



REPRODUCTIVE SUCCESS AND BREEDING POPULATION SIZE OF SNOWY PLOVERS IN THE MONTEREY BAY REGION, CALIFORNIA, IN 2017



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SUMMARY

The Pacific Coast population of the western snowy plover (*Charadrius nivosus nivosus*) was listed as threatened by the U.S. Fish and Wildlife Service (USFWS) in 1993. Researchers and associates of Point Blue Conservation Science (Point Blue), USFWS, and the California Department of Parks and Recreation (California State Parks) have monitored nesting western snowy plovers (hereafter snowy plover, or plover) in the Monterey Bay region since 1984. Here we report on reproductive success and breeding population size of snowy plovers in the Monterey Bay region in 2017 and assess the effect of management efforts intended to support population recovery. Management actions included the following; habitat protection to minimize human disturbance of nesting plovers, predator removal by the Wildlife Services Division of the U.S. Department of Agriculture (Wildlife Services), water management to provide nesting and foraging habitat in the managed ponds of the California Department of Fish and Wildlife's (CDFW) Moss Landing Wildlife Area, and ongoing restoration of beach and dune habitats.

The primary results of the 2017 breeding season are the following:

- An estimated 403 snowy plovers (215 males, 188 females) nested in the Monterey Bay region in 2017. Our estimate exceeded the USFWS recovery plan target of 338 adults for the region for the 12th time in the 15 years since the target was first attained in 2003.
- We documented 416 nesting attempts (Table 1, Appendices 1-13); 386 of those attempts were detected at the egg stage and 30 were detected as broods of chicks (i.e. after the nest had hatched).
- The clutch hatch rate of 44% was below the average of 61% from 1999-2014.
- Causes of nest loss were similar to recent years with at least two-thirds of all nest losses caused by predators. Common ravens (*Corvus corax*) were responsible for 66% of all nests lost to predators and mammals for only 7%.
- A minimum of 435 chicks hatched from the 386 nests found at the egg stage.
- 293 chicks were banded.
- A minimum of 161 chicks fledged of which 99 were banded and 62 unbanded.
- The minimum estimate of chicks fledged per male was 0.75 as calculated by the minimum number of unbanded and banded chicks (n=161) known to have fledged divided by number of banded and unbanded males (n=215) in the population.
- The 161 chicks that were confirmed to have fledged in 2017 should be considered a minimum total number because more unbanded chicks likely fledged than we were able to verify.
- All snowy plover monitoring by Point Blue Conservation Science staff and associates was conducted under **USFWS permit number TE-807078-17**. There were no incidental mortalities of snowy plovers or plover eggs resulting from activities conducted under

this permit and the planned future activities for 2018 are expected to be the same as in 2017.

INTRODUCTION

Staff and research associates of Point Blue, with the assistance of staff and/or interns of the USFWS and the California State Parks, 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 ascertain the number of breeding plovers, number of nesting attempts, clutch hatching rate, chick fledging rate, and causes of egg and chick loss. Here we summarize the results of the monitoring effort in 2017.

Throughout this document, 2017 results will be compared to a running average from 1999-2014. Beginning in 2015, we modified our study design by not attempting to band every chick that hatched. Beginning in 2016 and continuing this year, we do not report fledge rates for unbanded chicks, and other reported numbers from 2015 onward should be viewed with this in mind.

STUDY AREA

The study area includes the beaches of Monterey Bay, former salt ponds adjacent to Elkhorn Slough (hereafter Salt Ponds), and pocket beaches in northern Santa Cruz County (Appendices 1-13). For reporting purposes we divide the study area from north to south, and describe approximate area boundaries, land ownership and management, and refer to corresponding area maps and nest identification codes (in parentheses) as follows:

North Beaches Region

Sunset-Manresa: From Beach Road to the northern boundary of Manresa State Beach. The southern end is backed by residential development. The beach is managed by California State Parks (see App. 2 – NO, NM, and NT).

Pajaro Spit: The sand spit on the north side of the Pajaro River mouth, including the beach north of the river and west of the Pajaro Dunes residential development. This beach is owned and managed by California State Parks and is part of Sunset State Beach (see App. 3 – PS and PH).

Zmudowski Beach: From the northern boundary of Moss Landing State Beach, north to the Pajaro River mouth. This beach is owned and managed by California State Parks and is part of Zmudowski State Beach (see App. 4 – ZS and ZB).

Moss Landing: From the mouth of Elkhorn Slough, north to the southern boundary of Zmudowski State Beach. This beach is owned and managed by California State Parks and is part of Moss Landing State Beach (see App. 5 – JR).

Salt Pond Region

This area includes approximately half of the former salt ponds adjacent to the western terminus of Elkhorn Slough that have been converted to managed, diked wetlands and are now encompassed within CDFW’s Moss Landing Wildlife Area (see App. 6).

South Beaches Region

Molera-Potrero: From the northern boundary of the Monterey Dunes Colony to the mouth of Elkhorn Slough. This beach is owned and managed by California State Parks and is part of Salinas River State Beach (see App. 7).

Monterey Dunes: From the southern to the northern end of Monterey Dunes Colony. This beach is backed by a beachfront residential development. This beach is owned and managed by California State Parks and is part of Salinas River State beach (see App. 8 – MD).

Salinas River North: From the northern border of Salinas River NWR, north to the southern boundary of the Monterey Dunes Colony. This beach is owned and managed by California State Parks and is part of Salinas River State beach (see App. 8 – SN).

Salinas River National Wildlife Refuge: From the northern boundary of Martin Dunes, north to and including the sand spit on the southern side of the Salinas River mouth. This beach is owned and managed by USFWS (see App. 9 – SX).

Martin Dunes: From the northern boundary of the Cemex sand mine north to the southern boundary of Salinas River NWR. This beach is owned and managed by Big Sur Land Trust and private owners with assistance from USFWS (see App 9 - SG).

Marina North: From the northern boundary of Marina Middle, north to the southern boundary of Martin Dunes. This beach is owned and managed by private owners with assistance from California State Parks and USFWS (see App. 10 – MN).

Marina Middle: From the southern end of the coastal dredge pond north to approximately 300m north of the northern end of the coastal pond. This beach is owned and managed by private owners with assistance from California State Parks and USFWS (see App. 10 – MA).

Marina South: From Reservation Road, north to the southern end of the coastal dredge pond at the Cemex sand mine. This beach is owned and managed by the Monterey Peninsula Regional Park District and private owners with assistance from California State Parks (see App. 10 - MX).

Reservation Road: From the Lake Court beach access for Marina State Beach north to Reservation Road. This beach is owned and managed by California State Parks and is part of Marina State Beach (see App. 11).

Fort Ord: From the southern boundary of Fort Ord, north to the southern boundary of Marina State Beach. This beach is owned and managed by California State Parks and is part of Fort Ord Dunes State Park (see App. 11 and 12).

Sand City: From Bay Avenue in Sand City, north to the south boundary of Fort Ord. This beach is owned by California State Parks, the City of Sand City, the Monterey Peninsula Regional Parks District, and private owners. Sand City was not monitored in 2017 and thus is shown only on the overview map (see App. 1).

Del Monte: From the City of Monterey north to Bay Avenue in Sand City. The beach is owned and managed by California State Parks and is part of Monterey State Beach (see App. 13).

Northern Santa Cruz County Pocket Beach Region

In northern Santa Cruz County, four beaches formerly supported nesting snowy plovers. **Wilder Creek Beach, Laguna Creek Beach, and Scott Creek Beach** are owned and managed by California State Parks and **Waddell Creek Beach** is owned by California State Parks and by a private party. These sites were not monitored in 2017 and are not shown on area maps.

MONITORING

In 2017, we attempted to find all plover nests initiated at most sites in the study area but some areas were monitored more intensively than others. We had an overall project goal of banding 50% of chicks across the entire Monterey Bay region, with banding efforts distributed across sites and across the nesting season. We used the following three-tiered monitoring strategy to reach this goal: at Tier 1 sites, the goal was to find and monitor every nest, and to band 85-95% of chicks (Pajaro Spit and Zmudowski); at Tier 2 sites, the goal was to find and monitor every nest, and to band 50% of chicks (Del Monte, Fort Ord, Reservation Road, Marina, Martin, Salinas North, Monterey Dunes, Molera Potrero, Moss Landing); at Tier 3 sites, the goal was to find and monitor as many nests as possible and to band a sample of chicks (Salinas River NWR, Salt Ponds, Sunset-Manresa). In 2017, we did not monitor plover reproductive success at the northern Santa Cruz county pocket beaches or at Sand City.

We recorded the longitude and latitude of each nest with Global Positioning System (GPS) units. We also used GPS units to create proxy nest locations for all nesting attempts found as broods of chicks by creating a waypoint at the first location a brood was observed. These locations were plotted on nest maps for each area (see Appendices 1-13). All monitoring was conducted under USFWS Permit TE-807078-17.

We estimated clutch hatching dates from egg laying dates, when known, or from egg flotation. Projected hatching dates were refined by examination of eggs for cracked shells, tapping chicks, or peeping chicks just before the projected hatching date. In order for an egg to be categorized as hatched, the chick had to be observed at the nest or with the attending parent. When eggs disappeared prior to the projected hatch date, causes of nest loss were determined by examining evidence at nests (damaged eggshells, predator tracks, evidence of tide wash). When cause of loss was unknown based on evidence at the nest, but the nest was lost during a similar time interval (+/- 3 days) and was at or adjacent to the area where the cause of loss was to an identified avian predator, we assigned the nest loss to an "event" ascribed to that avian predator (i.e. gull event). Nests where the fate of at least one egg was known were considered "known fate" nests and were used to calculate the clutch hatch rate (percentage of nests hatched).

We used unique color-band combinations to individually mark a sample of adults and chicks. We trapped adults on or near the nest using noose mat carpets or at the nest using walk-in box traps. We captured chicks in or near the nest by hand at the time of hatching. We monitored brood survival throughout the chick-rearing period by directly observing chicks with attending males and also by observing male behavior that indicated the presence of chicks (e.g. lure displaying). We considered chicks to have reached fledging age if they survived 28 days or more after hatching. For banded chicks, chicks could be seen at or after fledging dates and still be attributed to specific broods whereas for unbanded chicks to be considered fledged, they must have been seen with their attending parent at or within a few days after fledging. We report the minimum number of unbanded chicks fledging but only banded chicks were used to calculate fledge rates. Site-specific fledging success was based on the broods that originated from the nests located at each site, even in cases where broods moved to adjacent areas before fledging.

Beginning in 2016, we used a combination of birds confirmed on nests (banded and unbanded), and banded birds that were present during the breeding season (probable breeders) to estimate the total breeding population size. In 2017, we used this same methodology to produce a breeding number for each sex that is the sum of confirmed banded breeders + confirmed unbanded breeders + probable banded breeders. For each area on Monterey Bay and for each sex, we estimated a minimum number of unbanded breeders by determined the maximum number of simultaneously extant nests during the season with unbanded parents and subtracted the number of breeders that were subsequently banded on nests. We compared that with the number of nests incubated by or broods attended by unbanded breeders at the end of the season and used the larger of the two as our estimate of the minimum number of unbanded breeders. We identified probable breeders by examining the sighting records of plovers observed three or more times in May or June. For each individual, we assessed the evidence for nesting based on number of sightings, the past years' history of confirmed nesting, and breeding behaviors exhibited in 2017 (e.g. paired, broody, skulking or alert, copulating, scraping, lure display). We are unable to estimate the number of unbanded breeders, if they were not confirmed on nests.

We also estimated the Monterey Bay breeding population size by conducting a single, coordinated “window” survey of all breeding during the third week of May as part of the rangewide window survey following methods outlined in Elliot-Smith and Haig (2006). The annual window survey is the primary method used by USFWS to estimate the size of the Pacific Coast population of snowy plovers and to monitor population status over time. In 2017, we did not survey Sand City during the window survey.

MANAGEMENT

Techniques used to improve the breeding success of snowy plovers in the study area included habitat protection, predator control, and water management. Habitat was protected by using cable fencing and regulatory and informational signs to temporarily (March 1 - Sept. 30) close nesting and brood rearing areas on upper beaches and dunes to recreational access. Fencing and signage were used along most linear beaches, at the sand spits at the Salinas and Pajaro river mouths, at the upper beach and dunes at Salinas River NWR, and at the salt ponds at Moss Landing Wildlife Area. In 2017, the majority of nests were protected by symbolic fences (n = 383 of 386 nests found at the egg stage) or were within closure areas at the aforementioned sites. Wildlife Services biologists conducted selective removal of problem avian and mammalian predators in 2017. Water levels at the Salt Ponds were managed to create dry nesting substrate and associated wet foraging areas for plovers.

RESULTS OF 2017 NESTING SEASON

Estimated Number of Breeders

In 2017, the Monterey Bay breeding population consisted of an estimated 215 males and 188 females for a total of 403 snowy plovers. The 215 males consisted of 171 banded birds (146 confirmed on nests and 25 probable breeders) and a minimum of 44 unbanded birds. The banded breeders included 19 males first captured and confirmed on a nest during the 2017 season (see Appendix 14). The 188 females in 2017 consisted of 140 banded birds (131 confirmed on nests and 9 probable breeders) and a minimum of 48 unbanded birds. Banded breeders included 8 females first captured and confirmed on a nest in 2017 (Appendix 14).

The USFWS breeding window survey in late May is currently the primary method of estimating the size of the entire U.S. Pacific Coast population each year. In 2017, 316 adults were detected in the Monterey Bay region on the window survey. The population estimate derived from monitoring can be used to calculate a correction factor for the window survey estimate (monitoring estimate/window survey estimate); in 2017 that factor was 1.28.

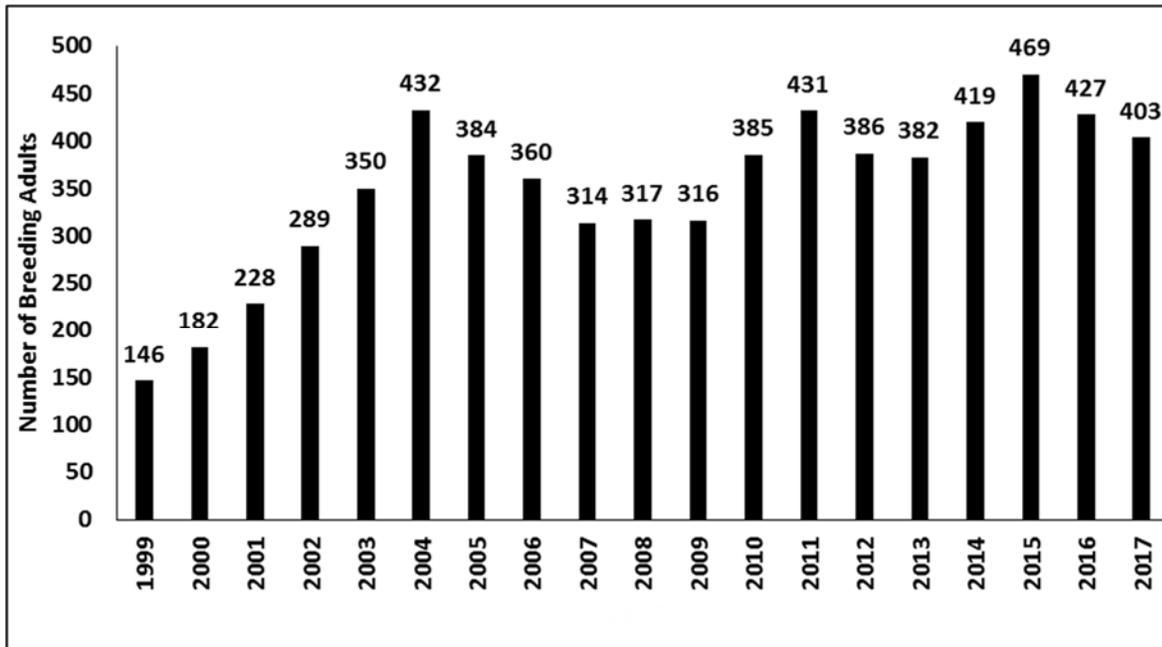


Figure 1. Estimated number of breeding snowy plovers in the Monterey Bay region, 1999-2017.

Return Rates

Of color banded adults that nested (or probably nested) in the Monterey Bay region in 2016, 67% of males and 59% of females returned and bred or were suspected of breeding in 2017. The rate for males was similar but the rate for females was lower than the average return rates of 69% for males and 64% for females from 1999-2014. Nineteen plovers (14 males and 15 females) that were banded as chicks and fledged in 2016 returned to breed in 2017, which represents an 11% return rate.

Nesting Attempts

We found 386 nests and 30 broods of chicks from undetected nests indicating a minimum of 416 nesting attempts in the Monterey Bay region in 2017 (Table 1, Appendices 1-13). Of the 386 nesting attempts found at the egg stage, we were able to document the fate of 348. These totals exclude any nesting that may have occurred at the northern Santa Cruz county pocket beaches or at Sand City because these sites were not monitored in 2017.

Clutch Hatching Rates

Our calculations of the clutch hatching rates exclude all nesting attempts documented only from the detection of broods as well as the 38 nests for which clutch fate was unknown. The 44% hatching rate of clutches found as eggs on beaches in 2017 (Table 1) was below the 60% average from 1999-2014; and the 48% Salt Pond hatch rate in 2017 was well below the 65% Salt

Pond average from 1999-2014. The 44% rate for ponds and beaches combined in 2017 was well below the average of 61% from 1999-2014.

Table 1. Reproductive success of snowy plovers in the Monterey Bay region in 2017.

Location	Nesting Attempts							Unbanded Chicks			Banded Chicks		
	Total Nesting Attempts ¹ (n)	Found as Broods (n)	Found as Nests (n)	Unknown Fate Nests (n)	Known Fate Nests (n)	Hatched Nests (n)	Clutch Hatch Rate ² (%)	Min. Unb. Chicks Hatched (n)	Max. Unb. Chicks Hatched ³ (n)	Min. Unb. Chicks Fledged (n)	Chicks Banded (n)	Banded Chicks Fledged (n)	Banded Chicks Fledged (%)
Del Monte	10	1	9	1	8	0	0%	1	6	1	0	0	
Sand City ⁴													
Fort Ord	41	0	41	3	38	31	82%	7	33	2	65	23	35%
Reservation Road	18	0	18	1	17	14	82%	4	9	1	26	6	23%
Marina South	12	5	7	1	6	2	33%	11	20	5	3	1	33%
Marina Middle	26	6	20	1	19	4	21%	13	22	7	10	9	90%
Marina North	3	0	3	0	3	1	33%	0	0	0	3	3	100%
Martin	5	0	5	0	5	0	0%	0	0	0	0	0	
Salinas NWR	33	4	29	1	28	13	46%	23	30	12	16	13	81%
North Salinas River	11	0	11	0	11	10	91%	9	12	1	16	7	44%
Monterey Dunes	16	0	16	3	13	10	77%	7	19	3	15	2	13%
Molera-Potrero	14	2	12	1	11	5	45%	7	11	4	10	4	40%
Moss Landing	40	1	39	2	37	14	38%	9	16	3	29	5	17%
Zmudowski Beach	23	0	23	0	23	13	57%	3	8	3	28	12	43%
Pajaro Spit	76	1	75	0	75	15	20%	7	9	2	34	6	18%
Sunset-Manresa	33	3	30	7	23	7	30%	10	36	10	11	4	36%
TOTAL BEACHES	361	23	338	21	317	139	43.8%	111	231	54	266	95	35.7%
SALT PONDS	55	7	48	17	31	15	48.4%	31	86	8	27	4	14.8%
GRAND TOTAL	416	30	386	38	348	154	44.3%	142	317	62	293	99	33.8%

¹ Nesting attempts is the sum of nests found at the egg stage and the brood stage

² Nests found as broods and unknown fate nests are not included in percentage of nests hatching. Clutch hatch rate is number of hatched nests divided by number of known fate nests.

³ Maximum number of unbanded chicks includes possible hatching eggs from both known and unknown fate nests.

⁴ Sand City was not monitored in 2017.

Clutch Failure

Of the 194 nests known to have failed, at least 68% of the losses in 2017 were caused by predators (Table 2). Of the 131 losses attributed to predators, 74% were attributed to avian predators, 7% to mammalian predators, and 19% to unknown predators.

Common ravens were the main nest predator at Monterey Bay in 2017. Sixty-six nest losses at a total of nine sites were attributed to ravens or to raven events. Overall, ravens were responsible for 34% of all nest losses, 50% of all losses to predators, and 68% of all losses to avian predators. Nest loss to ravens was concentrated around the Salinas River and Marina areas in the central part of the South Bay Region and distributed throughout the North Bay Region. Ten additional nests were lost to American crow (*Corvus brachyrhynchos*) or unknown corvid. These losses represent the first confirmed losses to crows since 2008, and most of these losses occurred at the Pajaro River area. Gulls were responsible for trampling or depredating 11 nests at the Pajaro River and Moss Landing areas.

Mammalian predators were responsible for a small percentage of nest loss in 2017. Striped skunks (*Mephitis mephitis*), the primary mammalian nest predators in recent years, were not responsible for any nest loss in 2017 but opossums depredated two nests at the Pajaro River.

Other causes of nest loss were far less common than losses due to predators. Environmental factors such as wind, tide, and rain were the suspected cause of 30 nest losses, with the most significant percentage of these lost at Moss Landing to a single high tide in late June (Table 2). It should be noted that we were unable to determine the fate of 38 of the 386 nests found at the egg stage (Table 1), but it is unlikely that all of these unknown fate nests hatched.

Table 2. Causes of loss for 194 snowy plover nests lost out of 348 known fate nests monitored in the Monterey Bay region in 2017.

Locations	Avian Predators						Mammalian Predators						Unk. Pred. Sp. ⁹	Other Causes					Total		
	CORA ¹	event ²	GHOW ³	AMCR ⁴	Corvid ⁵	Gull	Unk. Av. ⁶	Dog	Fox	Unk. Canine	Skunk	Oppos. ⁷		Unk. Mamm. ⁸	Hum. ¹⁰	Tide	Wind	Non-Viable		Des. ¹¹	Cause Unk.
Del Monte				2			2			1				1			1			1	8
Sand City ¹²																					0
Fort Ord															3	2	1	1			7
Reservation Road														1		1		1			3
Marina South	2	2																			4
Marina Middle	4	10						1													15
Marina North	1	1																			2
Martin	2	2																		1	5
Salinas NWR	4	9																		2	15
N. Salinas River																				1	1
Monterey Dunes						3															3
Molera-Potrero						1		1	1				1		2						6
Moss Landing	5		1			3						1		11	1			1			23
Zmudowski Beach	2	3				1	1								2						10
Pajaro River Spit	5	6		5	3	5	3						2	6	1	4	3		1	16	60
Sunset-Manresa	6	2				1			1					1						5	16
Salt Ponds														15						1	16
Total	31	35	1	7	3	9	11	1	1	3	0	2	2	25	1	20	10	1	5	26	194

¹ common raven; ² common raven event; ³ great-horned owl (*Bubo virginianus*); ⁴ American crow; ⁵ unidentified corvid (raven or crow); ⁶ unknown avian predator; ⁷ Virginia opossum; ⁸ unknown mammal species; ⁹ unknown predator species; ¹⁰ human; ¹¹ deserted; ¹² Sand City was not monitored in 2017.

Chicks Hatched

The number of chicks that hatched in the Monterey Bay region ranged from 142-317 unbanded chicks in addition to the 293 that were banded (Table 1; see Appendix 14 for band combinations). The total number of chicks hatched includes all chicks that possibly hatched from nests where fate was known and where fate was unknown (Table 1). However, as previously stated it is unlikely that all 38 unknown fate nests hatched, so this maximum number of chicks hatched probably was not attained.

Chicks Fledged

In 2017, 99 of 293 banded chicks fledged for a banded chick fledging rate of 34%. This is slightly below the average of 40% from 1999-2014. A minimum of 62 unbanded chicks also fledged in 2017 (Table 1) for a minimum total number of 161 fledglings. Applying the estimated 34% fledge rate from the banded chicks to the maximum number of unbanded chicks that hatched

results in a maximum estimate of 107 unbanded fledglings. This results in a maximum fledgling estimate of 206, which is still slightly below the long-term average of 229 from 1999-2014.

Chicks Fledged Per Male

The estimate of chicks fledged per male is 0.75 as calculated by the minimum number of unbanded and banded fledglings (n=161) divided by number of banded and unbanded males (n=216) in the population. If the maximum estimate of 206 fledglings produced is used (see above), the number of chicks fledged per male is 0.95, which is still slightly less than the 1.0 target needed for population stability and well below the average of 1.3 from 1999-2014.

DISCUSSION

Our estimate of 403 breeding snowy plovers in the Monterey Bay region in 2017 exceeded the USFWS recovery plan target of 338 adults for the region for the 12th time in the 15 years since the target was first attained in 2003. The estimate of the breeding population size derived from monitoring was 1.28 times the size of the population estimate derived from the annual window survey. This is a slightly higher ratio than the average of 1.22 from 2005-2014, meaning that fewer birds were detected than average on the 2017 window survey. Detection rates are influenced by many things, including breeding stage, predator presence, and variability in behavior of individual plovers. Under-detection of plovers during the 2017 window survey probably was influenced by the high rates of nest predation occurring in our focal areas, and by the relative lack of brood presence, which would result in less mobbing behavior and fewer birds counted during the window survey.

The confirmed 161 chicks that fledged in 2017 should be considered a minimum because more unbanded chicks likely fledged than we were able to verify. However, even the maximum estimated fledgling number of 206 is slightly below the 1999-2014 average of 229 fledglings for Monterey Bay, and would still result in a chicks fledged per male rate that is just below the USFWS population target of 1.0.

Overall, plovers experienced subpar productivity in 2017, with hatching rates much lower and fledging rates somewhat lower relative to the 1999-2014 averages. Clutch hatching was heavily impacted by corvid predation with ravens or crows affecting more than half of all sites, and the heaviest predation was concentrated at beaches at and adjacent to the Pajaro and Salinas River mouths. The highest fledge rates occurred in some but not all of the areas that were heavily impacted by raven predation (e.g. Marina and Salinas River NWR). Because fewer nests hatched in these areas, densities of chicks at any one time were lower, and this may have resulted in higher fledge rates at these sites. Fledge rates were the lowest at the Pajaro Spit, Moss Landing, and Monterey Dunes, though the reasons are not clearly understood. Peregrine falcons (*Falco peregrinus*) were observed regularly throughout the study area and appeared to impact fledge rates at some, but not all areas, where they were present. At the north Fort Ord and Jetty Road areas, peregrine falcons were observed depredating plover chicks and may have

been at least partially responsible for the lower than average fledge rates at Fort Ord, Reservation Road, and Moss Landing beaches.

In 2017, as in 2016, beaches were narrower than average due to severe storms from the previous two winters. It is likely that this had some effect on chick fledgling rates due to the reduced availability of habitat and competition for space with recreational beach users. We expect variability in beach widths to continue as a result of sea level rise combined with increased variability in storm frequency and magnitude. In future years narrow beaches will be more likely to occur and future efforts to enhance plover productivity at these sites will need to take this into account.

MANAGEMENT RECOMMENDATIONS

Here we provide recommendations to management agencies, landowners, and other coastal stakeholders responsible for managing plover habitat in the Monterey Bay region.

Managing Predators

Predators continue to have significant negative effects on plover nest success despite considerable management efforts.

- Common ravens have been the dominant avian predator of plover nests in recent years and we expect this to continue. We recommend initiating raven management efforts early in the nesting season and a continued investment of effort in developing alternative methods of control that are adaptable to different sites and circumstances.
- In the past several years, skunks have been a dominant predator of plover nests at multiple sites. We recommend initiating skunk management early in the season at sites historically impacted by skunks (e.g. Pajaro Spit). We also recommend initiating cooperative predator management efforts with managers of coastal residential developments where skunks have been problematic.
- We suspect that raptors are locally significant predators of both adult plovers and chicks in some years. We recommend continued monitoring of diurnal avian predators to determine the location and scale of predation impacts and to inform possible management actions.

Human Disturbance

Human-caused impacts are likely negatively affecting plover reproductive success at sites where trespass into closed areas occurs and where high levels of high-impact recreation may limit chick use of lower beach areas.

- We recommend that regulatory signs and fencing be monitored for problems during the breeding season and replaced or augmented if necessary.

- We also recommend that enforcement of beach rules and regulations be increased from current levels and that restriction of high impact recreational uses (e.g. equestrians) be considered in areas where chick fledging rates have been negatively impacted.

Coastal Adaptation

The Monterey Bay shoreline is highly vulnerable to sea level rise and other associated effects of climate change. Adapting to the effects of climate change will require directed planning to identify and prioritize areas that will be most resilient and to improve the overall resilience of beach and dune habitats through habitat restoration and management.

- We recommend identifying which beach areas are highly vulnerable and which are resilient to sea level rise, erosion, and beach narrowing.
- We recommend continued restoration of beaches and dune habitats as a means of improving resiliency while also providing high quality snowy plover nesting and brood rearing areas.
- We recommend minimizing or mitigating high impact human activities on beaches that are most vulnerable.

Monitoring

Nesting activity has increased in recent years at some sites and declined at others, particularly in northern Santa Cruz County. Additional funding for monitoring, development of new monitoring partnerships (e.g. with citizen scientists or universities), or additional survey work by land managers would provide necessary information to develop management strategies.

- We recommend increased plover monitoring using the above strategies at the following sites: the northern Santa Cruz County pocket beaches (Wilder, Laguna, Scott Creek, and Waddell), Sunset-Manresa beaches, and beaches north to Rio Del Mar.

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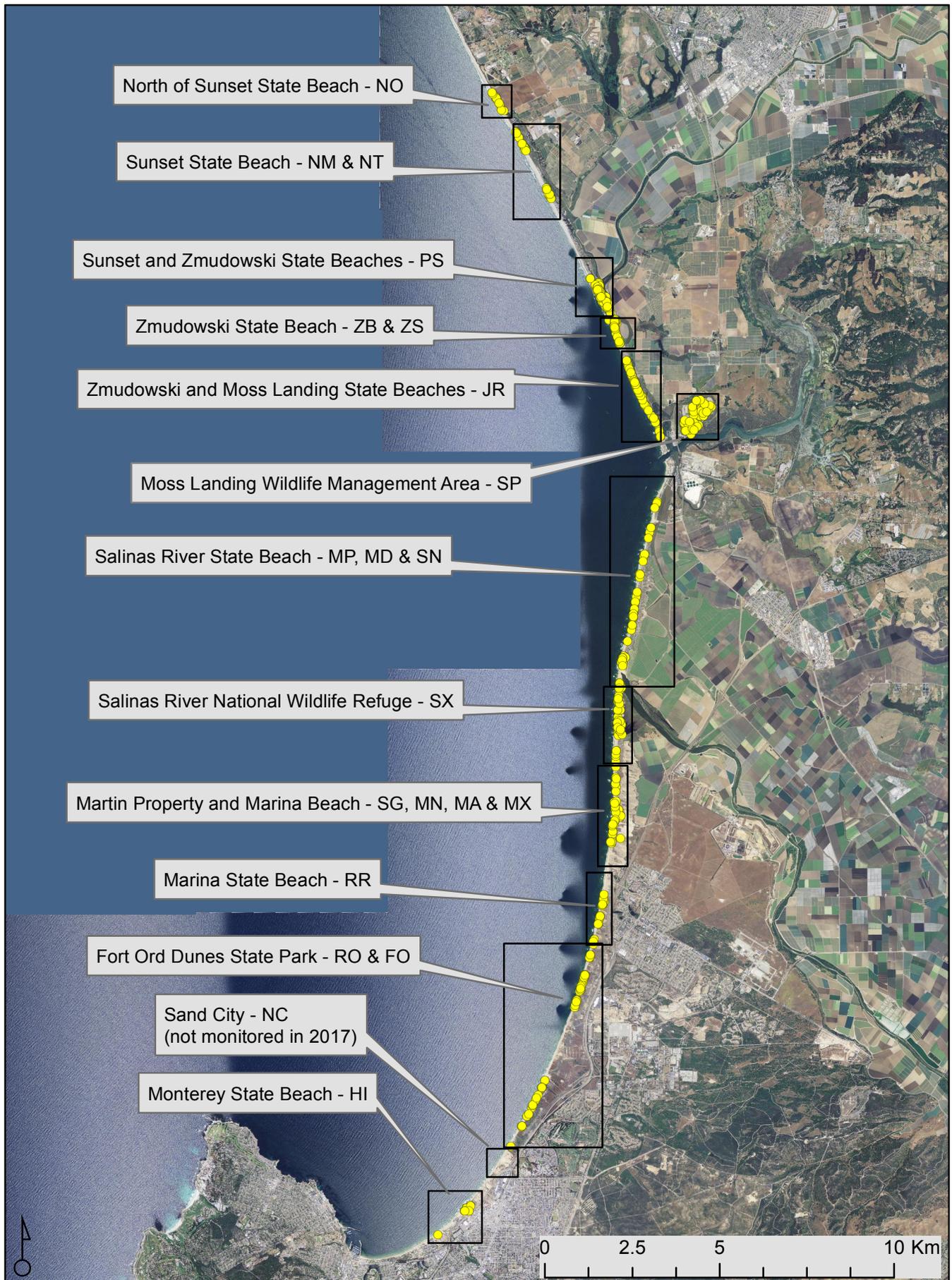
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Jacob Martin and Gary Page greatly assisted with the fieldwork at Sunset-Manresa and Pajaro Spit, respectively. Chris Caris and Kate Beer contributed significantly to the field work throughout the South Bay Region. Amy Palkovic deserves special thanks for preparing the nest maps. We also thank Tim Atkins of USDA Wildlife Services. This project was conducted collaboratively by Point Blue 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.



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Appendix 1. Overview of Snowy Plover nest locations in the Monterey Bay area in 2017.



Appendix 2. Snowy Plover nest locations at Monterey Bay Academy and at the northern section of Sunset State Beach in 2017.



Appendix 3. Snowy Plover nest locations at the Pajaro spit at Zmudowski and Sunset State Beaches in 2017.



Appendix 4. Snowy Plover nest locations at the central portion of Zmudowski State Beach in 2017.



Appendix 5. Snowy Plover nest locations at Jetty Road at Zmudowski and Moss Landing State Beaches in 2017.



Appendix 6. Snowy Plover nest locations at Moss Landing Wildlife Area in 2017.



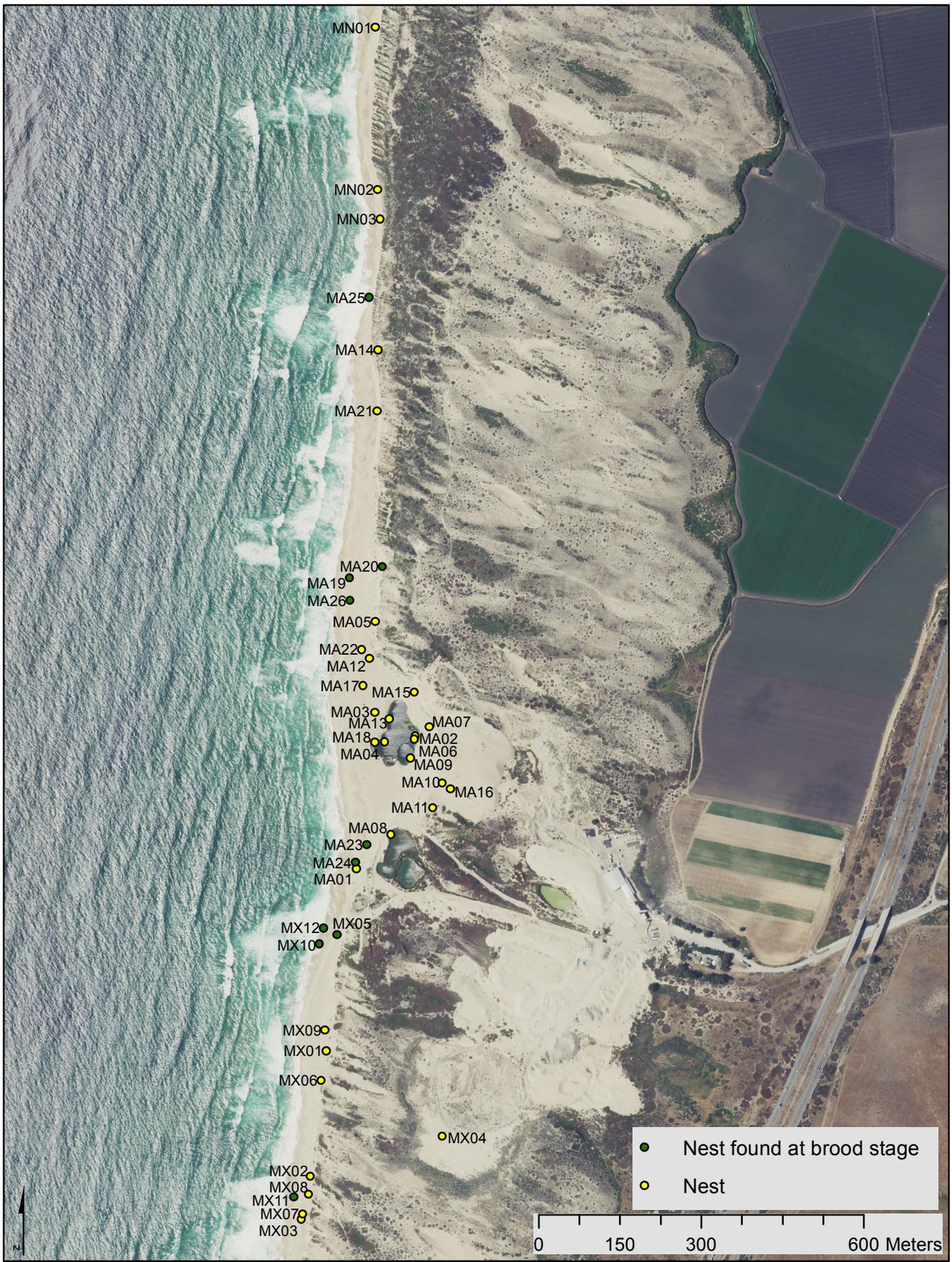
Appendix 7. Snowy Plover nest locations at the northern portion of Salinas River State Beach in 2017.



Appendix 8. Snowy Plover nest locations at the southern portion of Salinas River State Beach in 2017.



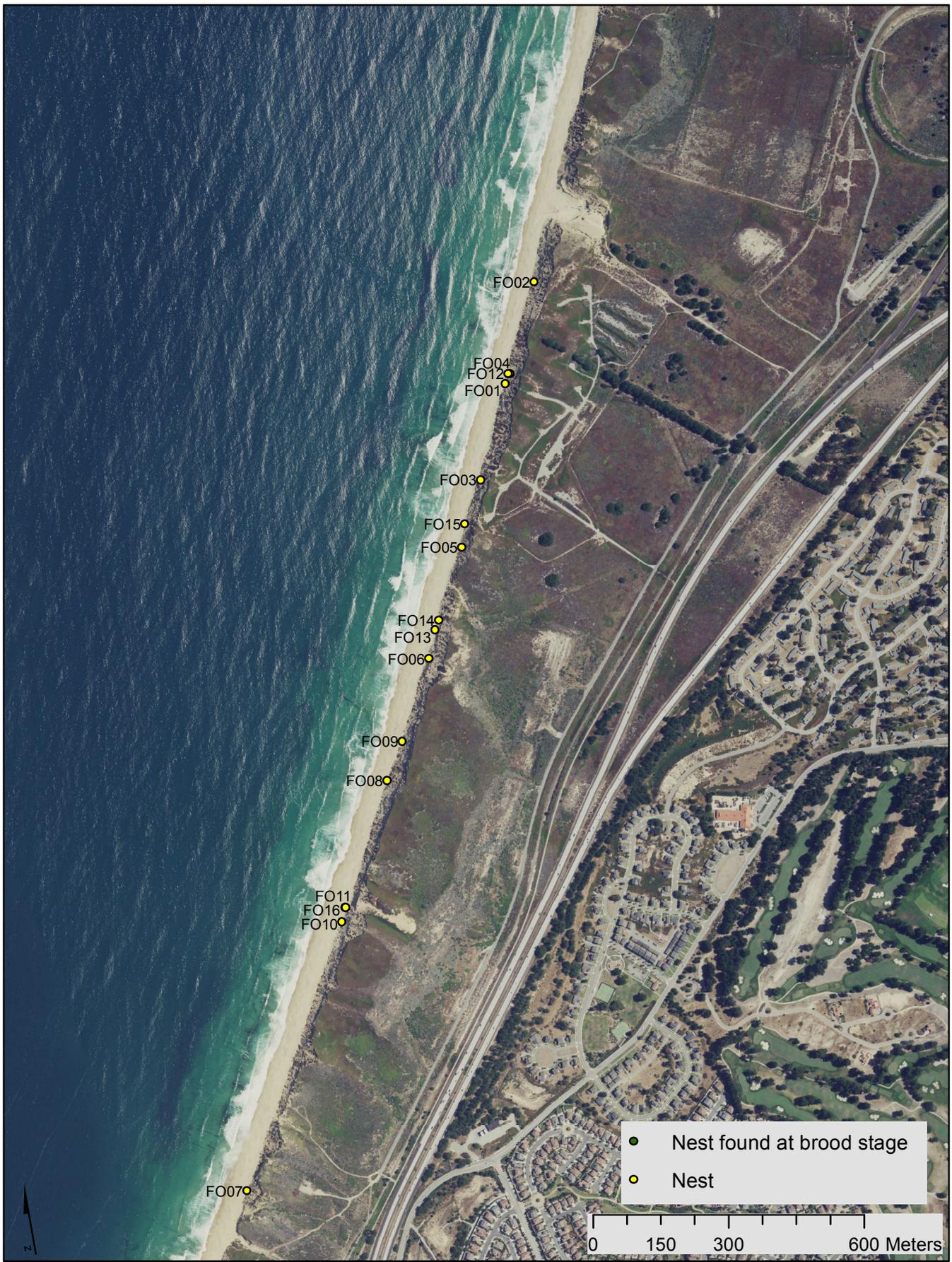
Appendix 9. Snowy Plover nest locations at the Salinas River National Wildlife Refuge and the Martin dunes in 2017.



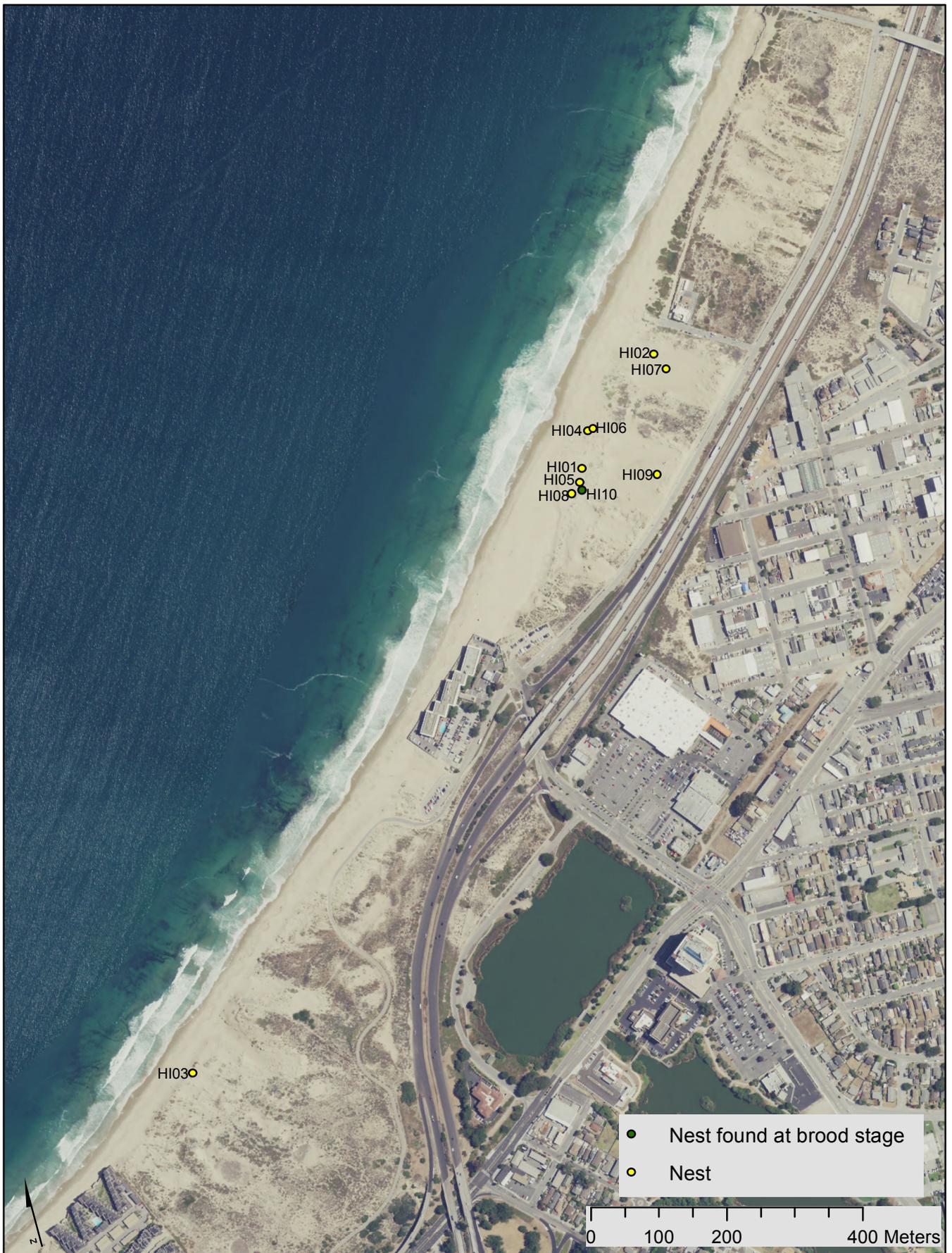
Appendix 10. Snowy Plover nest locations at Marina beach in 2017.



Appendix 11. Snowy Plover nest locations at Marina State Beach and the northern portion of Fort Ord Dunes State Park in 2017.



Appendix 12. Snowy Plover nest locations at the southern portion of Fort Ord Dunes State Park in 2017.



Appendix 13. Snowy Plover nest locations at Monterey State Beach in 2017.

Appendix 14. Adults and chicks banded in 2017, Monterey Bay region.

BAND COMBINATION	BANDING DATE	BANDING LOCATION ¹	BAND TYPE ²	AGE ³	SEX ⁴
aa av	6-Jun	FORT ORD	SS-SS	C	U
aa bv	7-Jun	SALINAS RIVER NWR	SS-SS	C	U
aa gv	1-Jun	SALT PONDS	SS-SS	C	U
aa ov	9-Jun	NORTH FORT ORD	SS-SS	C	U
aa rv	15-Jun	MARINA	SS-SS	C	U
aa vv	23-Jul	MOSS LANDING	SS-SS	C	U
aa wv	14-Jun	NORTH FORT ORD	SS-SS	C	U
aa yv	5-Jun	NORTH FORT ORD	SS-SS	C	U
ab av	18-Apr	NORTH FORT ORD	SS-SS	C	U
ab gv	22-Apr	SUNSET-MANRESA	SS-SS	C	U
ab ov	28-Apr	MARINA	SS-SS	C	U
ab ow	25-Jul	FORT ORD	SS-SS	C	U
ab rv	11-May	FORT ORD	SS-SS	C	U
ab wv	3-Jun	SALINAS NORTH	SS-SS	C	U
ab yv	6-Jul	NORTH FORT ORD	SS-SS	C	U
ag av	19-Jun	SALINAS RIVER NWR	SS-SS	C	U
ag gv	5-Jun	NORTH FORT ORD	SS-SS	C	U
ag gv	30-Jul	PAJARO SPIT	SS-SS	C	U
ag ov	16-Jun	RESERVATION RD	SS-SS	C	U
ag rv	7-Jul	SALINAS RIVER NWR	SS-SS	C	U
ag vv	18-Jul	PAJARO SPIT	SS-SS	C	U
ag wv	6-Jun	SALT PONDS	SS-SS	C	U
ag yv	22-Jun	NORTH FORT ORD	SS-SS	C	U
ao av	21-Jun	SALINAS RIVER NWR	SS-SS	C	U
ao gv	13-Jun	SALT PONDS	SS-SS	C	U
ao ov	23-Jun	NORTH FORT ORD	SS-SS	C	U
ao rv	14-Jul	SALINAS RIVER NWR	SS-SS	C	U
ao vv	5-Aug	SUNSET-MANRESA	SS-SS	C	U
ao wv	15-Jun	ZMUDOWSKI	SS-SS	C	U
ao yv	5-Jul	PAJARO SPIT	SS-SS	C	U
ap ov	9-Aug	MONTEREY BAY AQUARIUM	SS-SS	C	U
ar av	28-Jul	SUNSET-MANRESA	SS-SS	C	U
ar ay	27-Jul	MOSS LANDING	SS-SS	C	U
ar bv	13-Jun	SALT PONDS	SS-SS	C	U
ar gr	28-Jul	MOSS LANDING	SS-SS	C	U
ar gv	23-Jun	NORTH FORT ORD	SS-SS	C	U
ar gw	25-Jul	ZMUDOWSKI	SS-SS	C	U
ar gy	29-Jul	ZMUDOWSKI	SS-SS	C	U
ar or	18-Jul	ZMUDOWSKI	SS-SS	C	U
ar rv	13-Jul	MONTEREY DUNES	SS-SS	C	U
ar ry	20-Jul	MOSS LANDING	SS-SS	C	U
ar vv	27-Jul	MOSS LANDING	SS-SS	C	U
ar wv	30-Jun	NORTH FORT ORD	SS-SS	C	U
ar yv	20-Jun	MARINA	SS-SS	C	U

¹ See site descriptions for more detail.

² Ms-ss = upper tarsus metal band on Left leg; ss-ss = all lower bands

³ c = chick; a = adult

⁴ u = unknown; m = male; f = female

Appendix 14. Adults and chicks banded in 2017, Monterey Bay region.

BAND COMBINATION	BANDING DATE	BANDING LOCATION ¹	BAND TYPE ²	AGE ³	SEX ⁴
aw av	7-Jul	NORTH FORT ORD	ss-ss	c	u
aw aw	15-Jul	PAJARO SPIT	ss-ss	c	u
aw ay	18-Jul	PAJARO SPIT	ss-ss	c	u
aw ba	26-Jul	PAJARO SPIT	ss-ss	c	u
aw bb	25-Jul	ZMUDOWSKI	ss-ss	c	u
aw bw	27-Jul	MOSS LANDING	ss-ss	c	u
aw gv	18-Jul	MOSS LANDING	ss-ss	c	u
aw lr	23-Jul	MOSS LANDING	ss-ss	c	u
aw ov	20-Jul	SALINAS NORTH	ss-ss	c	u
aw ow	29-Jul	MOSS LANDING	ss-ss	c	u
aw rv	24-Jul	NORTH FORT ORD	ss-ss	c	u
aw vg	31-Jul	MOSS LANDING	ss-ss	c	u
aw yv	20-Jul	MOSS LANDING	ss-ss	c	u
ay ar	23-Jul	MOSS LANDING	ss-ss	c	u
ay av	5-Jun	PAJARO SPIT	ss-ss	c	u
ay gg	17-Jul	PAJARO SPIT	ss-ss	c	u
ay gv	30-Jun	NORTH FORT ORD	ss-ss	c	u
ay ov	19-Jun	SALINAS RIVER NWR	ss-ss	c	u
ay rv	1-Jun	SALT PONDS	ss-ss	c	u
ay wv	16-Jul	ZMUDOWSKI	ss-ss	c	u
ay yv	1-Jun	SALT PONDS	ss-ss	c	u
Ba or	21-Apr	SUNSET-MANRESA	Ms-ss	a	m
bo av	21-Apr	NORTH FORT ORD	ss-ss	c	u
Bo bb	12-Jul	RESERVATION RD	Ms-ss	a	m
bo gv	15-May	MONTEREY DUNES	ss-ss	c	u
bo ov	30-Jun	NORTH FORT ORD	ss-ss	c	u
bo rv	19-May	SALT PONDS	ss-ss	c	u
bo wr	16-Jun	ZMUDOWSKI	ss-ss	c	u
bo wv	3-Jun	SALINAS NORTH	ss-ss	c	u
bo yv	7-Jul	NORTH FORT ORD	ss-ss	c	u
Bw ag	7-Jun	RESERVATION RD	Ms-ss	a	f
bw av	21-Apr	NORTH FORT ORD	ss-ss	c	u
bw bv	25-Jul	PAJARO SPIT	ss-ss	c	u
bw gv	18-May	MONTEREY DUNES	ss-ss	c	u
bw ov	27-May	SALT PONDS	ss-ss	c	u
bw ov	27-Jul	PAJARO SPIT	ss-ss	c	u
bw rv	15-May	RESERVATION RD	ss-ss	c	u
Bw wr	19-Jul	FORT ORD	Ms-ss	a	m
bw wv	3-Jun	MARINA	ss-ss	c	u
bw yv	6-Jun	MOLERA-POTRERO	ss-ss	c	u
By ar	25-Jul	PAJARO SPIT	Ms-ss	a	m
by av	25-Apr	MARINA	ss-ss	c	u
by bv	26-May	SALINAS NORTH	ss-ss	c	u
by gv	6-Jul	PAJARO SPIT	ss-ss	c	u

¹ See site descriptions for more detail.

² Ms-ss = upper tarsus metal band on Left leg; ss-ss = all lower bands

³ c = chick; a = adult

⁴ u = unknown; m = male; f = female

Appendix 14. Adults and chicks banded in 2017, Monterey Bay region.

BAND COMBINATION	BANDING DATE	BANDING LOCATION ¹	BAND TYPE ²	AGE ³	SEX ⁴
by ov	15-May	RESERVATION RD	SS-SS	C	U
by rv	7-Jun	SALINAS RIVER NWR	SS-SS	C	U
by wv	28-May	ZMUDOWSKI	SS-SS	C	U
by yv	8-Jun	MOLERA-POTRERO	SS-SS	C	U
gl av	1-May	NORTH FORT ORD	SS-SS	C	U
gl ov	19-Jun	SALT PONDS	SS-SS	C	U
gl rv	13-Jul	MONTEREY DUNES	SS-SS	C	U
gl wv	30-May	SALT PONDS	SS-SS	C	U
gl ww	30-Jun	SUNSET-MANRESA	SS-SS	C	U
gl yv	16-Jun	ZMUDOWSKI	SS-SS	C	U
go av	4-May	NORTH FORT ORD	SS-SS	C	U
go gv	26-May	SALINAS NORTH	SS-SS	C	U
go ov	22-Jul	PAJARO SPIT	SS-SS	C	U
go rv	18-Apr	NORTH FORT ORD	SS-SS	C	U
go vv	25-Jul	ZMUDOWSKI	SS-SS	C	U
go wv	20-Jun	ZMUDOWSKI	SS-SS	C	U
go yv	25-May	FORT ORD	SS-SS	C	U
gv ly	25-Jun	PAJARO SPIT	SS-SS	C	U
lg bg	28-Jul	MOSS LANDING	SS-SS	C	U
lg ov	8-May	MONTEREY DUNES	SS-SS	C	U
lg rv	26-May	FORT ORD	SS-SS	C	U
lg wv	1-Jul	MOSS LANDING	SS-SS	C	U
lg yv	7-Jun	MOLERA-POTRERO	SS-SS	C	U
lo aw	26-Jul	NORTH FORT ORD	SS-SS	C	U
lo ay	27-Jul	ZMUDOWSKI	SS-SS	C	U
lo ob	31-May	FORT ORD	SS-SS	C	U
lo or	22-Apr	SUNSET-MANRESA	SS-SS	C	U
lo ov	28-Jul	SUNSET-MANRESA	SS-SS	C	U
lo rv	9-Jun	NORTH FORT ORD	SS-SS	C	U
lo wg	28-Jul	RESERVATION RD	SS-SS	C	U
lo wv	16-Jun	RESERVATION RD	SS-SS	C	U
lo yv	7-Aug	SALINAS RIVER NWR	SS-SS	C	U
lo yy	27-Jul	MOSS LANDING	SS-SS	C	U
lw av	5-Jun	NORTH FORT ORD	SS-SS	C	U
lw bv	29-Jul	MOSS LANDING	SS-SS	C	U
lw gv	22-Jun	NORTH FORT ORD	SS-SS	C	U
lw ob	28-Jul	MOSS LANDING	SS-SS	C	U
lw ow	25-Jul	FORT ORD	SS-SS	C	U
lw oy	18-Jul	PAJARO SPIT	SS-SS	C	U
lw rb	18-Jul	MOSS LANDING	SS-SS	C	U
lw rr	21-Jul	RESERVATION RD	SS-SS	C	U
lw rv	27-Jul	MONTEREY DUNES	SS-SS	C	U
lw rw	20-Jul	MOSS LANDING	SS-SS	C	U
lw wv	22-Jul	PAJARO SPIT	SS-SS	C	U

¹ See site descriptions for more detail.

² Ms-ss = upper tarsus metal band on Left leg; ss-ss = all lower bands

³ c = chick; a = adult

⁴ u = unknown; m = male; f = female

Appendix 14. Adults and chicks banded in 2017, Monterey Bay region.

BAND COMBINATION	BANDING DATE	BANDING LOCATION ¹	BAND TYPE ²	AGE ³	SEX ⁴
lw yv	11-Jul	RESERVATION RD	ss-ss	c	u
ly av	25-Jul	FORT ORD	ss-ss	c	u
ly ov	27-Jul	ZMUDOWSKI	ss-ss	c	u
ly rv	5-Aug	RESERVATION RD	ss-ss	c	u
ly vv	29-Jul	ZMUDOWSKI	ss-ss	c	u
ly yv	14-Jun	RESERVATION RD	ss-ss	c	u
oa bv	28-Jul	RESERVATION RD	ss-ss	c	u
oa gv	6-Jun	SALT PONDS	ss-ss	c	u
Oa gy	9-Jun	NORTH FORT ORD	Ms-ss	a	m
oa ov	11-Jul	NORTH FORT ORD	ss-ss	c	u
oa rv	7-Aug	SALINAS RIVER NWR	ss-ss	c	u
oa vv	13-Jun	SALT PONDS	ss-ss	c	u
oa yv	17-Jul	RESERVATION RD	ss-ss	c	u
ob av	10-May	NORTH FORT ORD	ss-ss	c	u
Ob gg	24-Jul	PAJARO SPIT	Ms-ss	a	m
ob gv	3-Jun	SALINAS NORTH	ss-ss	c	u
ob rv	22-Apr	SUNSET-MANRESA	ss-ss	c	
ob vv	28-Jul	MOSS LANDING	ss-ss	c	u
ob wv	16-May	ZMUDOWSKI	ss-ss	c	u
ob yv	11-May	FORT ORD	ss-ss	c	u
Og ar	31-May	FORT ORD	Ms-ss	a	f
og av	23-Jun	NORTH FORT ORD	ss-ss	c	u
og bv	29-Jul	MOSS LANDING	ss-ss	c	u
og gv	28-May	SALINAS NORTH	ss-ss	c	u
og ov	21-Apr	NORTH FORT ORD	ss-ss	c	u
og rv	20-Jul	FORT ORD	ss-ss	c	u
og yv	14-Jul	RESERVATION RD	ss-ss	c	u
ol av	22-Jun	SALINAS NORTH	ss-ss	c	u
ol gv	14-Jul	RESERVATION RD	ss-ss	c	u
ol rv	20-Jul	PAJARO SPIT	ss-ss	c	u
ol vv	15-Jul	PAJARO SPIT	ss-ss	c	u
ol wv	17-Jul	RESERVATION RD	ss-ss	c	u
oo av	19-May	SALT PONDS	ss-ss	c	u
Oo br	16-Jun	NORTH FORT ORD	Ms-ss	a	f
oo gv	3-Jun	SALINAS NORTH	ss-ss	c	u
oo ov	7-Jul	NORTH FORT ORD	ss-ss	c	u
oo rv	21-Apr	NORTH FORT ORD	ss-ss	c	u
oo vv	26-Jul	PAJARO SPIT	ss-ss	c	u
oo wv	15-May	MONTEREY DUNES	ss-ss	c	u
oo yv	27-May	SALT PONDS	ss-ss	c	u
oo yv	27-Jul	PAJARO SPIT	ss-ss	c	u
Ow ar	18-May	MONTEREY DUNES	Ms-ss	a	m
ow av	6-Jul	PAJARO SPIT	ss-ss	c	u
ow bv	26-Jul	PAJARO SPIT	ss-ss	c	u

¹ See site descriptions for more detail.

² Ms-ss = upper tarsus metal band on Left leg; ss-ss = all lower bands

³ c = chick; a = adult

⁴ u = unknown; m = male; f = female

Appendix 14. Adults and chicks banded in 2017, Monterey Bay region.

BAND COMBINATION	BANDING DATE	BANDING LOCATION ¹	BAND TYPE ²	AGE ³	SEX ⁴
ow gv	15-Jun	ZMUDOWSKI	ss-ss	c	u
ow rv	29-Jun	SALINAS RIVER NWR	ss-ss	c	u
ow rw	20-Jul	MOSS LANDING	ss-ss	c	u
ow wv	13-Jun	SALT PONDS	ss-ss	c	u
Ow ww	27-Jul	MOSS LANDING	Ms-ss	a	m
ow yv	19-Jul	FORT ORD	ss-ss	c	u
oy av	15-May	RESERVATION RD	ss-ss	c	u
oy gv	3-Jun	MARINA	ss-ss	c	u
oy ov	6-Jun	MOLERA-POTRERO	ss-ss	c	u
oy rv	2-May	RESERVATION RD	ss-ss	c	u
oy rv	7-Aug	PAJARO SPIT	ss-ss	c	u
Oy wr	27-Jul	MOSS LANDING	Ms-ss	a	m
oy wv	23-May	MONTEREY DUNES	ss-ss	c	u
oy yv	6-Jul	PAJARO SPIT	ss-ss	c	u
ra av	15-May	RESERVATION RD	ss-ss	c	u
ra av	6-Jun	MARINA	ss-ss	c	u
Ra br	21-Jul	PAJARO SPIT	Ms-ss	c	m
Ra gy	28-Jul	MOSS LANDING	Ms-ss	a	m
ra ov	28-May	ZMUDOWSKI	ss-ss	c	u
Ra oy	28-May	ZMUDOWSKI	Ms-ss	a	m
Ra rr	30-May	SALT PONDS	Ms-ss	a	m
ra rv	22-Jun	SALINAS NORTH	ss-ss	c	u
ra vv	28-Jul	RESERVATION RD	ss-ss	c	u
ra wv	1-May	NORTH FORT ORD	ss-ss	c	u
ra yv	18-Apr	NORTH FORT ORD	ss-ss	c	u
rb av	26-May	MARINA	ss-ss	c	u
rb bv	19-Jun	SALT PONDS	ss-ss	c	u
Rb bw	20-Jul	FORT ORD	Ms-ss	a	f
rb gv	11-Jun	MOLERA-POTRERO	ss-ss	c	u
rb ov	30-May	SALT PONDS	ss-ss	c	u
rb ov	30-Jun	SUNSET-MANRESA	ss-ss	c	u
rb rv	16-Jun	ZMUDOWSKI	ss-ss	c	u
Rb ry	10-Jul	RESERVATION RD	Ms-ss	a	m
rb wv	4-May	NORTH FORT ORD	ss-ss	c	u
rb yv	28-May	SALINAS NORTH	ss-ss	c	u
ro av	30-May	SALT PONDS	ss-ss	c	u
ro bv	20-Jul	MOSS LANDING	ss-ss	c	u
Ro by	19-Jul	MOSS LANDING	Ms-ss	a	f
ro gv	20-Jul	MOSS LANDING	ss-ss	c	u
ro ov	25-May	FORT ORD	ss-ss	c	u
ro rv	3-Jun	MARINA	ss-ss	c	u
Ro ry	29-Jun	PAJARO SPIT	Ms-ss	a	m
ro wv	6-Jun	MARINA	ss-ss	c	u
ro yv	8-May	MONTEREY DUNES	ss-ss	c	u

¹ See site descriptions for more detail.

² Ms-ss = upper tarsus metal band on Left leg; ss-ss = all lower bands

³ c = chick; a = adult

⁴ u = unknown; m = male; f = female

Appendix 14. Adults and chicks banded in 2017, Monterey Bay region.

BAND COMBINATION	BANDING DATE	BANDING LOCATION ¹	BAND TYPE ²	AGE ³	SEX ⁴
rw av	18-May	FORT ORD	ss-ss	c	u
Rw ay	6-Jul	PAJARO SPIT	Ms-ss	a	m
rw bv	1-Jul	MOSS LANDING	ss-ss	c	u
rw gv	8-Jun	MOLERA-POTRERO	ss-ss	c	u
Rw og	27-Jul	MOSS LANDING	Ms-ss	a	m
rw ov	10-May	NORTH FORT ORD	ss-ss	c	u
rw rv	3-Jun	SALINAS NORTH	ss-ss	c	u
rw yv	19-May	SALT PONDS	ss-ss	c	u
Rw yy	27-Jun	NORTH FORT ORD	Ms-ss	a	f
wa av	20-Jun	MARINA	ss-ss	c	u
wa gv	29-Jun	MOLERA-POTRERO	ss-ss	c	u
wa ov	20-Jul	FORT ORD	ss-ss	c	u
wa vv	7-Jun	SALINAS RIVER NWR	ss-ss	c	u
wa yv	5-Jun	PAJARO SPIT	ss-ss	c	u
wb av	28-Apr	MARINA	ss-ss	c	u
wb gv	26-May	FORT ORD	ss-ss	c	u
wb ov	1-Jun	SALT PONDS	ss-ss	c	u
wb vg	2-Aug	SUNSET-MANRESA	ss-ss	c	u
wb vy	30-Jul	PAJARO SPIT	ss-ss	c	u
wb vv	14-Jul	RESERVATION RD	ss-ss	c	u
wb yv	6-Jun	MARINA	ss-ss	c	u
wg av	11-Jul	NORTH FORT ORD	ss-ss	c	u
wg bv	19-Jun	SALINAS RIVER NWR	ss-ss	c	u
wg gv	1-Jun	SALT PONDS	ss-ss	c	u
wg ov	18-Jul	ZMUDOWSKI	ss-ss	c	u
wg rv	29-Jul	ZMUDOWSKI	ss-ss	c	u
wg vv	5-Aug	RESERVATION RD	ss-ss	c	u
wg vv	17-Jul	RESERVATION RD	ss-ss	c	u
wg yv	24-Jul	NORTH FORT ORD	ss-ss	c	u
wo av	14-Jul	RESERVATION RD	ss-ss	c	u
wo bv	18-May	MONTEREY DUNES	ss-ss	c	u
wo gv	1-May	NORTH FORT ORD	ss-ss	c	u
wo ov	31-May	ZMUDOWSKI	ss-ss	c	u
wo rv	3-Jun	SALINAS NORTH	ss-ss	c	u
wo vv	27-Jul	ZMUDOWSKI	ss-ss	c	u
wo vv	21-Jul	RESERVATION RD	ss-ss	c	u
wo yv	21-Apr	NORTH FORT ORD	ss-ss	c	u
wr av	23-May	MONTEREY DUNES	ss-ss	c	u
wr bg	3-May	NORTH FORT ORD	ss-ss	c	u
wr gv	30-May	SALT PONDS	ss-ss	c	u
wr ov	1-Jun	FORT ORD	ss-ss	c	u
wr rv	16-May	ZMUDOWSKI	ss-ss	c	u
wr vv	6-Jun	MOLERA-POTRERO	ss-ss	c	u
wr yv	2-May	RESERVATION RD	ss-ss	c	u

¹ See site descriptions for more detail.

² Ms-ss = upper tarsus metal band on Left leg; ss-ss = all lower bands

³ c = chick; a = adult

⁴ u = unknown; m = male; f = female

Appendix 14. Adults and chicks banded in 2017, Monterey Bay region.

BAND COMBINATION	BANDING DATE	BANDING LOCATION ¹	BAND TYPE ²	AGE ³	SEX ⁴
wy av	9-Jun	NORTH FORT ORD	ss-ss	c	u
wy gv	15-Jun	MARINA	ss-ss	c	u
wy ov	1-Jun	SALT PONDS	ss-ss	c	u
wy rv	16-Jun	RESERVATION RD	ss-ss	c	u
wy wv	5-Jun	NORTH FORT ORD	ss-ss	c	u
ya ay	5-Jul	PAJARO SPIT	ss-ss	c	u
ya bv	28-Jul	MOSS LANDING	ss-ss	c	u
ya ov	20-Jul	PAJARO SPIT	ss-ss	c	u
ya rv	17-Jul	FORT ORD	ss-ss	c	u
ya wy	20-Jul	PAJARO SPIT	ss-ss	c	u
ya yv	7-Jul	SALINAS RIVER NWR	ss-ss	c	u
yb av	17-Jul	ZMUDOWSKI	ss-ss	c	u
yb bv	17-Jul	PAJARO SPIT	ss-ss	c	u
Yb gg	5-Jun	NORTH FORT ORD	Ms-ss	a	m
yb gv	28-Jul	MOSS LANDING	ss-ss	c	u
yb ov	28-May	SALINAS NORTH	ss-ss	c	u
yb rv	27-May	SALT PONDS	ss-ss	c	u
yb rv	28-Jul	PAJARO SPIT	ss-ss	c	u
yb vy	29-Jul	PAJARO SPIT	ss-ss	c	u
yb wv	22-Jun	SALINAS NORTH	ss-ss	c	u
yb yv	23-May	MONTEREY DUNES	ss-ss	c	u
Yg ar	19-Jul	FORT ORD	Ms-ss	a	m
yg av	30-Jun	NORTH FORT ORD	ss-ss	c	u
Yg ay	6-Jun	RESERVATION RD	Ms-ss	a	f
yg bv	20-Jul	SALINAS NORTH	ss-ss	c	u
yg gv	21-Jun	SALINAS RIVER NWR	ss-ss	c	u
yg ov	15-Jun	SALT PONDS	ss-ss	c	u
yg ov	24-Jul	SUNSET-MANRESA	ss-ss	c	u
yg rv	14-Jul	RESERVATION RD	ss-ss	c	u
yg wv	14-Jul	SALINAS RIVER NWR	ss-ss	c	u
yg yv	15-Jun	ZMUDOWSKI	ss-ss	c	u
Yl aw	26-Jul	PAJARO SPIT	Ms-ss	a	m
yo av	1-Jun	FORT ORD	ss-ss	c	u
yo bv	28-Jul	MOSS LANDING	ss-ss	c	u
yo gv	25-Jul	PAJARO SPIT	ss-ss	c	u
yo ov	27-Jul	MONTEREY DUNES	ss-ss	c	u
yo rv	27-May	SALT PONDS	ss-ss	c	u
yo wv	29-Jun	MOLERA-POTRERO	ss-ss	c	u
yo yv	16-May	ZMUDOWSKI	ss-ss	c	u
Yo yy	27-Jul	MOSS LANDING	Ms-ss	a	m
Yr ag	13-Jun	SALT PONDS	Ms-ss	a	f
yr av	22-Jun	NORTH FORT ORD	ss-ss	c	u
yr bv	5-Jun	NORTH FORT ORD	ss-ss	c	u
yr bv	31-Jul	PAJARO SPIT	ss-ss	c	u

¹ See site descriptions for more detail.

² Ms-ss = upper tarsus metal band on Left leg; ss-ss = all lower bands

³ c = chick; a = adult

⁴ u = unknown; m = male; f = female

Appendix 14. Adults and chicks banded in 2017, Monterey Bay region.

BAND COMBINATION	BANDING DATE	BANDING LOCATION ¹	BAND TYPE ²	AGE ³	SEX ⁴
yr bv	2-Aug	SUNSET-MANRESA	ss-ss	c	u
yr gv	14-Jul	SALINAS RIVER NWR	ss-ss	c	u
yr ov	6-Jun	SALT PONDS	ss-ss	c	u
yr rv	20-Jun	ZMUDOWSKI	ss-ss	c	u
yr wv	6-Jun	FORT ORD	ss-ss	c	u
yr yv	6-Jun	MARINA	ss-ss	c	u
yv ao	25-Jun	PAJARO SPIT	ss-ss	c	u
yy av	17-May	MONTEREY DUNES	ss-ss	c	u
yy bv	8-May	MONTEREY DUNES	ss-ss	c	u
yy gv	18-May	FORT ORD	ss-ss	c	u
yy ov	17-Jul	ZMUDOWSKI	ss-ss	c	u
yy rv	7-Jun	MOLERA-POTRERO	ss-ss	c	u
yy vv	18-Jul	MOSS LANDING	ss-ss	c	u
yy wv	26-May	FORT ORD	ss-ss	c	u
yy yv	6-Jun	MARINA	ss-ss	c	u

¹ See site descriptions for more detail.

² Ms-ss = upper tarsus metal band on Left leg; ss-ss = all lower bands

³ c = chick; a = adult

⁴ u = unknown; m = male; f = female