses attributed to predators, 55.0 % were attributed to avian predators, 32.1% to mammalian predators and 13.0% to unknown predators. Ravens, gulls and a Whimbrel were the avian species identified depredating nests (Table 4). Nest depredation by ravens was documented at 5 sites and gull depredation at 6 sites (Table 4). Overall, 25 nest losses were attributed to ravens.

Skunks, canines, and raccoons were responsible for 42 of the 43 nest losses attributed to mammalian predators (Table 4). One nest categorized as lost at hatch was undoubtedly also destroyed by avian or mammalian predators but we could not be sure if the losses occurred in the egg or chick phase.

Among nest losses attributed to other causes were 5 nests destroyed by humans and 23 by natural elements such as wind, tide and rain (Table 4). Nineteen nests were deserted and 4 had non-viable eggs.

No cause of loss could be attributed 18.6% of the 226 nests that failed but most of these were probably taken by predators rather than other causes listed in table 4.

Table 4. Causes of Snowy Plover nest loss at Monterey Bay in 2014. Unk. is Unknown, and Pred. is Predator.

Locations	Avian Predator					Mammalian Predator					Unk.				Non-		Cause	Lost at	Fate	
	CORA	WHIM	Gull	Corvid	Unk.	Coyote	Canine	Skunk	Racoon	Unk.	Pred.	Human	Tide	Wind	Viable	Des.	Unk.	Hatch	Unk	Total
Sand City											1									1
Fort Ord							1	6								2	1			10
Reservation Road					1			1								2	1		1	6
Marina South					2						2		2		2	1				9
Marina Middle			1		2			1			3		1	1	2	3				14
Marina North																	3			3
Martin			3																	3
Salinas NWR					2		1	10			2	1	2	2	1	1	6	1		29
N. Salinas River			3		4		2	2					4			2	2			19
Monterey Dunes			1		1							1	1	3						7
Molera/Potrero	1				3											1				5
Moss Landing	7	1			5	1	1					1		3		1	6			26
Zmudowski Beach	8		4		2		1										3			18
Pajaro River Spit	7		7	1	3			8	1	1	4			5	1	4	14			56
Sunset/Manresa	2				1			3	2								2			10
Seascape																				
Salt Ponds											6	1			1	2				10
Total	25	1	19	1	26	1	6	31	3	1	17	5	7	16	4	19	42	1	1	226

Note: The Reservation Road nest of unknown fate is treated as a failed nest.

Chick Fledging Rates

Chick fledging rate was also below average on the beaches and above average at the ponds in 2014. On the beaches, only 33-36% of the chicks fledged in 2014 (Table 2). This rate was about 16% below the average of 40.6% from 1999-2013 (Fig. 4). In contrast, the 52-53% chick fledge rate at the ponds exceeded the 1999-2013 average of 36.6% by 43%.

Fledging success pooled for the areas that the peregrine hunted – from North Salinas to Marina-- was 14% for all nests that hatched prior to the falcon’s removal compared with 34% for all nests that hatched afterwards, including nests that had chicks on the ground after the falcon returned to the area. The fledging rate of chicks from plover nests that hatched prior to the removal of the Great Horned Owl was 31% and 43% subsequent to its removal.

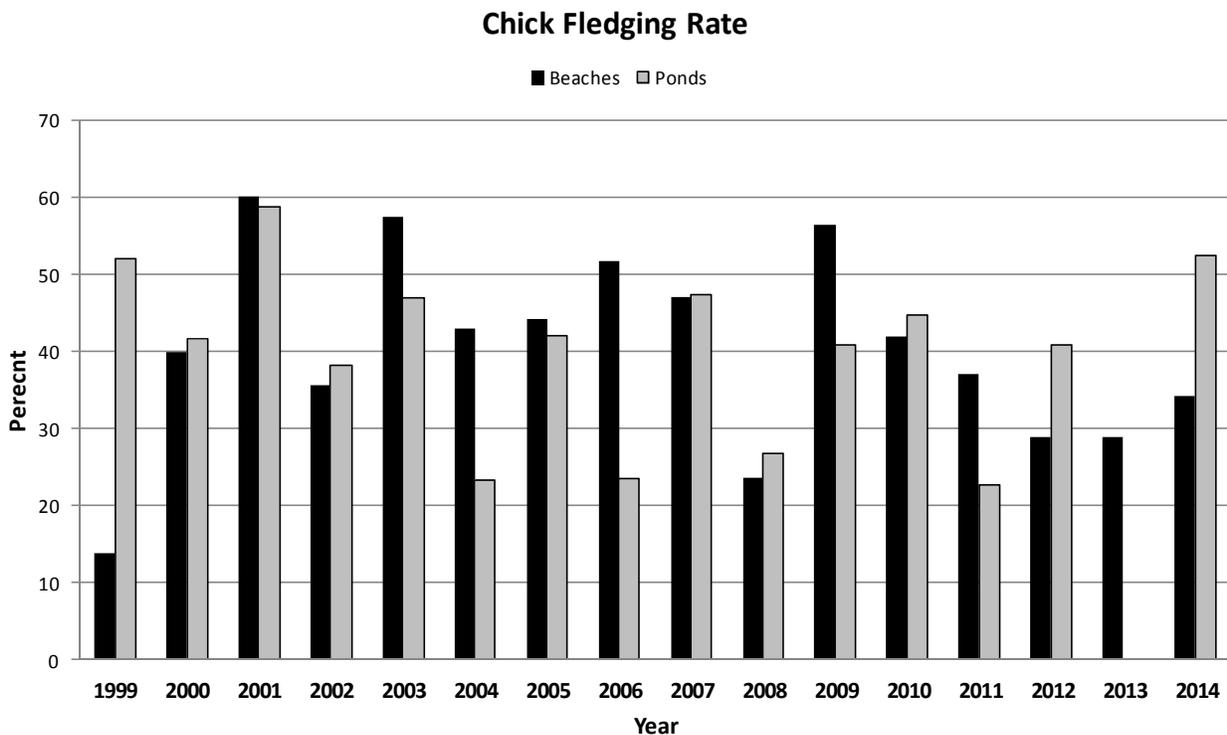


Figure 4. Chick fledging rates of Snowy Plovers at Monterey Bay.

Number of chicks fledged

The total of 241 fledged young for the Monterey Bay area in 2014 was slightly above the 228-bird average from 1999-2013 and ended the steady decline from 2009 to 2013 (Fig. 5). The number of fledglings from the beaches was 24% above the prior 15-year 180-bird average whereas the 17 fledges from the Salt Ponds was 62% below the 45-bird average.

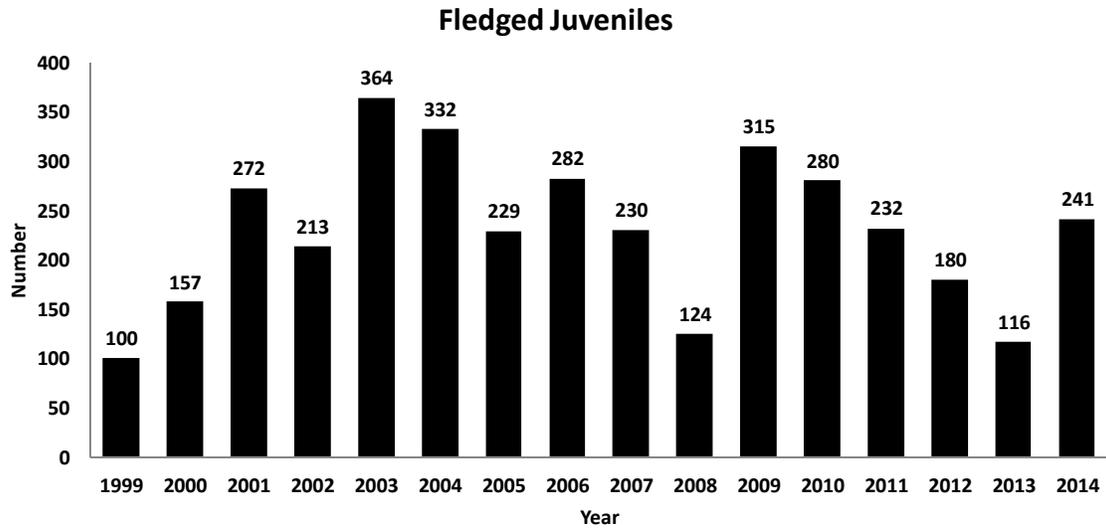


Figure 5. Number of fledged juveniles at Monterey Bay.

Young Fledged Per Male

The 2014 fledging rate of 1.1 young per male was 21% lower than the 1.4 bird average of the past 15 years (Fig. 6) but sufficient to maintain population stability (USFWS Recovery Plan).

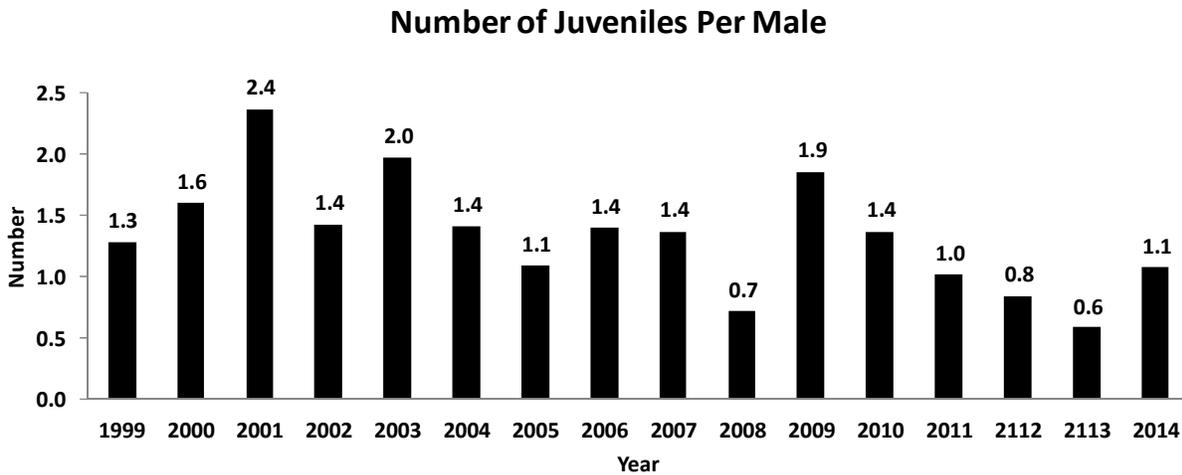


Figure 6. Mean number of juveniles reared per male at Monterey Bay.

DISCUSSION

Our estimate of 419 breeding Snowy Plovers in the Monterey Bay region again in 2014 exceeded the USFWS recovery plan target of 338 adults for the region for the 9th time in the 12 years since it was first attained in 2003. Moreover, the number of breeders in the Monterey Bay area also exceeded the 400-bird target for USFWS Recovery Unit 4 which encompasses all coastal nesting areas from Sonoma through Monterey counties.

The USFWS window survey in late May is currently the primary method of estimating the relative size of the entire U.S. Pacific coast population annually. Our data continue to suggest that the window survey underestimates the number of breeders in the Monterey Bay region. In 2014, 337 adults were detected in the study area on the window survey. This represents only 80% of the estimated 419 adults (mainly color banded birds) known to have nested there over the season. Over the 10-years from 2005-2014 the percent of plovers detected on the Monterey Bay area window survey averaged 75.1% (SE= 2.4%) of known nesters.

The 241 chicks fledged in the Monterey Bay area in 2014 slightly exceeded the previous 15 year average of 228 fledglings for Monterey Bay and the USFWS target of 1 fledgling per male for population stability. Despite the above average fledgling production plovers experienced below average hatching and fledgling rates in 2014 relative to the prior 15 years in the area. The overall clutch hatching rate was 51% compared with the 62% average and the overall chick fledging rate was 35% compared to the 41% average for the prior 15 years

Pajaro Spit experienced exceptionally high fledging success compared with recent years. Fifty-three chicks fledged there in 2014, a great increase over the average of 11 fledglings during the previous 5 years. Several factors may have contributed to this increase including the absence of Northern Harriers, the presence of a large Caspian Tern colony (not typical at this site), and an abundance of vegetation, which provided food and cover for a high density of broods. Many plover broods favored the southern half of the spit, which the highly territorial terns defended against predators. The chicks may also have benefitted from the dense vegetative cover in the closed area of the beach. Flightless chicks were rarely observed on the beach west of the protected area and consequently not subjected to human disturbance as much as observed in previous years when broods frequented the unfenced area. Great Horned Owl tracks were consistently observed throughout the 2014 season (as in previous years) and several depredated adult tern carcasses were found. The owls may have been preying on the terns and ignoring the plover chicks in contrast to prior years. The use of 14 single nest exclosures late in pairs' incubation periods also had a positive effect on hatching success at Pajaro Spit. As in recent years, hatching rates improved with control of Common Ravens and Striped Skunks.

Bay-wide, improved control of Common Ravens in or adjacent to plover habitat probably also led to improved plover productivity. Nest losses attributed to ravens were distributed over a small geographic area in 2014 with only 5 sites documented having losses to ravens in 2014 compared with 11 sites in 2013.

Capture and translocation of two avian predators this year appeared to have a positive effect on plover productivity. A second-year Peregrine Falcon observed hunting in Snowy Plover habitat from Marina to the Salinas River from late March to June was seen taking a shorebird chick at Salinas River NWR and suspected of taking multiple adult and young Snowy Plovers during the same timeframe. This bird was captured at Salinas River NWR on June 9 and transported to the Sacramento NWR where it was released. Fledging success pooled for the areas that the peregrine hunted – from North Salinas to Marina -- was 14% for hatchlings from all nests that hatched prior to the falcon's removal compared with 34% for those that hatched afterwards, including in nests that had chicks on the ground after the falcon returned. This same falcon was identified (marked with a VID band) depredating what appeared to be a 2-week old Snowy Plover chick near the Marina dredge pond on Aug 12, 2014. Nevertheless, productivity dramatically improved for all beach segments during the two month interim when this falcon was not observed and presumably absent from the area.

Owls were suspected to be responsible for low chick fledging rates at Fort Ord. Consequently an adult Great Horned Owl was trapped at Ford Ord Dunes State Park and released at Antioch NWR on June 26. The fledging rate of chicks from plover nests that hatched prior to the removal of the Great Horned Owl was 31% and 43% subsequent to its removal.

The population of Snowy Plovers increased in the Monterey Bay in spite of falling below one fledged chick per male in the previous 2 years. Potential contributors to the higher than expected numbers were the very high return rates of breeding males and females between 2013 and 2014 and the recruitment of birds from other areas such as Oceano Dunes and Vandenberg AFB into the Monterey Bay population. The high rate of return of Monterey Bay breeders from 2013 to 2014 may be a reflection of relatively mild winter in 2013-14.

On the Pacific coast, the Snowy Plover has become a management-dependent species requiring provision of undisturbed nesting areas and protection from predators to be a successful breeder. Monitoring plover nests and broods continues to be an important component of the management program because it identifies where and when plovers are experiencing breeding problems so that management actions can be directed to where they are most needed.

RECOMMENDATIONS

The following summarizes suggested management actions for Monterey Bay nesting areas.

Wilder, Laguna, Scott Creek, and Waddell Creek Beaches -- While no nests have been found on these beaches since 2009, Snowy Plovers are regularly seen during the breeding season, particularly in spring. More frequent surveys of northern Santa Cruz County beaches are needed to properly assess nesting activity.

Management and monitoring actions:

- 1) Symbolic fence maintenance (Scott Creek).
- 2) Enforcement of dog prohibition (Scott Creek).
- 3) Twice weekly plover nesting and predator surveys, particularly from March through May.

Sunset State Beach – Raccoon, Common Raven and Striped Skunk depredation of nests continues to overwhelm plover nesting efforts at Sunset.

Management actions:

1. Initiate skunk and raccoon trapping early in the nesting season.
2. Explore the possibility of Common Raven management at north Sunset early in the season by State Parks rangers using methods similar to those used at Big Basin State Park.

Pajaro River mouth (northern river spit north to Palm Beach) – Common Ravens, Striped Skunks and gulls were the primary nest predators north of the Pajaro River. Great-horned Owls were present in the nesting area for most of the season; however, moderate vegetative cover and the presence of a large Caspian Tern colony may have lessened the negative impacts owls have been suspected of causing at the Pajaro River mouth in past years.

Management actions:

- 1) Initiate skunk removal at the north end of Pajaro Spit in March.
- 2) Promote a joint State Parks/ Pajaro Dunes integrated skunk management strategy.
- 3) Consider installation of predator exclusion fence at north end of Pajaro Spit nesting area to prevent skunks from crossing into nesting area from under the condominiums.
- 4) Increase State Park ranger patrols to improve compliance with the leash law in front of Pajaro Dunes houses and compliance with the dog prohibition on Pajaro River spit.
- 5) Symbolically fence and install signs on the eastward side of fenced areas in front of the Pajaro Dunes houses to prevent trespass into nest area. Alternatively, consider leaving these areas unfenced in order to discourage nesting in this area.

Zmudowski and Moss Landing State Beaches – Common Ravens were documented taking 8 nests, nearly half of all nest losses at Zmudowski. Horseback riders continue to ride in the fenced area.

Management actions:

- 1) Increase enforcement to improve equestrian compliance with horse regulations.
- 2) Devote more State Park staff time to maintenance of cable fencing.

Salt Ponds (Moss Landing Wildlife Area) – Productivity was improved over 2013, with a lower density of nesting plovers in the ponds. However, the lack of vegetative cover is likely still a limiting factor for chick survival.

Management actions:

- 1) Increase monitoring of diurnal predator activity.
- 2) Initiate limited, experimental planting of vegetative cover.

Molera through Potrero Road (Salinas River State Beach) – Equestrian use in this area continues to heavily impact nesting habitat. In 2014 one nest was abandoned after equestrians heavily disturbed the area around an unfenced nest. Pedestrian trespass into fenced areas is especially problematic in the 300 meters just south of the Potrero access.

Management actions:

- 1) Increase enforcement to improve equestrian compliance with horse regulations.
- 2) Increase ranger foot patrols of the Potrero beach area to prevent trespass into fenced habitat areas.

Monterey Dunes Colony – There was a high level of trespass within fenced habitat areas, a lot of which came from the east (house) side. A nest was deliberately destroyed by humans and a symbolic fence vandalized. Residents persist in taking dogs onto the beach from houses in violation of the dog prohibition.

Management actions:

- 1) Increase enforcement to improve equestrian compliance with horse regulations.

North Salinas (Salinas River State Beach) The area just north of and adjacent to the Salinas River mouth is a natural preserve that, except for the outer beach area, is closed to pedestrian access during the Snowy Plover nesting season. Fisherman and beach-goers accessing the outer beach and lagoon area via the Scatini farm property continue to disturb birds as they pass through the closed nesting area. Nests and chicks are at risk of being stepped on. The river mouth was not breached this year and it provided good foraging habitat and cover for broods.

Management actions:

- 1) Repair the back gate on the levee at the corridor entrance to prevent pedestrian and vehicle trespass into the closed nesting area.
- 2) Ensure that the symbolic fencing and closed nesting area signs are up on the boundary of the Scatini farm and State Park property.
- 3) Install new signs at the end of the symbolic fence line when the river mouth is open to the ocean to alert the public of the river mouth closure. Suggested wording would be: "Attention: Do not go past this point. Area between river and cable fencing is closed to protect Snowy Plover nesting habitat. Entering this area may result in citation."
- 4) Increase patrols of the Salinas River levee by State Parks rangers to improve compliance with the closure of the nesting area.
- 5) Coordinate with all of the agencies to have river breaching occur at the earliest possible date.

Salinas River National Wildlife Refuge – Striped skunks were identified taking 10 nests, over a third of all nest losses at Salinas River NWR. A second year Peregrine Falcon suspected of depredating adult and chick plovers was captured and released at Sacramento National Wildlife Refuge in June but returned by August. Therefore, vigilant monitoring for this individual will be needed prior to and during the 2015 breeding season.

Management actions:

- 1) Initiate skunk trapping in the early nesting season.
- 2) Monitor Peregrine Falcon activity and determine appropriate management actions.

- 3) Monitor Northern Harrier hunting and nesting activity and determine management actions with consideration of overall bay-wide harrier management.
- 4) Maintain the “no dog” signs at the kiosk and on the entrance gate as they get vandalized throughout the season.
- 5) Install new signage at the end of the symbolic fence line when the river mouth is open to the ocean to alert the public of the river mouth closure. Suggested wording is “Attention: Do not go past this point. Area between river and cable fencing is closed to protect Snowy Plover nesting habitat. Entering this area may result in citation.”
- 6) Increase patrols by Refuge law enforcement officers to improve compliance with the closure of the nesting area.

Martin Dunes and Marina (Cemex) – There were a variety of causes of nest loss on these beaches. The transported Peregrine Falcon was likely responsible for depressed early season fledge rates on these beach segments.

Management Actions

- 1) Monitor Peregrine Falcon activity and determine appropriate management action.

Reservation Road and Fort Ord– Excellent hatch rates indicate productivity is limited by chick survival at these beaches. The translocation of a Great Horned Owl may have had a positive impact on fledge rates at both sites this year.

Management Actions

- 1) Consider trapping and relocating up to two Great Horned Owls.
- 2) Increase enforcement of the dog prohibition on beaches and entry into closed nesting areas.

Sand City and Monterey State Beach

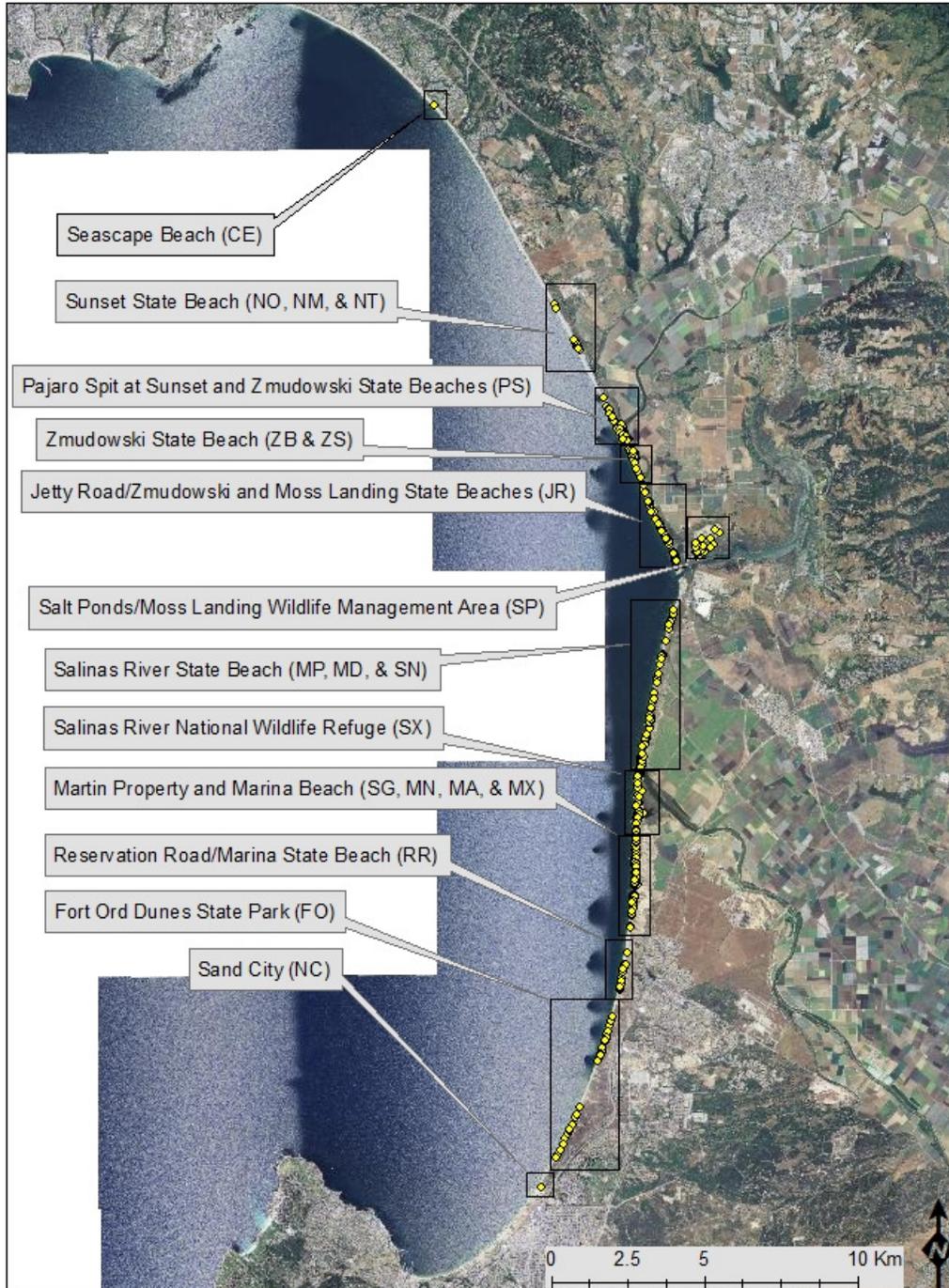
Management Actions

- 1) Increase enforcement of the dog prohibition on beaches and closed nesting areas.

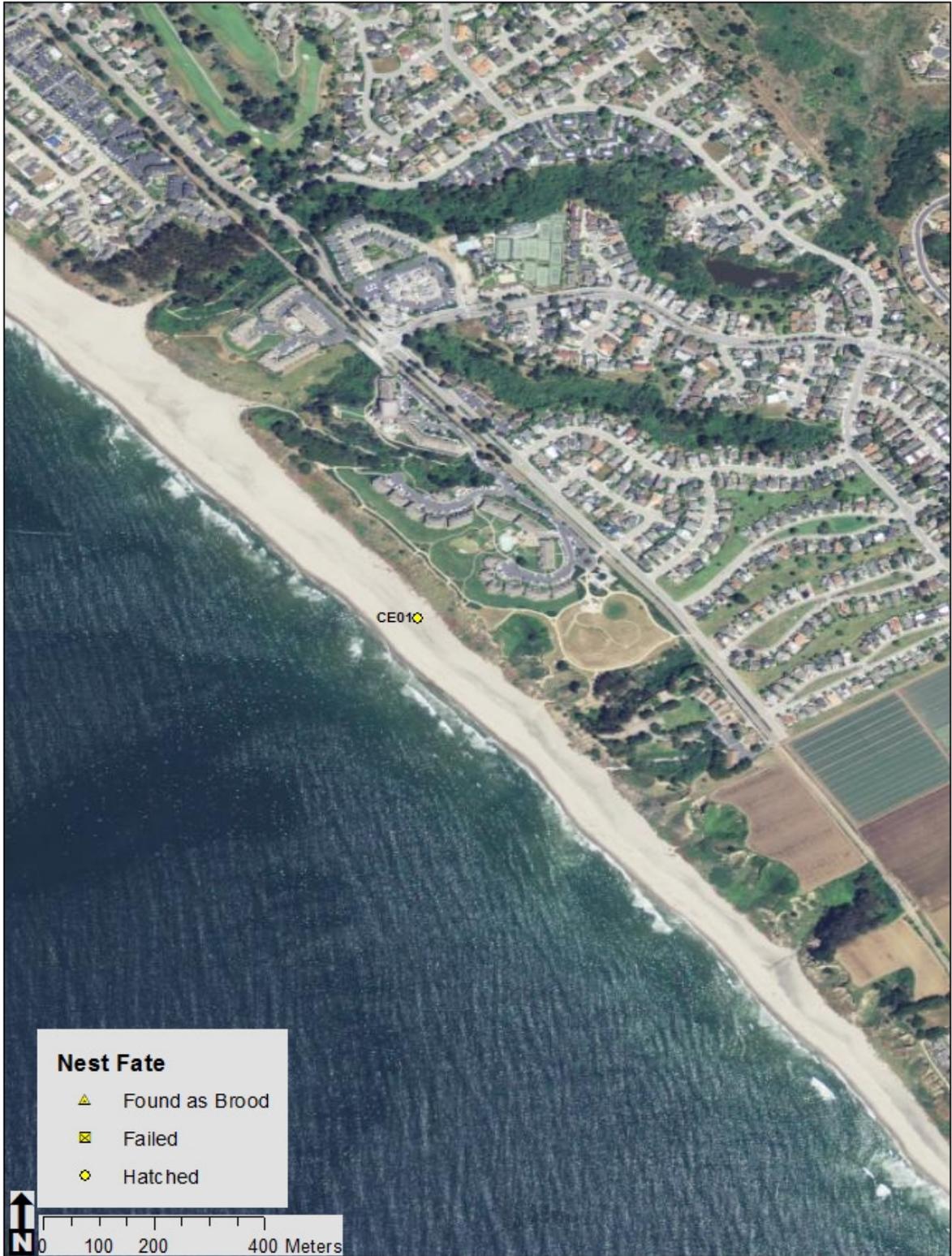
ACKNOWLEDGEMENTS

Jacob Martin greatly assisted with the fieldwork at Sunset Beach and Amy Palkovic at Reservation Road and Fort Ord. Allie Patrick, Esther Haile, and Chris Caris also contributed significantly to the field work in the south bay. Amy Palkovic deserves special thanks for preparing the nest maps. Nick Todd and the Ventana Wildlife Society conducted raptor management work. Personnel of USDA Wildlife Services were responsible for control of skunks and ravens. This project was conducted collaboratively by Point Blue (formerly PRBO) Conservation Science, the Salinas River National Wildlife Refuge Unit of the Don Edwards San Francisco Bay National Wildlife Refuge of the U. S. Fish

Wildlife Service, the California Department of Parks and Recreation, the California Department of Fish and Wildlife, the Wildlife Services Unit of the U. S. Department of Agriculture, and the Monterey Bay Aquarium.



Appendix 1. Overview of Snowy Plover nest locations in the Monterey Bay area in 2014.



Appendix 2. Snowy Plover nests found at Seascapes beach in 2014.



Appendix 3. Snowy Plover nest locations at the northern section of Sunset State Beach in 2014.



Appendix 4. Snowy Plover nest locations at the Pajaro Spit at Sunset and Zmudowski State Beaches in 2014.



Appendix 5. Snowy Plover nest locations at Zmudowski State Beach in 2014.



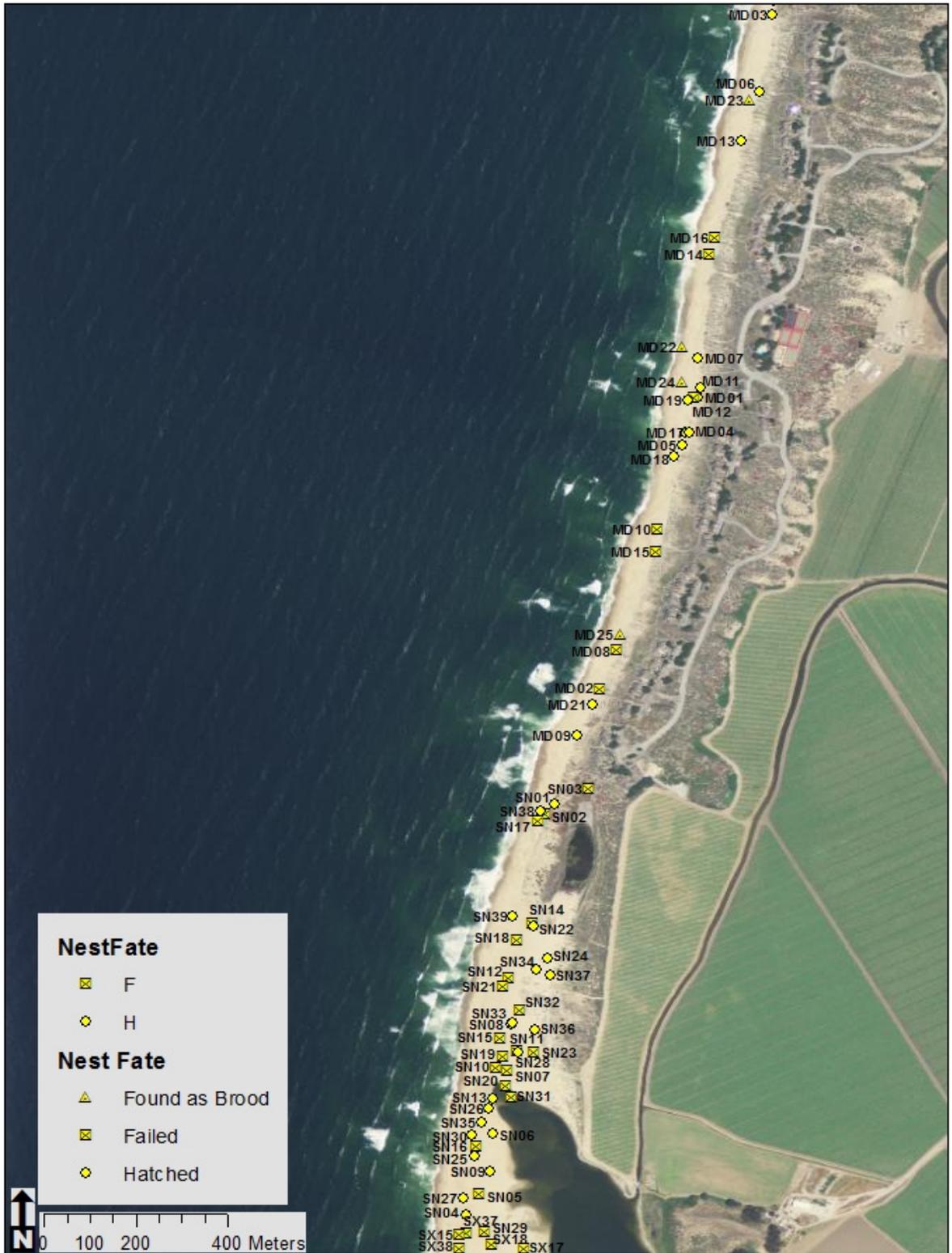
Appendix 6. Snowy Plover nest locations at Jetty Road at Zmudowski and Moss Landing State Beaches in 2014.



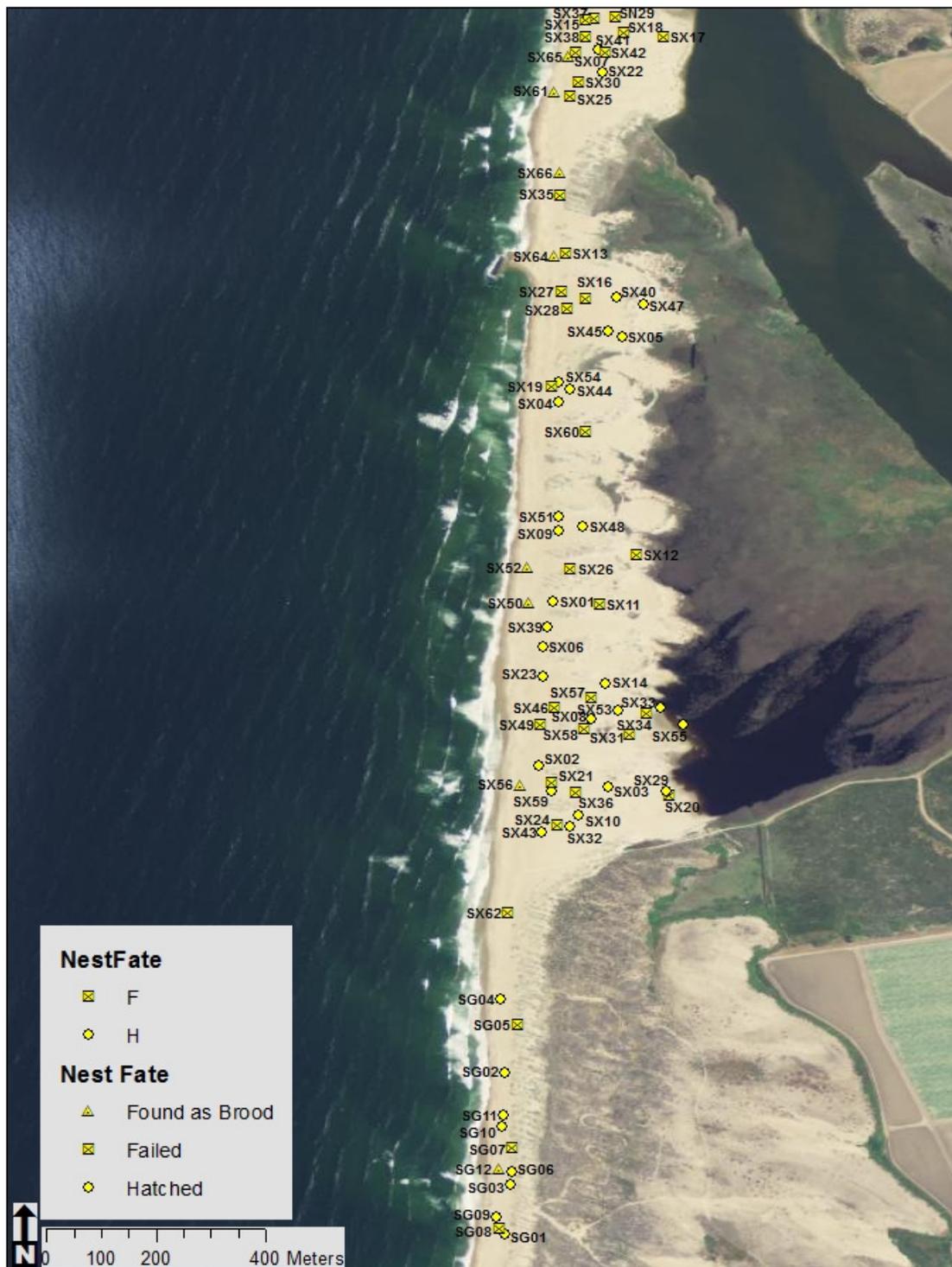
Appendix 7. Snowy Plover nest locations at Moss Landing Wildlife Management Area in 2014.



Appendix 8. Snowy Plover nest locations at the northern portion of Salinas River State Beach in 2014.



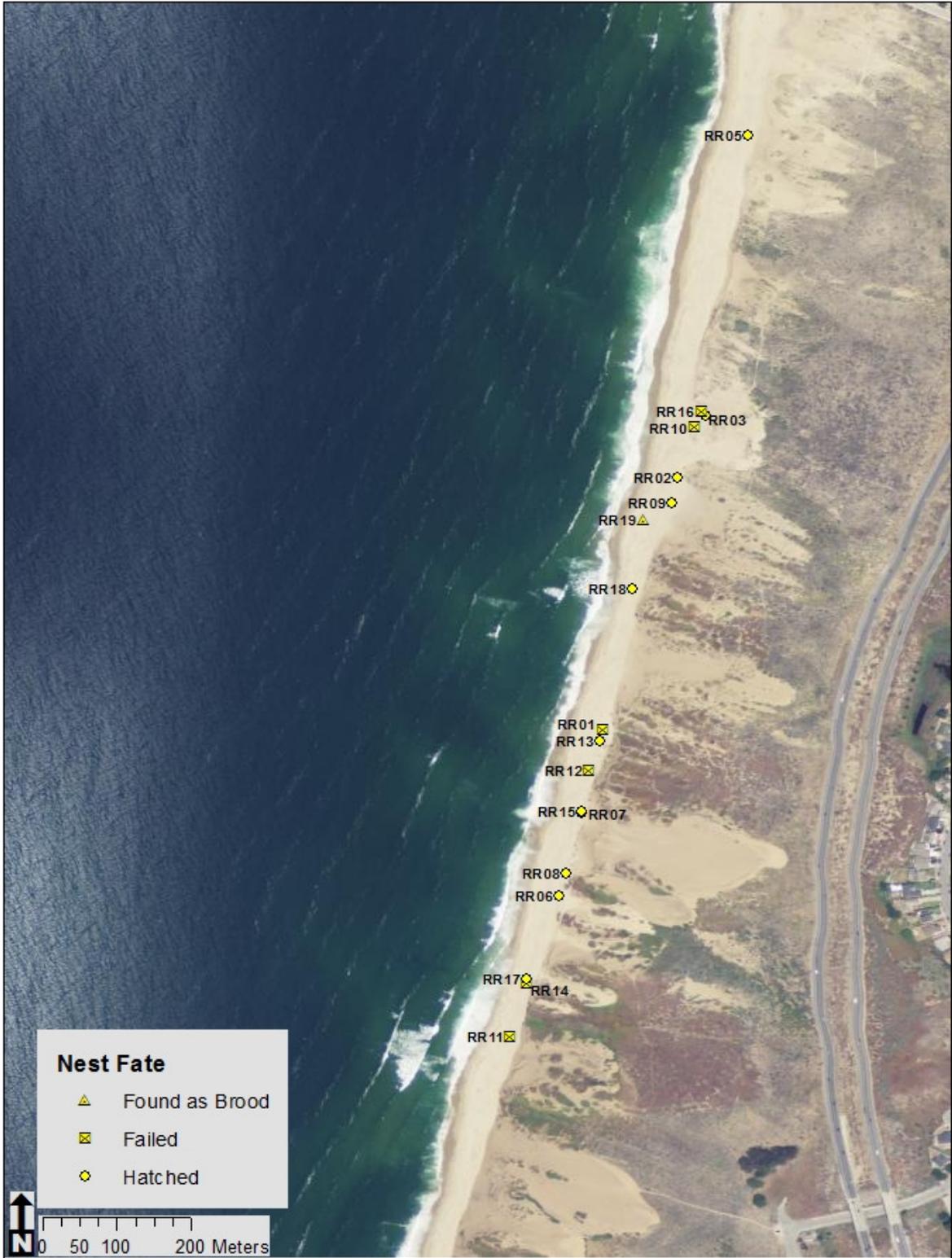
Appendix 9. Snowy plover nest locations at the southern portion of Salinas River State Beach in 2014.



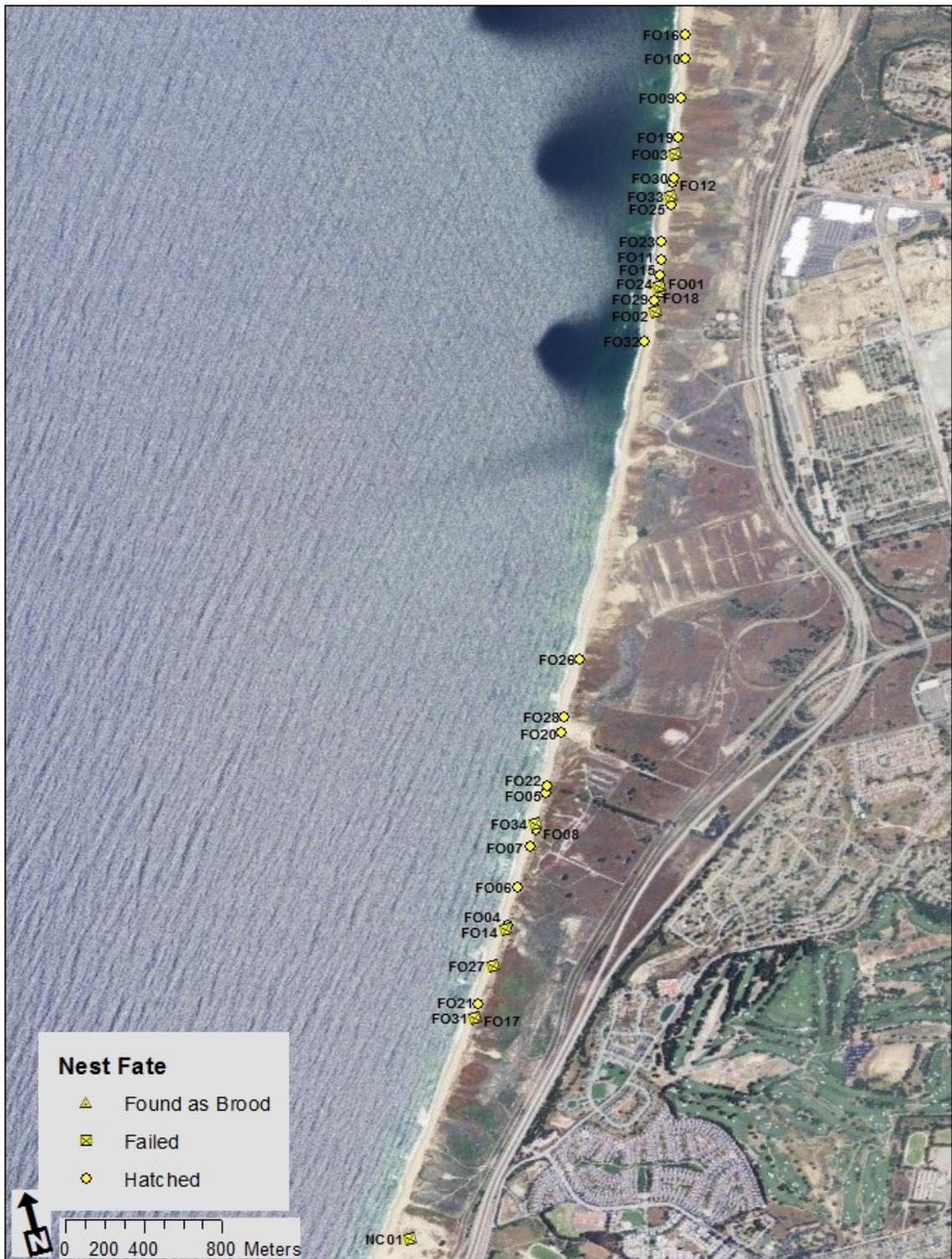
Appendix 10. Snowy plover nest locations at the Salinas River National Wildlife Refuge and the Martin dunes in 2014.



Appendix 11. Snowy Plover nest locations at Marina beach in 2014.



Appendix 12. Snowy Plover nest locations at Marina State Beach in 2014.



Appendix 13. Snowy Plover nest locations at Fort Ord Dunes State Park and Sand City in 2014.

Appendix 13. Monterey Bay, 2014, Injured and Dead Snowy Plovers

Disposition	Band Combination	Point Blue Specimen Number	MWVCRC (DFW/OSPR) No. ¹	UCD Path No. ²	Date Collected/Captured	Disposition Date (carcass)	Disposition Location (carcass)	Location Collected/Captured	Collector/Observer	Age	Sex
INJURED/DEAD	Yb og	14346	14-0363	14s0387/ 14s0529	5/18/2014	5/19/2014	MWVCRC (DFW/OSPR)	Moss Landing	Carleton Eyster	Adult	Female
DEAD	Rb ww	14868	14-0381	14s0373	5/23/2014	5/23/2014	MWVCRC (DFW/OSPR)	Marina (CEMEX dredge pond)	Allie Patrick	Adult	Male
DEAD	pr ol	13967	14-0382	NA	5/23/2014	5/23/2014	MWVCRC (DFW/OSPR)	Moss Landing State Beach	Dave Dixon	Adult	Female
DEAD	wy ba	12914	14-0404	14s0528	6/30/2014	6/30/2014	MWVCRC (DFW/OSPR)	Moss Landing State Beach	Dave Dixon	Adult	Male
DEAD	bo ra	15328	14-0446	14s0777	8/11/2014	8/11/2014	MWVCRC (DFW/OSPR)	Pajaro Spit	Jenny Erbes	Chick	Female
DEAD	ra yy	15284	14-0575	NA	9/9/2014	10/1/2014	MWVCRC (DFW/OSPR)	Moss Landing	General Public/ Kriss Neuman	2014 Fledged Juvenile	Female
DEAD	pv bg	19520	NA	NA	7/17/2014	7/17/2014	discarded	Pajaro Spit	Carleton Eyster	Adult	Male
INJURED/DEAD	unbanded	NA	NA	NA	5/21/2014	5/22/2014	Monterey Bay Aquarium (alive)	Marina (CEMEX dredge pond)	Carleton Eyster	UNKNOWN	Male
INJURED	aa ya	15320	NA	NA	9/24/2014			Pajaro Spit	Carleton Eyster	2014 Fledged Juvenile	UNKNOWN
INJURED	oa bb	13396	NA	NA	3/12/2014			Pajaro Spit	Carleton Eyster	Adult	Female
INJURED	yy ol	12030	NA	NA	9/16/2014			Salinas River NWR	Jenny Erbes	Adult	Male

¹ MWVCRC is Marine Wildlife Veterinary Care and Research Center, CA Dept Fish and Wildlife/Office of Spill Prevention and Response

² UCD is University of California Davis (birds with these numbers had tissue samples archived at MWVCRC or sent to UCD)