



NESTING OF THE SNOWY PLOVER IN THE MONTEREY BAY AREA, CALIFORNIA IN 2012



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**PRBO Conservation Science Publication # 1898.
PRBO Conservation Science
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December 2012

SYNOPSIS

Researchers and associates of PRBO Conservation Science (PRBO), 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, and on pocket beaches in northern Santa Cruz County in 2012. The objective was 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 breeding habitat to minimize disturbance to nesting birds by the public (Table 1).
- ❑ 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).
- ❑ Water management to provide nesting and feeding habitat in the managed ponds of the Moss Landing Wildlife Management Area.

The estimated 386 plovers that nested in 2012 was a 10% decrease from the previous year (Fig. 1) but still a higher number than 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 third consecutive year (Table 2). The 2012 nesters consisted of 213 males and 173 females. All but 9 unbanded males and 12 unbanded females were uniquely color banded. Among the color marked breeders were 25 males and 29 females raised in the Monterey Bay area in 2011.

Return rates of 2012 nesters were above average for males and about average for females. Overall, 74.8% of the banded males and 63.2% of the banded females documented nesting in the study area in 2011 also bred there in 2012 (Fig. 2). Return rates exceeded the prior 13-year-average of 67.5% for males and 63.1% for females by 10.7% and 0.2%, respectively.

There were 413 nests and 11 broods from undetected nests indicating at least 424 nesting attempts in the Monterey Bay area in 2012 (Table 2).

The plovers experienced subpar breeding success in 2012. Their clutch-hatching rate was 51.0 % on Monterey Bay beaches and 58.8% in the Salt Ponds. These rates were well below their respective averages from 1999-2011. The hatching rate on the beaches was 21% below the 64% average of the previous 13 years and the Salt Pond rate was 17% below the prior 13-year average of 71% (Fig. 3).

Overall, 56% of the 197 nest losses in 2012 were attributed to predators (Tables 3 and 4). Of nest losses to predators 71.6% were attributed to birds, 2.8% to mammals and 25.7% to unknown predators. A one-legged Western Gull, captured on camera taking one nest and an abandoned egg at Monterey Dunes and seen taking a nest at North Salinas, was collected by Wildlife Service personnel and found to have plover egg shells in its alimentary canal. We believe it was responsible for most of the nest losses attributed to unidentified avian predators in the Monterey Dunes and at Molera/Potrero areas.

Eight losses were attributed to humans, including 3 nests that were deliberately removed from mini exclosures on the Pajaro River spit (Table 4). Ironically two of the exclosures had just been placed around nests to protect them from being trampled by roosting gulls.

Chick fledging rate was well below average on the beaches and about average in the Salt Ponds. From 28-30% of the chicks fledged on the beaches in 2012. This rate was about 32% below the average of 42.4% from 1999-2011. Fledging rates were below 10% in the Reservation Road and Monterey Dunes areas and below 20% at the Pajaro Spit and Martin areas. The 39-42% fledging at the Salt Ponds was about 4% greater than the 39.1% Salt Pond average over the previous 13 years (Table 2, Fig. 4).

The total of 180 fledglings in 2012 was also below the 1999-2011 average (Fig. 5); 137 were from the beaches and 43 from the Salt Ponds. The total was 25% below the 241-bird average; the number from the beaches was 27% below the 188-bird average; and the number from the salt ponds was 12% below the 49-bird average.

The 2012 fledging rate of 0.8 young per male was 42% lower than the 1.45 bird average of the past 13 years (Fig. 6) and was well below the level of one young per male needed to prevent the population from declining (USFWS Recovery Plan).

The consequence of the low number of fledglings in 2012 will likely be a smaller breeding population in the Monterey Bay area in 2013.



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INTRODUCTION

Staff and research associates of PRBO Conservation Science, with 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 2012.

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 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 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 Salinas River NWR (or north of the Salinas River mouth) 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 northernmost section of the Molera/Potrero segment is backed by commercial development.

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 Game's (DFG) Moss Landing Wildlife Management 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 2012, we recorded the longitude and latitude of all nests with Global Positioning Units. These locations are depicted in Appendices 1-12. Monitoring is conducted under U. S. Fish and Wildlife Service Permit PRT 807078-14.1.

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, are used to protect most nests (Table 1) and limit human disturbance of brood rearing birds.

While 10 foot by 10 foot single nest enclosures, made of 2-inch-wide by 4-inch-tall wire mesh fencing, standing 5-feet-high and 10 feet-long on each side have been used extensively in the past to protect nests from predators, their widespread use in the Monterey Bay area has been limited in recent years because of the effectiveness of a mammalian predator removal program conducted by USDA. No enclosures of this

type were used in 2012 (Table 1). However, 28 circular mini exclosures 24-36 inches in diameter and 24 inches high were used to protect nests from predators in the North Bay (Table 1) after some areas had experienced a large number of nest losses. We also sometimes use gull exclosures – a symbolic fenced exclosure with a few lengths of cord stretched over the top that surrounds individual nests. Four gull-specific exclosures were used at the Pajaro spit in 2012 (Table 1).

Table 1. Nest protection measures for Snowy Plovers at Monterey Bay in 2012.

Location	Total Nests	Nest Protection Measures						
		10 X 10 Excl. Only	Min Excl. Only	Symb. Fence Only	Fence & Mini Excl.	Fence & 10 X 10 Excl.	Fence & Gull Excl.	Sign Only
Del Monte	1			1				
Sand City	2			2				
Fort Ord	13			12				
Reservation Road	13			13				
Marina								
<i>Marina South</i>	9			9				
<i>Marina Middle</i>	22			19				
<i>Marina North</i>	7			7				
<i>Martin</i>	9			9				
Salinas River NWR	50			50				
Salinas River North								
<i>Salinas River N. Spit</i>	19			19				
<i>Monterey Dunes</i>	23			23				
<i>Molera/Potrero</i>	28			26				
Jetty to Beach Roads								
<i>Moss Landing</i>	45			42	2			
<i>Zmudowski Beach</i>	30			20	10			
<i>N. Pajaro R.M.</i>	60			41	14		4	1
Sunset/Manresa	14			12	2			
Salt Ponds	68			68				
Total	413	0	0	373	28	0	4	1

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.

RESULTS

The 2012 Nesting Season

Number of Breeders

The estimated 386 plovers that nested in 2012 was a 10% decrease from the previous year (Fig. 1) but still a greater number than the target of 338 breeders recommended for the Monterey Bay area in the USFWS Recovery Plan. The 2012 nesters consisted of 213 males and 173 females. All but 9 unbanded males and 12 unbanded females were uniquely color banded. Among the color marked breeders were 25 males and 29 females that were produced from nesting attempts in the Monterey Bay area in 2011. No plovers were detected nesting on the northern Santa Cruz County pocket beaches in 2012 (Table 2).

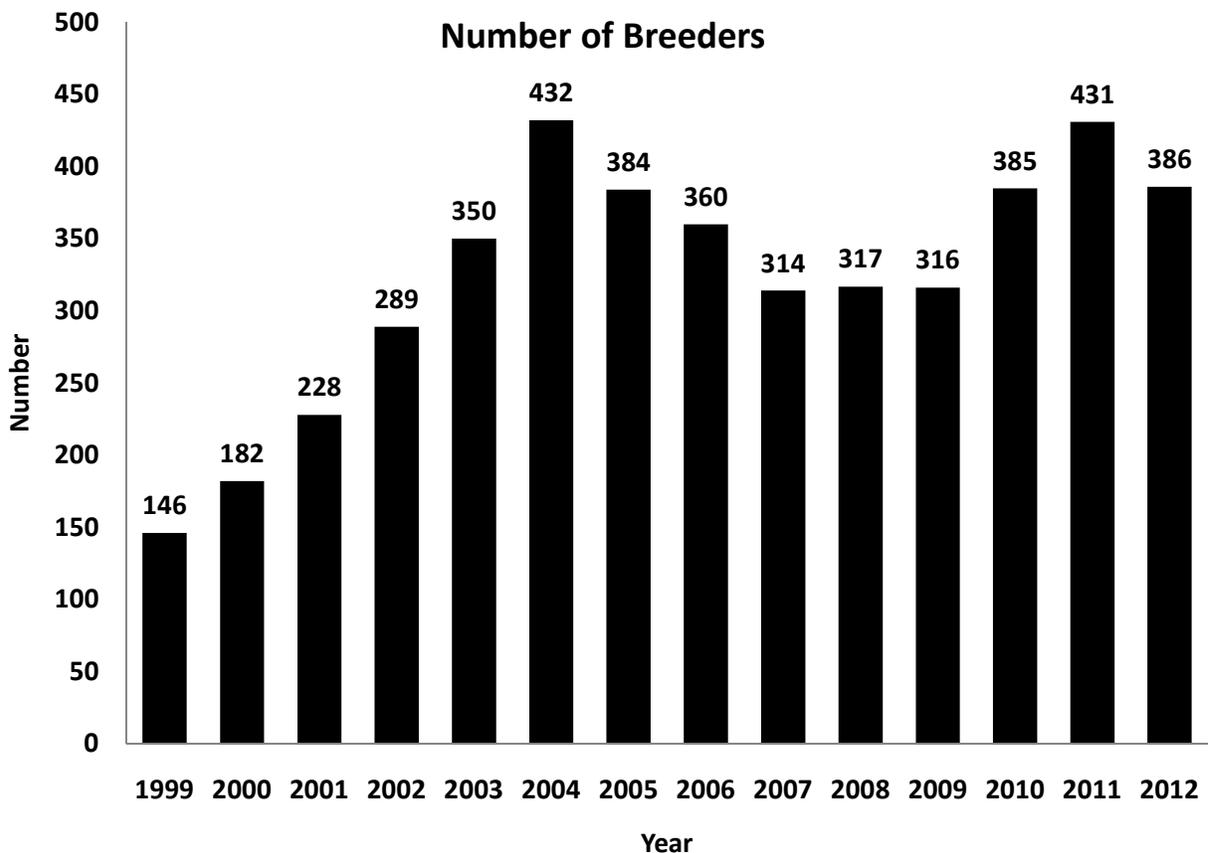


Figure1. Number of nesting Snowy Plovers at Monterey Bay, 1999-2012.

Return Rates

Male return rates were above average and female rates about average in 2012. Overall, 74.8% of the banded males and 63.2% of the banded females documented nesting in the study area in 2011 also bred there in 2012 (Fig. 2). The 2012 return rates exceeded the prior 13-year-average of 67.5% for males and 63.1% for females by 10.7% and 0.2%, respectively. As is in most years, male return rate exceeded that of females (Fig 2).

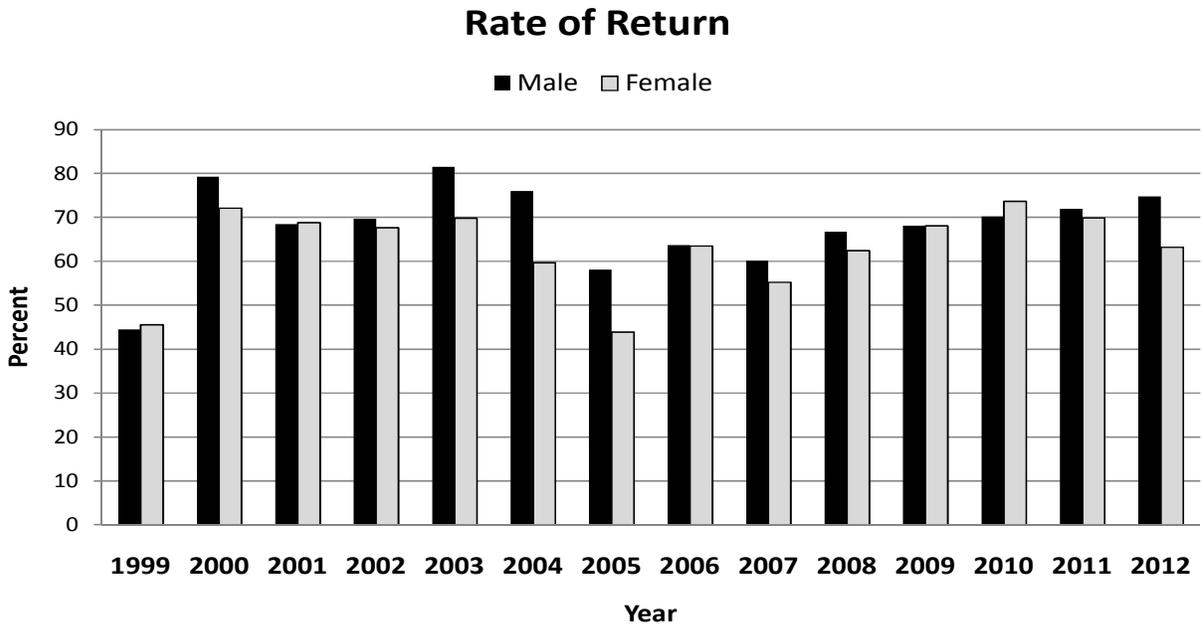


Figure 2. Return rates of nesting Snowy Plovers at Monterey Bay.

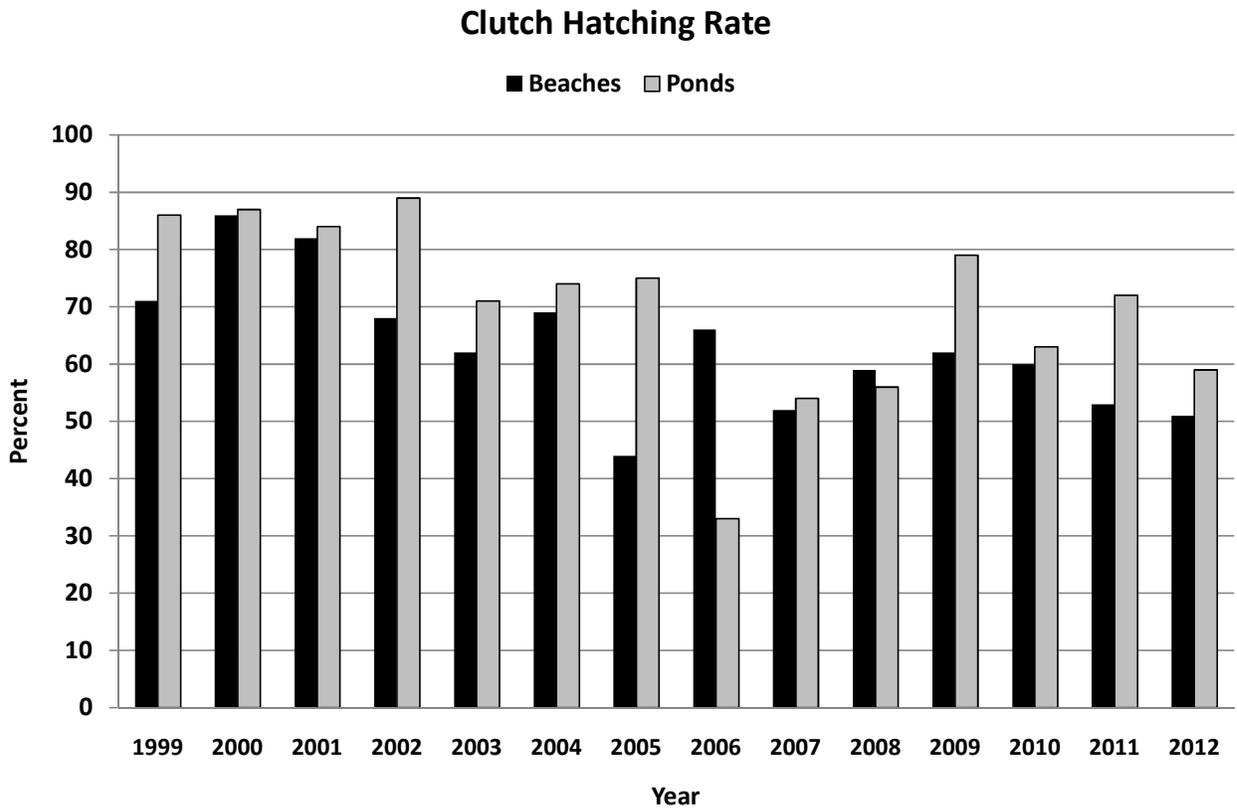


Figure 3. Clutch hatching rates of Snowy Plovers at Monterey Bay.

Table 2. Breeding success of Snowy Plovers at Monterey Bay in 2012. Juv. is Juvenile and Att. is Attempt.

Regions	Nest Attempts		Chicks		Juv.	% Nests Hatch	% Chicks Fledge		Juv. Per Nest Att.
	Nests	Broods	Low	High			High	Low	
Del Monte-Reserv. Rd.									
<i>Del Monte</i>	1	0	0	0	0	0.0	0.0	0.0	0.00
<i>Sand City</i>	2	0	5	5	1	100.0	20.0	20.0	0.50
<i>Fort Ord</i>	13	0	32	35	9	100.0	28.1	25.7	0.69
<i>Reservation Road</i>	13	0	31	31	2	84.6	6.5	6.5	0.15
Marina									
<i>Marina South</i>	9	1	13	14	7	55.6	53.8	50.0	0.70
<i>Marina Middle</i>	22	1	35	37	13	54.5	37.1	35.1	0.57
<i>Marina North</i>	7	0	16	16	5	85.7	31.3	31.3	0.71
<i>Martin</i>	9	1	15	17	2	55.6	13.3	11.8	0.20
Salinas NWR	50	4	96	104	44	70.0	45.8	42.3	0.81
Salinas River N									
<i>N. Salinas River</i>	19	0	27	30	7	63.2	25.9	23.3	0.37
<i>Monterey Dunes</i>	23	2	23	27	2	30.4	8.7	7.4	0.08
<i>Molera/Potrero</i>	28	1	19	21	9	25.0	47.4	42.9	0.31
Jetty-Beach Rds.									
<i>Moss Landing</i>	45	0	23	23	5	20.0	21.7	21.7	0.11
<i>Zmudowski Beach</i>	30	0	48	48	13	66.7	27.1	27.1	0.43
<i>Pajaro Spit</i>	60	0	71	71	12	46.7	16.9	16.9	0.20
Sunset/Manresa	14	0	9	10	6	28.6	66.7	60.0	0.43
TOTAL BEACHES	345	10	463	489	137	51.0	29.6	28.0	0.39
SALT PONDS	68	1	102	110	43	58.8	42.2	39.1	0.62
<i>Wilder Creek</i>	0	0	0	0	0	0.0	0.0	0.0	0.00
<i>Laguna Creek</i>	0	0	0	0	0	0.0	0.0	0.0	0.00
<i>Scott Creek</i>	0	0	0	0	0	0.0	0.0	0.0	0.00
<i>Waddell Creek</i>	0	0	0	0	0	0.0	0.0	0.0	0.00
TOTAL S. CRUZ	0	0	0	0	0	0.0	0.0	0.0	0.00
GRAND TOTAL	413	11	565	599	180	52.3	31.9	30.1	0.42

Clutch Hatching Rates

There were 413 nests and 11 broods from undetected nests indicating at least 424 nesting attempts in the Monterey Bay area in 2012 (Table 2). The clutch-hatching rates (percent of nests documented hatching at least one egg) were 51.0 % on Monterey Bay beaches and 58.8% in the Salt Ponds. These rates excluded all nesting attempts documented only from the detection of broods.

The 2012 clutch hatching rates on the beaches and at the Salt Ponds were below their respective averages from 1999-2011. The 51.0% hatching rate on the beaches was 21% below the 64.2% average of the previous 13 years and the Salt Pond rate of 58.8% was 17% below the 71% average of the previous 13 years (Fig. 3). The < 33% clutch hatching rates at Monterey Dunes, Molera/Potrero, Moss Landing, and Sunset/Manresa areas dragged down the overall beach rate in 2012 (Table 2).

Table 3. Total Snowy Plover clutches lost and percent attributed different causes. 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
1999	31	13	3	13	6	23	29	13	0	0
2000	27	0	19	26	0	15	30	11	0	0
2001	51	2	45	6	4	2	22	8	12	0
2002	87	13	39	2	3	17	17	1	7	0
2003	91	10	25	4	1	9	13	3	34	0
2004	129	6	23	12	8	20	11	2	19	0
2005	216	16	47	5	3	9	6	1	14	0
2006	123	33	12	25	0	10	9	2	9	0
2007	162	12	37	14	2	10	10	5	9	0
2008	138	11	37	20	1	17	1	4	7	2
2009	113	11	33	9	2	19	4	11	12	0
2010	153	8	18	22	3	20	9	3	16	1
2011	193	8	33	16	1	11	11	1	20	0
2012	197	2	40	14	4	9	6	0	25	0
Mean	122	10	29	13	3	14	13	5	13	0

At least 55% of the 197 nest losses in 2012 were likely caused by predators (Tables 3 and 4). Of the 109 losses attributed to predators, 71.6% were taken by birds, 2.8% to mammals and 25.7% to unknown predators. Skunks and a canine took a total of 3 nests (Table 4). Gulls, ravens, and Whimbrels, were the avian species identified (by their tracks) depredating nests (Table 4). A one-legged Western Gull, captured on camera taking one nest and an abandoned egg at Monterey Dunes, and seen taking one nest at North Salinas, was collected by Wildlife Service personnel and found to have plover egg shells in its alimentary canal. We believe it was responsible for most of the nest losses attributed to unidentified avian predators in the Monterey Dunes and Molera/Potrero areas. Eight losses were attributed to humans, including 3 nests that were deliberately removed from mini enclosures on the Pajaro River spit and 1 nest vandalized by humans in a mini-enclosure at north Sunset. Ironically two of the enclosures at Pajaro had just been placed around nests to protect them from being trampled by roosting gulls. Clutch desertion was responsible for 6% of the nest failures; and high tides, strong winds and rain together were responsible for at least 9% of the failed nests (Table 3). No nests had non-viable eggs and the fate of one nest was not determined (Table 4).

Table 4. Causes of Snowy Plover nest loss at Monterey Bay in 2012. Unk. is Unknown, and Pred. is Predator.

Locations	Avian Predator					Mammalian Predator			Unk.					Non-		Cause	Lost at		Fate
	CORA	WHIM	Gull	NOHA	Unk.	Canine	Skunk	Unk.	Pred.	Human	Tide	Wind	Rain	Viable	Desert.	Unk.	Hatch	Total	Unk.
Del Monte					1													1	
Sand City																		0	
Fort Ord																		0	1
Reservation Road													1		1			2	
Marina South					3											1		4	
Marina Middle					5						1				3	1		10	
Marina North					1													1	
Martin											1					3		4	
Salinas NWR		1				1				1		1			2	9		15	
N. Salinas River			1													6		7	
Monterey Dunes			2		12											2		16	
Molera/Potrero					13					3						5		21	
Moss Landing			2		14				7		6	2			1	4		36	
Zmudowski Beach	2	2			1		2					2				1		10	
Pajaro River Spit	3		4		4					3	1	3			2	12		32	
Sunset/Manresa	2									1					1	6		10	
Salt Ponds					5				21						2			28	
Wilder Creek																		0	
Laguna Creek																		0	
Scott Creek																		0	
Waddell Creek																		0	
Total	7	3	9	0	59	1	2	0	28	8	7	10	1	0	12	50	0	197	1

Chick Fledging Rates

From 28-30% of the chicks that hatched on the beaches fledged in 2012 (Table 3). This rate was about 32% below the average of 42.4% from 1999-2011 (Fig. 4). Fledging rates were below 10% in the Reservation Road and Monterey Dunes areas and below 20% at the Pajaro Spit and Martin areas. The 39-42% fledging rate at the Salt Ponds was about 4% greater than the 39.1% average there over the previous 13 years (Fig. 4).

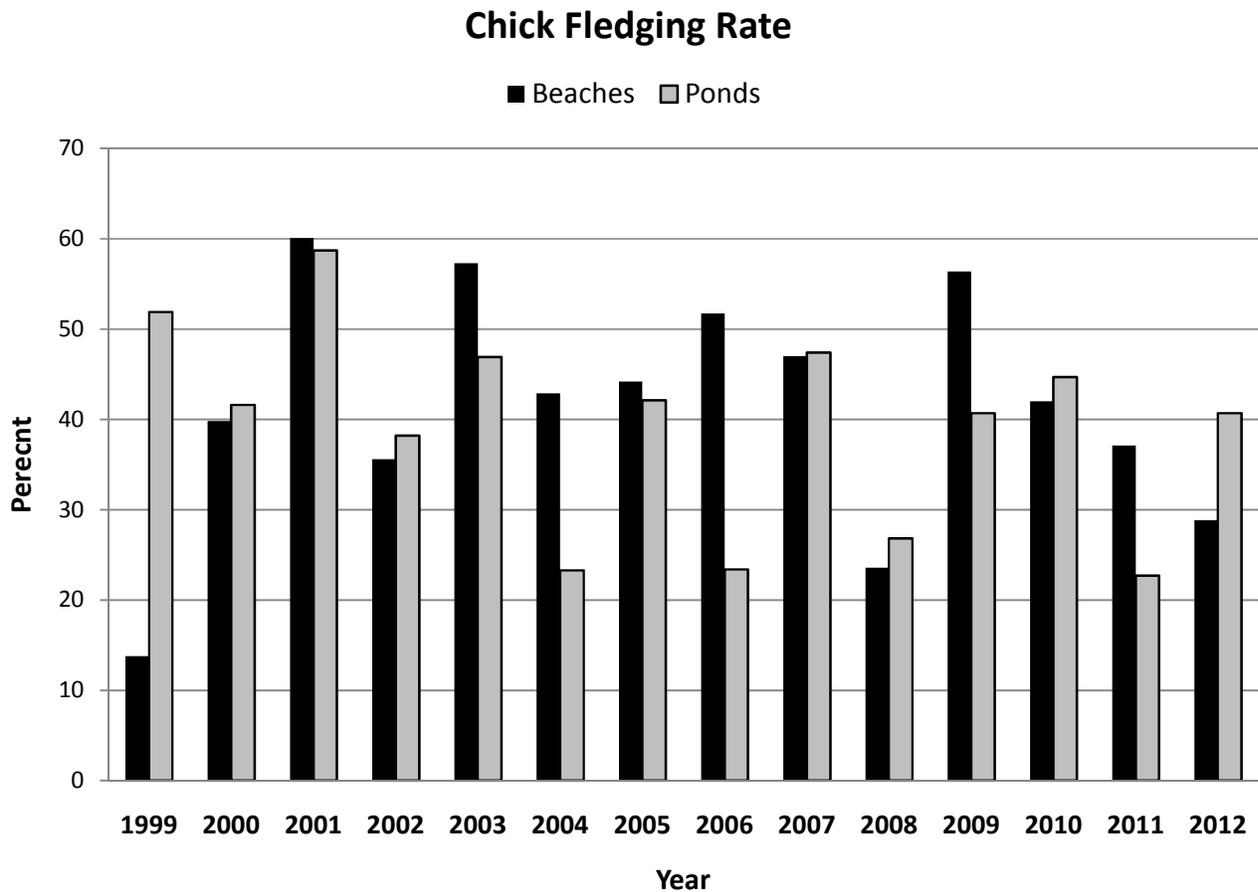


Figure 4. Chick fledging rates of Snowy Plovers at Monterey Bay.

Number of chicks fledged

Of the 180 young that fledged in 2012, 137 were from the beaches and 43 from the Salt Ponds. The total number of fledged young in 2012 was 25% below the 241-bird average from 1999-2011 (Fig.5). The number of fledglings from the beaches was 27% below the prior 13-year 188-bird average and the 43 fledglings from the salt ponds 12% below the prior 49-bird average.

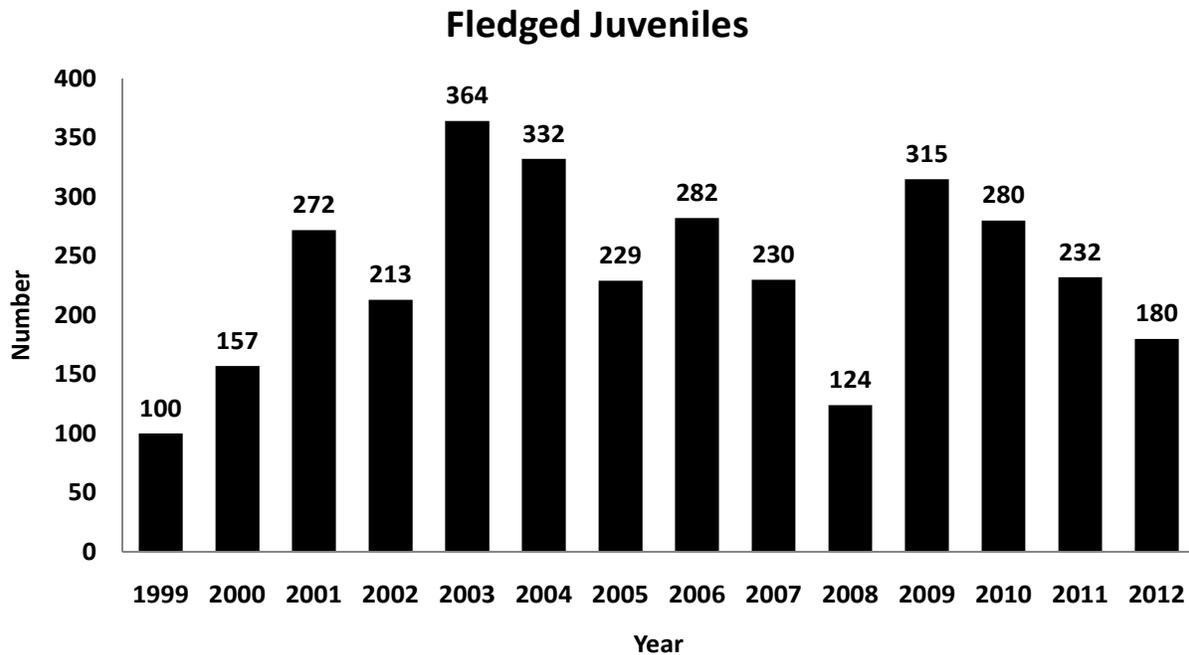


Figure 5. Number of fledged juveniles at Monterey Bay.

Young Fledged Per Male

The 2012 fledging rate of 0.8 young per male was 42% lower than the 1.45 bird average of the past 13 years (Fig. 6) and was well below the level of one young per male needed to prevent the population from declining (USFWS Recovery Plan).

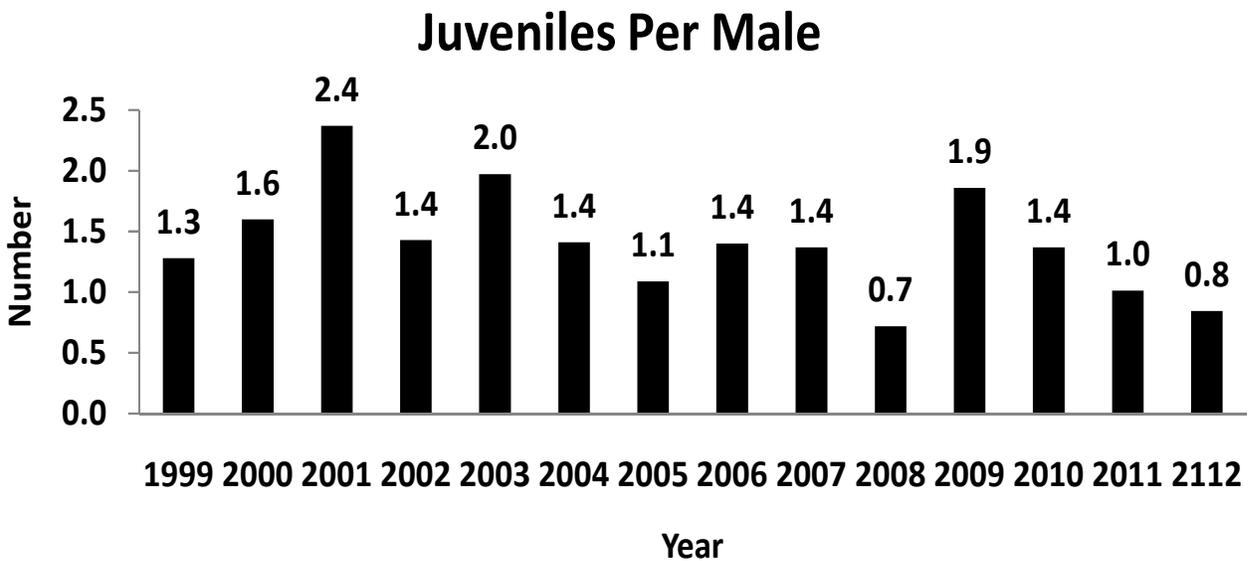


Figure 6. Mean number of juveniles reared per male at Monterey Bay.

DISCUSSION

Despite a 10% decline in the number of breeding Snowy Plovers from 2011, the 386 Snowy Plovers in 2012 was 14% larger than the target of 338 adults for the Monterey Bay region recommended by the USFWS. This target has been exceeded in the Monterey Bay area in 7 of the 10 years since it was first attained in 2003. Although the number of breeders in the Monterey Bay area dipped slightly below the 400-bird target for all of USFWS Recovery Unit 4 – all coastal nesting areas from Sonoma through Monterey counties – when breeders from other areas within unit 4 are accounted for it is likely that the population for the entire recovery unit will approximate the 400-bird target.

The USFWS window survey in late May is the underlying method of estimating the relative size of the U.S. Pacific coast population from year to year. Our data continue to suggest that it underestimates the number of breeders in the Monterey Bay region. In 2012, 305 adults were recorded in the study area on the window survey. This represents only 79% of the estimated 386 adults (mainly color banded birds) known to have nested in the study area.

Plovers experienced subpar breeding success in the Monterey Bay area in 2012. Clutch hatching rates were below the 13-year average on both the beaches (- 21%) and the Salt Ponds (- 17%). The chick fledging rate was about average in the Salt Ponds (+ 4%) but well below average on the beaches (- 32%). The number of fledglings was below average on both the beaches and in the Salt Ponds. The total of 180 fledges, for both areas combined, was 25% lower than the average of the prior 13 years. The consequence of the low number of fledglings produced in 2012 will likely be a smaller breeding population in the Monterey Bay area in 2013. One fledged young per male is necessary to sustain a population experiencing average mortality levels but only 0.8 chicks per male fledged in 2012.

Depredation of clutches by avian predators was the prominent identified cause of nest failure. Avian predators were responsible for at least 39.6% of the 197 nest losses. Many of 28 additional losses attributed to unknown predators and 50 nesting failures for which no cause of loss could be assigned were likely caused by avian predation as well. Only 3 nest losses were attributed to mammalian predators in 2012.

Gulls and ravens were the main avian predators identified taking nests (Table 4). Gulls and ravens were responsible for at least 7 nests lost at Pajaro spit and probably some of 12 additional nests for which no cause of loss could be assigned. Although we only were able to positively identify gulls as responsible for 2 nest losses in the Molera/Potrero and Monterey Dunes areas combined, many of the 25 nests categorized as lost to unidentified avian predators and some of the 7 for which no cause could be assigned were likely taken by a one-legged Western Gull which we confirmed taking one nest and an abandoned egg at Monterey Dunes. It was observed actively searching for plover nests and also was seen taking a nest at North Salinas. The gull was collected by personnel from Wildlife Services on 2 July and found to have a gut full of plover egg shells. It may have been responsible for losses over the broad area from Marina to Jetty Road.

Most nest loss at the Salt Ponds (93%, n = 28) was attributed to predators which could not be positively identified because they do not leave tracks on the dry, hard, pond bottoms. In the recent past we obtained indisputable evidence of ravens and Red-tailed Hawks depredating plover nests in the ponds. Since two pairs of these hawks nested in eucalyptus trees overlooking the ponds, we are suspicious that

they were responsible for some, if not the majority, of the losses attributed to unknown predators in 2012. Most nest losses in the ponds were in the cells closest to the nesting hawks. In cell one (southwest cell in Appendix 6), which was farthest from the trees, 100% of 24 nests hatched. Moving clockwise toward the area where the Red-tailed Hawks nested, only 50% (n = 14) of the nests hatched chicks in cell two, 33% (n = 12) in cell three, and 24% (n = 17) in cell four.

Five areas exhibited very low chick fledging rates. They were Reservation Road (6.5%), Monterey Dunes (7-9%), Martin (12-13%), Pajaro Spit (17%), and Moss Landing (22%). It is rare to observe actual chick depredation but we speculate that avian predators were largely responsible for the high levels of chick loss in these areas. Red-tailed Hawks and Peregrine Falcons, seen on several occasions hunting at Reservation Road, may have been important contributors to the high rate of chick loss noted there. At Pajaro spit, the regular presence of Great Horned Owl tracks on the beach points to owls as one possibility. Also contributing to chick mortality at Pajaro spit may have been gulls which formed large restless roosting flocks within the fenced-off breeding area. Predators that may have been taking chicks in the Salt Ponds were Red-tailed Hawk, Northern Harrier, Peregrine Falcon, Barn Owl, Great Horned Owl and Coyote.

The Snowy Plover is a management-dependent species requiring provision of undisturbed nesting areas and protection from predators to be a successful breeder on the Pacific coast. Monitoring plover nests and broods is an important component of a 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. This year it took weeks to identify the cause of high levels of nest loss in the Molera/Potrero and Monterey Dunes areas because the predator(s) didn't leave distinctive tracks or other signs and the monitors did not suspect a gull that deliberately targeted nests. Also, in the Salt Ponds the predators, which took 21 nests, could not be identified to species as they didn't leave tracks on the hard pond bottoms. To counter these problems in 2013, we plan to deploy several nest cameras to speed up the identification of the predators which are taking nests.

Cameras are not a practical method of identifying the predators of chicks because of the mobility of chicks. We checked a Barn Owl nesting box near the Salt Ponds after the end of this breeding season and turned up the bands of one Snowy Plover that disappeared as a chick in the ponds several years ago. Limited dissection of both hawk and owl pellets has not turned up any additional plover bands, but many pellets and nest box debris remain unexamined. In the past there have been up to three active Barn Owl nest boxes near the ponds and this year at least one brood of Great Horned Owls fledged in the adjacent eucalyptus trees. We will continue to check hawk and owl pellets in 2013 to see if we can learn more about what avian predators are responsible for chick loss, especially in the Salt Ponds.

ACKNOWLEDGEMENTS

Lynne Stenzel and Bernadette Ramer of PRBO Conservation Science greatly assisted with the fieldwork at Pajaro Dunes, Laird Henkel in the South Bay, and Jacob Martin in the North Bay. Amy Palkovic deserves special thanks for preparing the nest maps. This project was conducted collaboratively by 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 Game, 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 2012.



Appendix 2. Snowy Plover nest locations at the northern section of Sunset State Beach in 2012.



Appendix 3. Snowy Plover nest locations at the Pajaro Spit at Sunset and Zmudowski State Beaches in 2012.



Appendix 4. Snowy Plover nest locations at Zmudowski State Beach in 2012.



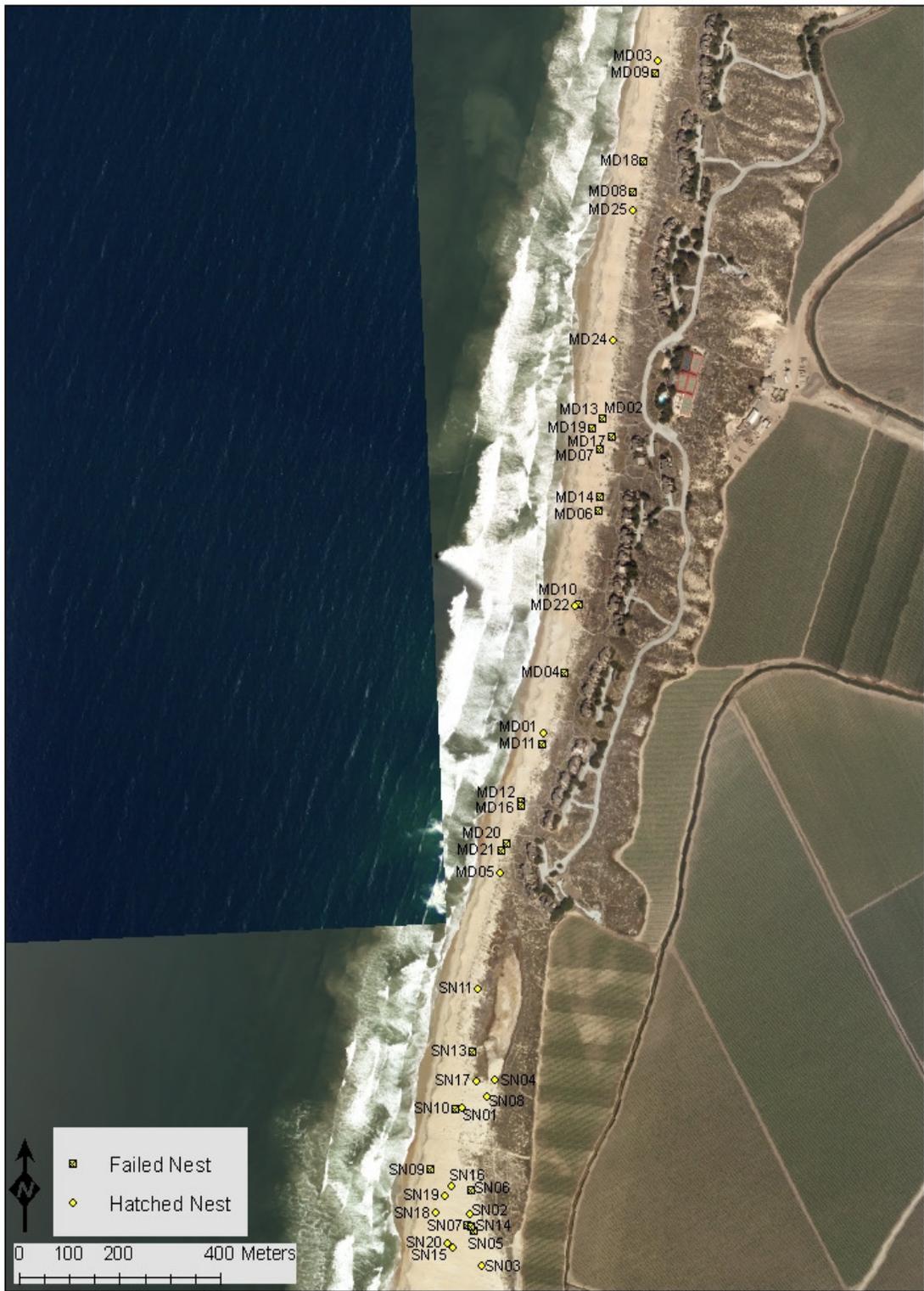
Appendix 5. Snowy Plover nest locations near Jetty Road at Zmudowski and Moss Landing State Beaches in 2012.



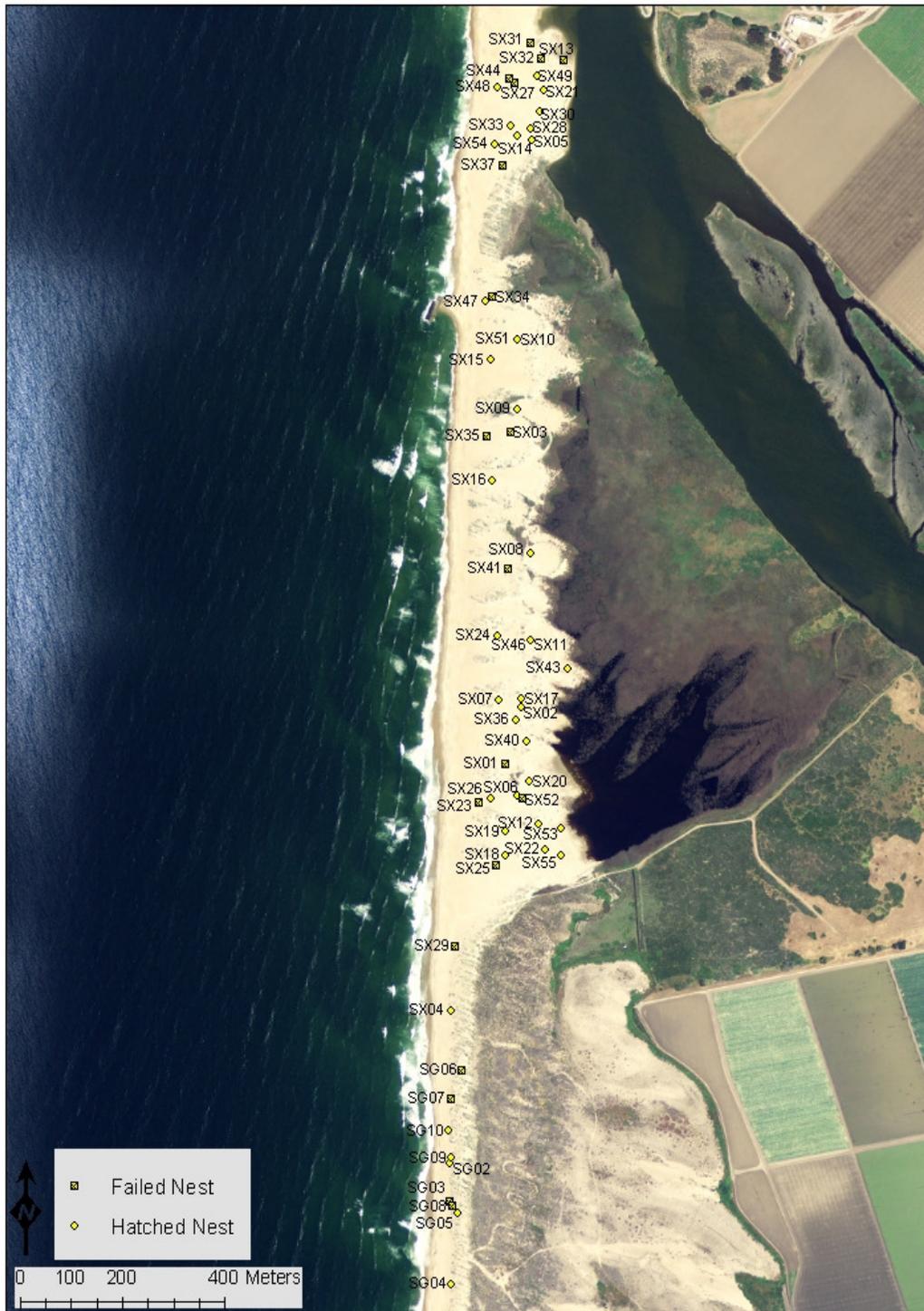
Appendix 6. Snowy Plover nest locations at the Moss Landing Wildlife Management Area in 2012. This map does not include 1 additional nest that was found as a brood.



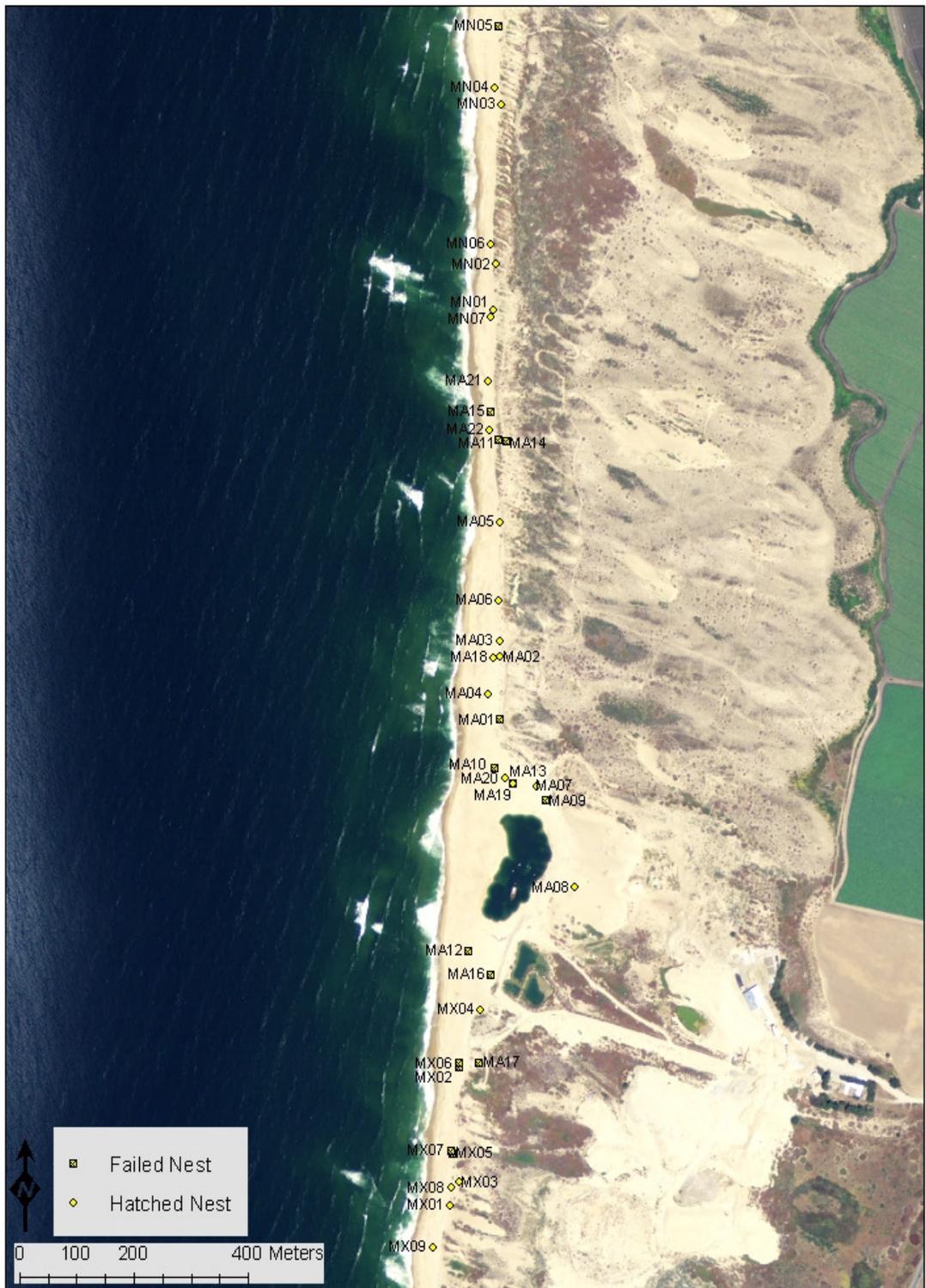
Appendix 7. Snowy Plover nest locations at the northern portion of Salinas River State Beach in 2012. This map does not include 1 additional nest that was found as a brood.



Appendix 8. Snowy Plover nest locations at the southern portion of Salinas River State Beach in 2012. This map does not include 3 additional nests that were found as broods.



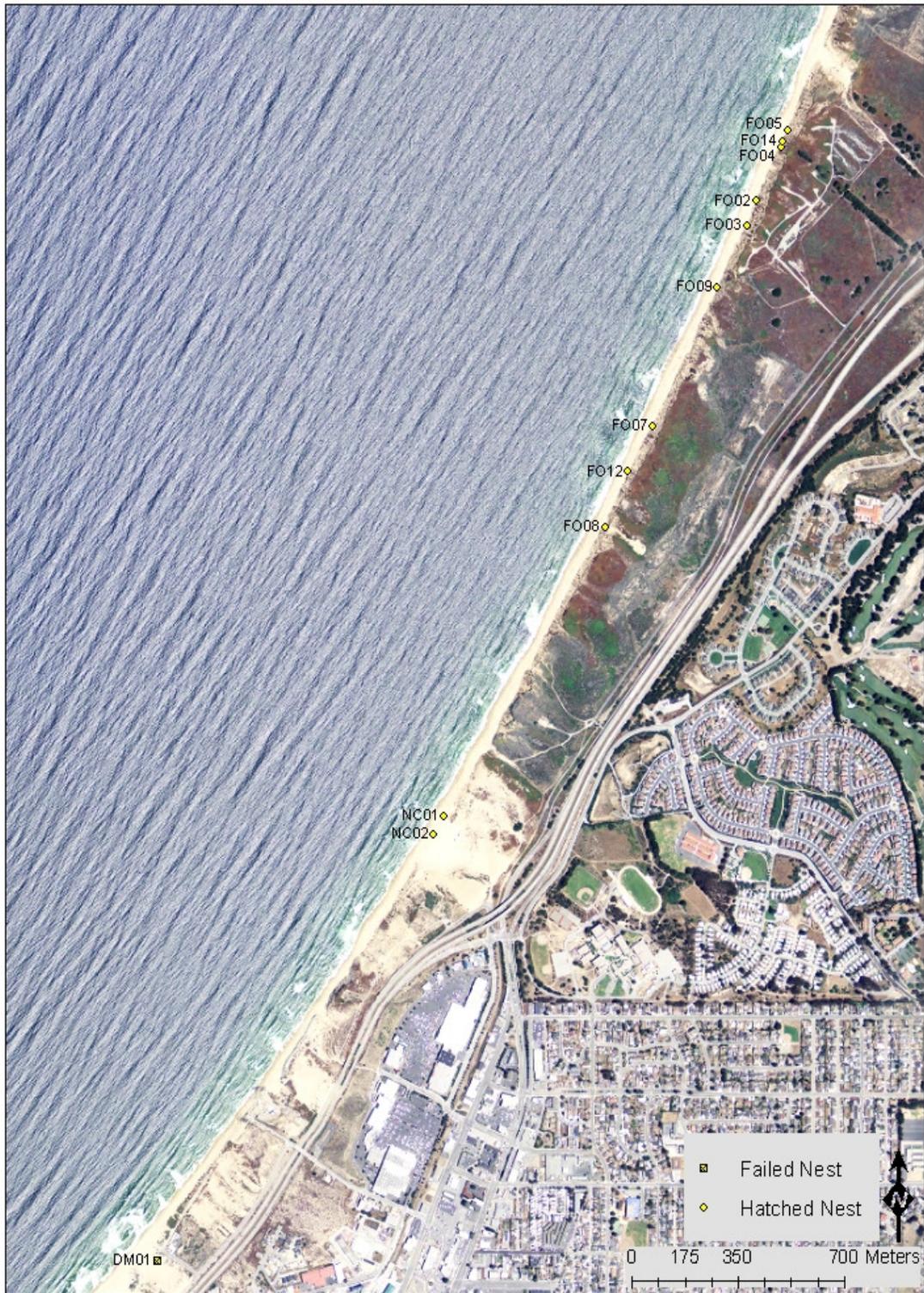
Appendix 9. Snowy Plover nest locations at the Salinas River National Wildlife Refuge and the Martin dunes in 2012. This map does not include 7 additional nests that were found as broods.



Appendix 10. Snowy Plover nest locations at Marina beach in 2012. This map does not include 2 additional nests that were found as broods.



Appendix 11. Snowy Plover nest locations at Marina State Beach and the northern portion of Fort Ord Dunes State Park in 2012.



Appendix 12. Snowy Plover nest locations at the southern portion of Fort Ord Dunes State Park, Sand City, and Monterey State Beach in 2012.