State of California
Natural Resources Agency
Department of Fish and Wildlife
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California Least Tern Breeding Survey

2017 Season

by
Hans Sin

Nongame Wildlife Program, 2021

Final Report

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ABSTRACT

Monitoring to document breeding success of California least terns (*Sternula antillarum browni*) continued in 2017, with a known 29 active nesting sites providing data, a decrease of 5 active nesting sites from 2016. An estimated 4097-5598 tern breeding pairs established 5983 nests and produced 1131-1655 fledglings across California. The fledgling to breeding pair ratio was 0.2 to 0.4. Statewide, 9518 eggs were reported, with an average clutch size of 1.72 eggs.

Camp Pendleton, Naval Base Coronado, Batiquitos, Point Mugu, Huntington, and Alameda Point each had over 300 minimum nests (same sites with > 300 nests in 2016), which represented 75% of the state nest total, and produced 65% of the state's fledglings. Overall least tern mortality (combined life stages of egg, chick, fledgling, and adult) due to non-predation factors was greater than mortality due to predation in 2017. However, predation mortality for eggs and adults was greater than non-predation mortality. Of the non-predation egg mortality events, the highest cause of failure was attributed to abandonment prior to the expected hatching date and post-term.

With the expressed consent of Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE) and Terra Peninsular we are able to report California least tern breeding data for the first time on the Baja peninsula. For 2017, a total of 472 pairs were reported from Ensenada to as far south as La Paz. These surveys were conducted by a team of researchers that visited 27 of the known 31 nesting sites during the breeding season.

Least terns were also observed in the State of Hawaii on the Island of Hawai'i in 2017. Monitors reported the presence four pairs producing six fledglings at Kohana'iki on the leeward side of the island, with the nesting season occurring from April through July (Baird et al. 2017). These species were confirmed to be least terns by genetic analysis and have been observed nesting on the Island of Hawai'i since 2012 (Scott Waddington, pers. comm., 2012, Baird et al. 2014).

INTRODUCTION

Species Taxonomy and Life History

[1] Sin, H. 2021. California least tern breeding survey, 2017 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 20121-xx. Sacramento, CA. 23 pp + Appendices.

The California least tern (*Sternula antillarum browni*) is a subspecies of least terns nesting along the west coast of North America, from Baja California, Mexico, north to the San Francisco Bay area (USFWS 1980). Least terns have been documented to nest on Midway Atoll (1989) and on the Island of Hawai'i (Szczys et al. 2014). A taxonomic change by the AOU (Banks et al. 2006) resurrected the genus *Sternula* for the least tern (formerly *Sterna*) based on the work of Bridge et al. (2005). Two other subspecies, Interior (*S. a. athalassos*) and Eastern (*S. a. antillarum*), are recognized in the United States (American Ornithologists' Union: AOU 1957); however, there is little genetic variation among the subspecies which questions the validity of this division (Draheim et al. 2010).

California least terns are thought to winter along the west coast of Central and South America (Massey 1977) with some evidence by a single band recovery of a second-year California least tern from coastal Guatemala that was recovered following a hurricane (USGS Bird Banding Laboratory, Unpublished). However, the wintering grounds of the California least tern are not known at this time.

They migrate to nesting areas by mid- to late-April and are generally present through September (Massey 1974, Cogswell 1977, Patton 2002). They nest as far north as Sacramento and as far south to La Paz, Baja California Sur (Eduardo Palacios, pers. comm., 2018). California least terns often have two waves of nesting during the breeding season (Massey and Atwood 1981). Late-season nests may be established by renesters from the first wave or late-arriving first time breeders (Massey and Atwood 1981). The age of first breeding is typically 3 years; however, breeding by two-year-old terns has been documented (Massey and Atwood 1981).

California least terns establish nesting colonies on sandy soils with little vegetation along the ocean, lagoons, and bays, where they forage by plunge-diving for small fish (e.g., anchovy, *Engraulis* sp., and silversides, *Antherinopsidae*). Their nests are shallow depressions lined with shells or other debris (Massey 1974, Cogswell 1977). Given that vegetative cover in active least tern colonies is generally less than 20% (Gockfeld 1983, Carreker 1985), removal of non-native vegetation and select native vegetation is recommended to maintain open nesting areas with some dense vegetation that can be used by chicks to hide from predators (Ryan et al. 2010). On average, there are two eggs per nest that are incubated by both parents for approximately three weeks. Upon hatching, the semi-precocial young are tended by both parents, become mobile within three days, and can fly by 28 days (U.S. Fish and Wildlife Service 1985). Least terns are a long-lived species and banded birds have been recovered after 24 years (USGS Bird Banding Laboratory, Unpublished).

Listing Status

The California least tern was listed as endangered by the U.S. Secretary of the Interior in 1970 (USFWS 1973) and the California Fish and Game Commission in 1971 (CDFG 1976) due to a population decline resulting from loss of habitat (Craig 1971, Cogswell 1977). The endangered status prompted wildlife agencies to initiate monitoring efforts to estimate the breeding population size of least terns in California. The Revised California Least Tern Recovery Plan (U.S. Fish and Wildlife Service 1985) identifies the recovery of the species as follows:

> "The annual breeding population in California must increase to at least 1200 pairs distributed in at least 20 secure coastal management areas throughout their 1982 breeding range before delisting can be considered. Each of the 20 secure management areas must have a minimum of 20 breeding pairs with a 5-year mean reproductive rate of at least 1.0 young fledged/per breeding pair. Of these 20 secure management areas San Francisco Bay, Mission Bay and San Diego Bay must have a minimum of 4, 6 and 6 secure colonies, respectively. If 1,200 breeding pairs in California occur in 15 secure management areas with a 3-year mean reproduction rate of 1.0, the California least tern

may be considered for threatened status. When additional information is available on the extent of nesting in Baja California, the Mexican colonies may be considered in the recovery goal for both threatened status and delisting."

Given the debate of sub-species the revised California Least Tern Recovery Plan identifies, "The subspecific status of the California least tern has no bearing on its endangered species listing because distinct population segments of a vertebrate species may be listed under the Endangered Species Act of 1973, as amended" (U.S. Fish and Wildlife Service 1985).

Monitoring Efforts

Craig (1971) conducted the initial surveys of breeding colonies in 1969 and 1970, focusing on site characteristics, including historical use and threats to each colony. In 1973, the first annual breeding survey was conducted (Bender 1974a), which changed the focus of the monitoring effort from an earlier descriptive emphasis to quantifying breeding numbers and nesting success for each breeding colony. Factors determining breeding success, such as predation and egg and chick abandonment, were recorded starting in 1975 (Massey 1975). From 1976 to 1978, research and new management techniques were initiated to develop a better understanding of least tern biology and to increase breeding success. These techniques included banding to study local movements (Jurek 1977), use of chick shelters (Jurek 1977), identifying key feeding areas (Atwood et al. 1977), and extensive use of decoys (Atwood et al. 1979). The first documented records of fledglings appeared in the 1977 annual survey report (Atwood et al. 1977). Massey (1989a) later conducted an analysis of fledgling survey techniques to determine a method that minimized sampling problems associated with the tendency of young to leave the nesting area within approximately three weeks of hatching. Based on that analysis, she recommended that an evening count of fledglings be done every three weeks, starting approximately eight to nine weeks after the first egg is laid, or three weeks after the first fledgling is observed.

Since 1971, the frequency of nest monitoring at breeding colonies increased from one to three visits per year to more than one visit per week. However, wide variation exists among sites and years. The observed statewide population increase of least terns in the 1970s and 1980s has been attributed to increased sampling and associated personnel effort rather than an actual increase in the number of California least terns (Atwood et al. 1977, USFWS 1980, Massey 1988). Additionally, USDA APHIS Wildlife Services (formerly Animal Damage Control) commenced predator management activities to benefit least terns in the 1980's. Their involvement resulted from monitors identifying predation of chicks as the main factor of poor breeding success rather than reduced habitat and pair disturbance (Collins 1984). Obst and Johnston (1992) recommended that datasheets and fledgling counts be standardized across the state. This was accomplished in 1993 when all site monitors were provided with the same datasheets and instructions (Caffrey 1994, 1995a). In an attempt to provide a more accurate statewide (rather than site specific) method of estimating the number of breeding pairs, calculations consider the number of pairs renesting on a site (Caffrey 1998). These equations have been used since the 1998 nesting season (Keane 2000). For over a decade, monitors have continued to provide comparable California least tern breeding success data, which has been compiled into annual summary reports.

In 2014, the Institute for Ecological Monitoring and Management (IEMM) completed an analysis of the long-term California least tern dataset to: (1) identify population trends and drivers of those trends; and (2) evaluate current monitoring and management practices. Based on their analyses, they recommended:

- Adopting the new data collection and reporting protocol deployed by CDFW in 2013;

- Decreasing emphasis on number of eggs per nest;
- Increased emphasis on fledgling monitoring using the improved chick classification method;
- Improved vital rate monitoring through a well-designed and coordinated recapture effort;
- Exploring new methods of colony monitoring like video or pellet and isotope analyses; and
- Rebalancing the effort directed to data collection and analysis to include more frequent comprehensive analyses.

The new data collection and reporting protocols were utilized by monitors since 2014 and continued through the 2017 breeding season in California.

For the intents of this report, to be consistent with the Recovery Plan, a nesting site is defined as a distinct area where least terns have established at least one nest; this site is usually identified by landowner or a specific land designation (i.e., a State Park). These nesting sites can also be synonymous with the term nesting colony. Furthermore, within a nesting site there can be least terns nesting in distinct groups with various distances apart; these nesting groups will be referred to as sub-colonies or sub-sites for management purposes.

Recovery of California Least Terns in Baja California, Mexico

The Revised California Least Tern Recovery Plan (U.S. Fish and Wildlife Service 1985) identifies the following in the first paragraph of Recovery Objectives:

> "The primary objective of this recovery plan is to restore and subsequently maintain the breeding population of California least terns at a secure level so that delisting can be considered. To achieve this level, the annual breeding population in California must increase to at least 1,200 pairs distributed among secure colonies in at least 20 secure coastal management areas throughout their breeding range. Concurrently, efforts should be directed toward protecting the existing breeding population in Baja California, Mexico. Data from California least tern populations in Baja California are insufficient to incorporate population numbers and necessary fledging rates into the prime objective for reclassification. When these data become available the prime objective will be modified accordingly. Because of current Mexican land use practices, remoteness of areas, and minimal monitoring of land uses, it appears unlikely that the Mexican colonies will contribute substantially to the recovery effort. However, this situation requires clearer definition."

Furthermore, the Step-down Outline of Recovery, Objective 5 states the following:

> "5. Encourage the protection of population outside the United States.
>
> 51. Protect least tern population and habitats in Baja California.
>
> 511. Determine colony locations and population size.
>
> 512. Identify least tern population and habitat protection problems.
>
> 513. Develop cooperative programs between the United States and Mexican governments for least tern protection and habitat preservation.
>
> 52. Identify and protect key migration and winter habitats outside the United States."

With the assistance of Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE) and Terra Peninsular, we can report and spatially display the range of the species with pair

estimates of California least terns into Baja, Mexico since the first recovery plan was written in 1977. Until recently, the knowledge of the California least tern in Baja, Mexico has been limited.

METHODS

Monitors for each site that had least tern nesting in 2017 or who planned monitoring activities for 2017 were provided the instructions and spreadsheet to report final breeding data used for the annual report. The spreadsheet format was revised in 2013, but the data fields remained similar to those used since the 1998 nesting season in order to continue standardized data collection for the entire state. The revised spreadsheet included more detailed information in the Season Chronology worksheet, which was used to calculate values that previously had to be entered separately in the Monitoring, Pair Estimation, Productivity, and Chronology worksheets. Likewise, the revised Mortality worksheet combined the data fields that had to be entered separately in the previous Mortality, Non-nest Mortality, and Predation worksheets.

Site Information

Site Preparation

Prior to the arrival of California least terns on the nesting grounds, land managers conducted a variety of site preparation activities, which varied by site based on need, staffing, and available funding (Appendix A-1). Information about each nesting site was requested to determine the level of protection provided to the birds. If a site had more than one discrete cluster of nests, the monitor had the option of reporting information for each sub-colony and/or for the entire the site. Following established conservation and monitoring methods for least terns and other similar species, monitors reported use of shelters to protect chicks from predators and weather, decoys to attract adults, presence of interpretive signs to explain restricted access, and a grid system to assist in locating nests with a yes/no response. However, fence type, vegetation management, and predator management were more variable. To standardize and simplify these three variables, categories were created which were easily reported as a number.

Fence type was reported as one of four categories: (1) the fence deterred or excluded most people and mammalian predators (i.e., chain link or solid fence that fully encloses the site); (2) cantilevered and/or barbed wire at the top deterred cats and other climbing mammals; (3) the fence would not deter most mammalian predators (i.e., not fully fenced on all sides; or fenced only with posted signs and wire or twine), or (4) no enclosure.

Vegetation management was reported as one of seven categories: (1) mechanically graded or dragged to remove vegetation; (2) manually removed; (3) herbicide (e.g., glyphosate or fusilade use; (4) combination of 1, 2 or 3; (5) vegetation removed by other means (e.g., spraying with salt water, soil solarization); (6) no vegetation management occurred prior to the nesting season, but was needed in the opinion of the monitor; or (7) vegetation management was not necessary.

Predator management was reported as one of three categories: (1) proactive (pre-nesting season) predator removal; (2) reactive predator removal; or (3) none.

Sampling Type

Each site was categorized as Type 1, 2, or 3 based on the level of sampling intensity employed. At a Type 1 site, monitors entered the colony to mark nests and record the number of eggs; a Type 2 nesting site was monitored from outside the colony. A Type 3 site was monitored primarily from

outside the colony, but sampling within the colony occurred more frequently than once per month or more than 5 times during the season when nests are active, or chicks are present. Type 1 sites yield more data, such as clutch size, hatching success, and evidence of predation. This type of monitoring allows more quantitative comparisons to be made among sites and years. Type 2 monitoring, however, minimizes disturbance to the nesting colony, possibly offering better conditions for behavior studies (Keane 1998, 2000, 2001).

Information regarding other monitoring techniques was requested as well. This included nest marking (generally with a tongue depressor or wooden stake), egg marking (numbering the shell), bird banding, and fledgling estimate method. When birds were banded or resighted, band number and color, nest number, date, and bird age and status (i.e., trapped and released, found dead, or other) was requested.

Fledgling estimate method was reported as one of four categories: (R) based on band recapture data; (3WD) based on daytime counts of fledglings added up every 3 weeks beginning 2-3 weeks after the first fledgling observation; (3WN) based on dusk counts of fledglings added up every 3 weeks beginning 2-3 weeks after the first fledgling observation; or (Other) based on alternate method. Nest information including nest number, grid code, and UTM coordinates were requested.

Monitoring Breeding Season Chronology

For each day breeding colonies were monitored, the following was reported: date, number of monitors, hours in the colony or blind, adults, fledges, chicks off nest, each predator species observed, and status of each nest using the following egg codes (e.g., two eggs in nest was coded 2E, or one egg and one hatch in nest was coded 1E/1H): E (egg); C (chick); DC (dead chick); DH (died hatching); H (hatched and no longer present); PH (probable hatch); A (abandoned pre-term); NV (abandoned post-term/non-viable); P (predated); B (buried by wind); D (damaged); T (human take); F (flooded); U (unknown); and INC (actively-incubated nest, contents unknown).

Pair Estimation

Three different calculations (Methods I, II, III) were used to determine the total number of breeding pairs at any one site. Adjustments to the total number of nests was required to estimate breeding pair totals due to pairs renesting after a failed attempt and young adults nesting later in the year (Massey and Atwood 1981).

Method I assumes the number of breeding pairs renesting is equal to half of the number of nests in the second wave, with the second wave defined as all nests initiated after 14 June (unless otherwise specified by the site monitor). If there is a period with an obvious lull in nest initiation, dates of nest initiation dictate the start of the second wave. For Method I, total breeding pairs of a site is calculated by adding the number of nests of the first wave (prior to 15 June) to half of the nests in the second wave.

Total Pairs (#nests prior to 15 June + [(#nests 15 June or after) / 2])

Method II calculates the total number of breeding pairs by subtracting the total number of nests and broods lost prior to 20 June from the total number of nests. This method assumes that renesting will not occur from a nest or brood lost after 20 June and the number of nests and broods lost before this date are equal to the number of pairs renesting at that same site.

Total Pairs (total nests - (#unsuccessful nests prior 20 June + #broods lost prior 20 June)

Method III is much more subjective, relying on the monitor to estimate of the number of renesting pairs in the first and second wave. This calculation subtracts the estimated number of renesting pairs for each wave from the total nests during each wave. The totals for waves one and two are then added to estimate the total number of breeding pairs. Adult banding can reduce the subjectivity of Method III by allowing the monitor to observe renesting pairs.

pairs first wave (#nests prior to 15 June - estimated renesters prior to 15 June)

pairs second wave (#nests 15 June or after - estimated renesters 15 June or after)

Total Pairs (pairs first wave + pairs second wave)

Pair estimation and total nest calculations included eggs that were laid and likely abandoned shortly thereafter, as the eggs were not observed to be incubated or attended by an adult.

Productivity

Productivity was measured by counting the number of nests, eggs, and eggs hatched, hatching success (ratio of eggs hatched to total eggs), and total fledglings at each site. Dates of first chick and fledgling were also typically recorded. These data will not be available for Type 2 or 3 sites simply because monitors cannot easily observe eggs and nests from a distance.

Statewide mean clutch size was calculated by using data from sites that reported clutch sizes of every nest detected (Statewide clutch size). In those cases, each nest was treated as an independent sample. Only Type 1 sites were used for clutch size calculations because the data from Type 2 and 3 sites was not reliable.

Accurate fledgling counts are problematic as fledglings quickly move from their nesting areas (Massey 1989a). As defined above, at least four specific techniques may be used. Reported fledgling counts are based on the total number of fledglings produced at each site, including those that were later found dead.

Mortality and Predation

Identifying causes of mortality was of particular importance since it has been identified as the main cause of low reproductive success for this species (Collins 1984). Therefore, mortality data was reported by date and included numbers of lost nests and individuals of each age class (egg, chick, fledgling, and adult). Causes of mortality were reported using one of the following mortality codes: P (predated); D (damaged); T (human take); F (flooded); B (buried by wind); DS (disease suspected); U (unknown); DH (died hatching); A (abandoned pre-term); or NV (abandoned post-term/non-viable). If the mortality cause was believed to be predation, predator species, type, and evidence were reported. Predator types were characterized as either "possible," "suspected," or "documented." If predation of terns occurred and a potential predator was known to be on or near the site through direct observation or other signs (track, scat, etc.), the animal was considered a *possible* predator. A *suspected* predator was reported when loss of least terns directly corresponded to the presence of a predator. *Documented* predators required a direct observation of a predator killing a least tern or substantial evidence to indicate responsibility. These three predator classifications rely on the expertise of the monitors. The evidence could be characteristic feeding patterns or tracks leading to a carcass or shell remains. Evidence of predation was reported using one of the following codes: O (observed predation); V (visual of predator on site); S (predator sign); and/or C (least tern carcass).

To quantify the impact of each predator species on the reproductive success and survivorship of least terns, two statistics are provided. The first ranks the species by the number of least tern individuals they were documented or suspected to have depredated. The second quantifies mortality by calculating the proportion of total least tern eggs, chicks, fledglings, and adults depredated by specific predators. The number of eggs, rather than the number of nests, was used in calculations since they more accurately represent individual terns. For the few cases when the number of eggs was not reported, the number of nests was used as a conservative estimate of the number of eggs depredated. When a range of individuals depredated by a species was reported, the average was used. Past analysis with minimum, average, or maximum values resulted in only slight differences (Marschalek 2005). Only the numbers of terns lost to a suspected or documented predator (possible category excluded) were used in calculating the proportion of least terns lost to predators. Past data shows little difference between only documented predation and combining suspected and documented predation (Marschalek 2008).

<u>Predator Control</u>

Both preventive and reactive predator management techniques were used to reduce the loss of least terns. Select predators were often removed from the site or adjacent areas just prior to the terns arriving in the spring. When predation was documented, the predator was removed using appropriate capture techniques. Sensitive and protected species were either trapped and released at off-site locations or were left on site and monitored. Number, sex, age, and disposition of each predator species, date, and control method and effort (e.g., hours on colony, trap hours, or trap nights) were requested. Predator disposition was reported using one of the following codes: H (harass); U (unsuccessful capture attempt); E (escaped); T (transferred); C (captively-held); R (relocated); K (killed); and D (found dead).

RESULTS and DISCUSSION

Site Preparation

Managers at most sites (Figure 1) implemented a variety of techniques to control vegetation, generally using mechanical and chemical methods together. Vegetation was managed at 81% of sites where it was needed. The majority of nesting sites (67%) were protected by fencing or an adjacent water body. Fences were extremely variable, ranging from wire or twine to a chain link fence completely enclosing the site. While over half of the sites used chick shelters, less than half of the sites used decoys. Site specific and site preparation data are in Appendix A-1.

Figure 1. Known nesting sites for the California Least Tern

Monitoring

The majority of sub-colonies monitored in 2017 were Type 1 sites and monitored at least one or two times per week. A grid system to assist in locating nests was used at most sites and nest marking was used at nearly all the sites. Color banding information is also provided in Appendix A-2.

Productivity

The 2017 California least tern nesting season lasted approximately five months. Least terns were heard vocalizing at Venice Beach, Huntington Beach and D St. Fill/Sweetwater on April 11th, five days later than the first detection in 2016. The first nest was detected at Camp Pendleton on April 26th, one day later at the same location as the 2016 season. Both the first chick (May 19th), and the first fledgling (June 9th) were detected at D St. Fill/ Sweetwater Marsh NWR. The last nest was found in Pt. Mugu on August 2nd, and least terns were last observed at Malibu Lagoon, and Tijuana Estuary NERR on September 9th. There was a new nesting location established this year at Malibu Lagoon, within Los Angeles County. Site-specific and complete productivity data are in Appendices A-3 (Pair Estimation Method I), A-4 (Pair Estimations Method II and III) and A-5 (Productivity). Based on 28

sites that reported demographic nest data, there were 9518 total eggs, with a Statewide clutch size of 1.62 eggs (Appendix A-6).

An estimated 4097-5598 California least tern breeding pairs established 5983 nests and produced 1080-1623 fledglings at 29 nesting sites with a total of 52 sub-colonies (Table 1, Figure 2, Appendices A-3 and 4). The fledgling to breeding pair ratio was 0.20 to 0.40, lower than that in 2016 (0.35 to 0.50 fledglings per pair). The minimum number of pairs at 4097, though higher than in 2016 at 3989, still shows a down trend of the population since 2003 when the minimal pairs were estimated at 6688.

The majority of breeding pairs were in San Diego County (2320 minimal pairs, 56%) and the fewest in the central coast area: San Luis Obispo and Santa Barbara counties combined (63 minimal pairs, 1.5%) (Table 1). While 85% of breeding pairs nested in the coastal southern California counties (San Diego, Orange, LA, and Ventura), the San Francisco Bay and central coast areas had the highest minimum fledgling-to-maximum pair ratio. This ratio is the most conservative estimate of fledgling success and ranged from a low of 0.25 in San Diego County to a high of 0.67 in the San Francisco Bay area. The colony with the highest ratio was Napa Sonoma with 1.23 fledglings per pair (Table 1).

Alameda Point, Huntington State Beach, Batiquitos, Naval Base Coronado each had over 300 minimum breeding pairs, which represented 72% of the state total, and produced 59% of the state's fledglings (Table 1).

Baja California had a total of 472 pairs (Table 2). Many of the sites' data were collected with one-time visits and might not have had as robust data compared to the United States. This demonstrates a funding need for monitoring efforts in Mexico.

Table 1. California least tern colony productivity in 2017 in the United States (pair estimates using Methods I, II, and III at site level).

2017 Results	Estimated Number of Breeding Pairs		Number of Nests	Estimated Number of Fledglings		Fledglings per Pair Ratio	
Site	**Min**	**Max**		**Min**	**Max**	**Min**	**Max**
Sacramento Area							
Bufferlands	1	1	1	0	0	0	0
San Francisco Bay Area							
Napa Sonoma Marsh Wildlife Area	65	65	142	80	80	1.23	1.23
Montezuma – Totals	7	8	9	5	5	0.63	0.71
Pittsburg Power Plant							
Alameda Point	382	386	447	182	250	0.47	0.65
Hayward Regional Shoreline	66	68	72	71	77	1.04	1.17
Eden Landing Ecological Reserve	14	20	21	20	28	1	2
Kings/San Luis Obispo/Santa Barbara Counties							
Kettleman City Evaporation Ponds	0	0	0	0	0	N/A	N/A
Oceano Dunes SVRA	44	48	52	7	7	0.15	0.16
Rancho Guadalupe Dunes Preserve	0	0	0	0	0	N/A	N/A
Guadalupe/Nipomo Dunes NWR	0	0	0	0	0	N/A	N/A
Vandenberg AFB-Purisima Pt.	19	27	28	8	8	0.3	0.42
Coal Oil Point Reserve	0	0	0	0	0	N/A	N/A
Ventura County							
Ormond Beach	25	37	38	20	20	0.54	0.8
Hollywood Beach	0	0	0	0	0	N/A	N/A
Santa Clara River/McGrath State Beach	7	9	9	0	0	0	0
Pt Mugu	262	307	377	27	51	0.09	0.19
Saticoy United Water Conservation District	0	0	0	0	0	N/A	N/A
Los Angeles/Orange Counties							
Venice Beach/Marina del Rey	0	0	0	0	0	N/A	N/A
Malibu Lagoon	22	25	31	13	25	0.52	1
LA Harbor	0	5	5	0	0	0	0
Seal Beach NWR - Anaheim Bay	118	124	124	4	8	0.03	0.07
Bolsa Chica Ecological Reserve	158	175	178	6	6	0.03	0.04
Huntington State Beach	560	626	679	26	140	0.04	0.25
Anaheim Lake	0	0	0	0	0	N/A	N/A
Burris Sand Pit/Burris Basin	12	14	14	10	10	0.71	0.83

Upper Newport Bay Ecological Reserve	15	16	17	13	13	0.81	0.87
San Diego County							
MCB Camp Pendleton	212	1368	1405	4	4	0.003	0.02
Batiquitos Lagoon Ecological Reserve	658	671	692	175	225	0.26	0.34
San Elijo Lagoon Ecological Reserve	0	0	0	0	0	N/A	N/A
Fairbanks Ranch							
San Dieguito Lagoon Ecological Reserve	0	0	0	0	0	N/A	N/A
Mission Bay							
FAA Island	33	39	41	16	21	0.41	0.64
North Fiesta Island	0	0	0	0	0	N/A	N/A
Mariner's Point	146	167	176	30	50	0.18	0.34
Stony Point	2	2	2	1	1	0.5	0.5
San Diego River Mouth							
San Diego Bay							
Lindbergh Field/Former Naval Training Center	21	24	24	13	17	0.54	0.81
US Navy - NI MAT	16	21	22	1	1	0.05	0.06
US Navy – NI Alt	0	0	0	0	0	N/A	N/A
Naval Base Coronado	804	863	889	278	472	0.32	0.59
D Street Fill/Sweetwater Marsh NWR	112	125	127	25	27	0.2	0.24
Chula Vista Wildlife Reserve	86	96	96	17	23	0.18	0.27
South San Diego Bay Unit, SDNWR/Saltworks	33	40	40	2	3	0.05	0.09
Tijuana Estuary NERR	197	221	225	77	83	0.35	0.42
Imperial County							
Salton Sea	0	0	0	0	0	N/A	N/A
State Total	4097	5598	5983	1131	1655	0.2	0.4

Table 2. California least tern colony productivity in 2017 in the Baja California Peninsula, Mexico.

LOCATION	# Pairs 2017
Punta Banda Barra	28
Punta Banda Tony's	0
Punta Banda Dique	0
Sto. Domigo Barra	0
Sto. Domingo Arroyo	0
Figueroa	21
San Quintin Punta Azufre	16
San Quintin La Salina	5
San Quintin Sabios	0
Vaso 26	0
Chaparrito	0
Ojo de Liebre Piedra	0
8 bombas	0
Vaso 1 E	0
Vaso 1 SW	45
Vaso 1 W	0
La Bocana Barra	0
La Bocana Salitrales	0
La Bocana Dunas	30
El Coyote	0
Boca de Las Animas	10
Boca de Sto. Domingo	3
Boca de La Soledad	0
Pto. Alcatraz	0
Punta Lengua	0
Boca Flor de Malva	10
San Venancio	4
La Paz	100
Los Cabos	200
Total	**472**

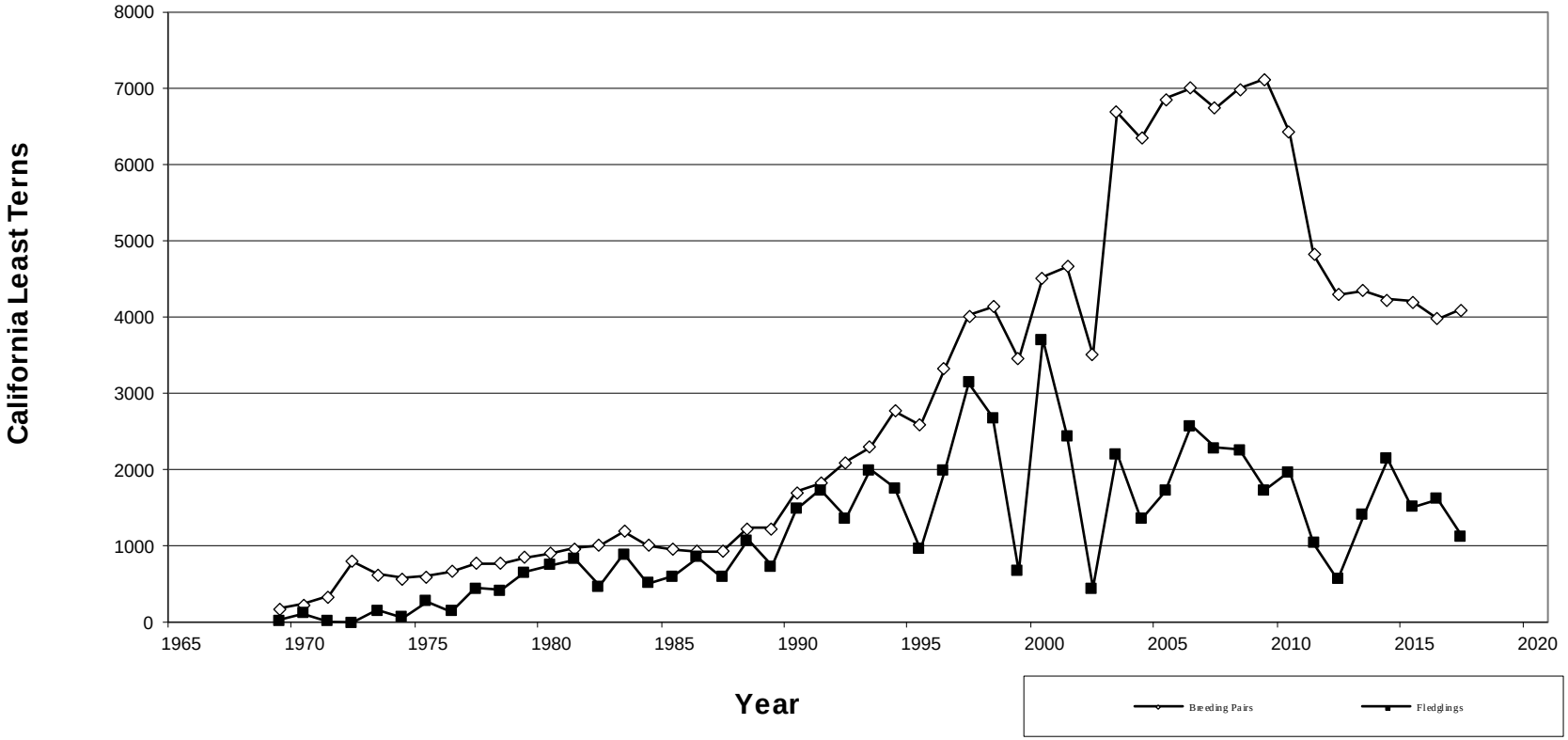

Figure 2. Minimum number of documented California least tern breeding pairs and fledglings in California during annual surveys, 1969-2017 (data from: Craig 1971; Bender 1974a, 1974b; Massey 1975, 1988, 1989b; Atwood *et al*. 1977; Jurek 1977; Atwood *et al*. 1979; Collins 1984, 1986, 1987; Gustafson 1986; Johnston and Obst 1992; Obst and Johnston 1992; Caffrey 1993, 1994, 1995b, 1997, 1998; Keane 1998, 2000, 2001; Patton 2002, 2004 unpublished table; Marschalek 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012; Frost 2013, 2014, 2015, 2016).

Mortality and Predation

Predation has consistently been a concern for all life stages of the California least tern. The following is a table of the cause of mortalities for the various life stages. The numbers below are not considered an absolute value as predation could have occurred without being observed.

Table 3. Cause of least tern mortality with associated counts for each life stage (data taken from Mortality worksheet unless otherwise indicated).

	Eggs*	Chicks	Fledglings	Adults	Total
Predation	2282**	62	41	38	2,423
Non-predation	1824	1324	248	124	3,523

*An additional 574 eggs were lost to unknown causes.
**Includes data from Chronology worksheet.

In 2017, 65% of sites had some level of predator management. It can be very difficult to accurately determine the predator species involved in tern predation events, which are not typically observed and from which little or no evidence may remain. Level of certainty regarding a predation event may be reflected by reporting it as either suspected or documented, based on the evidence available and the conservative nature of the biologist. For this reason, the proportion of least terns lost to each predator species includes both suspected and documented species.

Forty-seven species as well as 12 other taxa (e.g., corvids, unknown) were reported as possible, suspected, or documented predators of least terns (Appendices A-7 and A-8). Of the 356 least tern individuals (including eggs) reported as taken by a documented or suspected predator species, 19% were depredated by peregrine falcons, 19% were depredated by rats (all at Mariner's Point), 16% were depredated by common ravens, 8% were depredated by northern harriers, and 5% were depredated by coyotes (the remaining predator species were responsible for fewer than 5% of the depredations). Nests were excluded from this analysis since the number of eggs better represents the loss of individuals. Abandonment was also excluded from depredation data but can be driven by a predator. Site-specific and complete mortality data are in Appendices A-7 and A-8.

Historically, predation due to gull-billed terns tended to be higher (Marschalek 2010). The foraging area of gull-billed terns has expanded since 2007; however, the number of least terns suspected or documented to be depredated by gull-billed terns has decreased over the last several years with 813 individuals depredated in 2009, 222 in 2010, 149 in 2011, 87 in 2012, 2 in 2013 (when the gull-billed tern acanthocephalan die-off may have contributed to reduced depredation), 7 in 2014, 14 in 2015, 9 in 2016 and 11 in 2017.

Predator species varied in importance among each least tern age class. Egg predators consisted of coyote 62%, common raven 17%, American crow 7%, unknown corvids 7% and all other species totaled 7%. Chick predators include American kestrel 22%, great blue heron 20%, gull-billed tern 18%, ants 13%, great horned owl 5%, northern harrier 5%, western gull 5%, and other species 12%. Fledgling predators include peregrine falcon 62%, American kestrel 9%, great horned owl 9%, unknown avian species 9%, raptors 6%, and northern harrier 6%. Adult predators include peregrine falcon 39%, raptors 23%, burrowing owl 13%, unknown avian species 13%, great horned owl 6%, and other species collectively are 6% (Appendices A-7 and A-8).

Summary by Site

Management and monitoring of least terns requires a site-by-site perspective. This can be dictated by the biology or geography of the area or the specific nesting area, or by human-related issues. Appendix A-9

Conclusion

California least tern breeding success was monitored in 2017 to track where this endangered species is relative to population recovery. Biologists recorded a minimum of 4097 breeding pairs, slightly higher than the previous year of 3989 pairs; however, the minimum fledgling-to-maximum breeding pair ratio (0.20) was lower than the previous year (0.35), indicating reduced reproductive success in 2017. High predation rates such as those at Camp Pendleton and others likely contributed to this decline. This ratio has been less than 0.50 for the last 16 years. Although some of the recovery criteria outlined in the 1985 Recovery Plan have been met (e.g., the minimum breeding pairs), there are concerns regarding the increased level of threats to the species in the last few years including metrics, such as the fledgling to pair ratio, which remain variable. While there have been over 1200 minimum breeding pairs every year since 1988, none of these years had a statewide fledgling to pair ratio of at least 1.0 (from 1988-2017, the average minimum fledgling-to-maximum pair ratio was 0.45). In 2017, from a regional perspective, only three sites in San Francisco Bay Area met the recovery criteria for the fledgling to pair ratio.

As was the case in 2016, California least tern population growth in 2017 was hindered by relatively low productivity as well as direct limiting factors (2,423 eggs, chicks, fledglings, and adults lost to predation) and indirect limiting factors (3,523 individuals lost to non-predation causes including abandonment prior to the expected hatching date and abandonment post-term, which combined contributed to nearly all the non-predation egg mortality). There was a substantial increase of predated eggs in 2017 (2,282) compared to 485 eggs in 2016. This was likely due to lack of predator control at sites. Insufficient foraging resources is widely thought to be a significant factor limiting California least tern population growth and continues to warrant additional study. Continued site preparation (including maintenance of fencing and vegetative cover), predator management, and monitoring will be key to identifying adaptive management strategies that will contribute to the recovery of this species.

The inclusion of data from Mexico is very exciting and is an additional step in meeting objectives in Recovery Plan. Previously, only two sites (Estero de Punta Banda and Bahia San Quintin) were known. With this new information the spatial range of the species has almost doubled in Mexico. However, many of these sites have similar management issues as those in the US including predation and human disturbance.

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Appendix A

Site Specific Data

Appendix A-1: Site Preparation in 2017.

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Sacramento Area											
Bufferlands	3	No	2	No	No	No	No	7	3	No	None
San Francisco Bay Area											
Napa Sonoma Marsh Wildlife Area											
Green Island Unit	4	No	1	Yes/paint pen	Yes/5 Ceramic Roof tiles, 12 driftwood pieces, washed up, 5 other debris pieces	No	No	6	3	No	CDFW
Pond 7/7A	4	No	1	Yes/paint pen	No	No	No	6	3	No	CDFW
Montezuma											

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Site_12A	None	No	3	Yes	12, half roofing tiles and half wooden A-frames	yes, 7	No	4	3		
Site_3/4C	None	No	3	Yes	12, half roofing tiles and half wooden A-frames	yes, 4	No	4	3		
Pittsburg Power Plant											

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Alameda Point	1	No	1	Yes/3inch metal washer placed upright in plaster of paris base, all painted white with nest number applied with black paint marker to washer	Yes/ approx. 250 wooden A frames, 800 terracotta half cylinders & scattered oyster shells	No	Yes/ 9.7 acres comprised of 99 grids (each grid 20m X 20m)	4	1,2	Grading of sand substrate; replacing plastic chick fencing annually; resetting grid, shelters, and oyster shells on sand after sand grading; reinforcing low ends of fence to prevent sand from draining out after rains.	FWS staff, volunteers, and VA contractors

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Hayward Regional Shoreline	4	Yes	1	Yes/5cm washers	Yes/26	Yes/12	Yes/10m grid cells	2,3	1	See Notes 1	See Notes 2
Eden Landing Ecological Reserve	4	No	3	Yes, Nest number marked on nearby oyster shell	Oyster shell enhancement plot deployed for SNPL provided some cover for chicks, observed hiding under neath	No	No	5 Pond flooded 3 years prior to manage for SNPL. Will be flooded again this winter to reduce veg.	3	Predator perches (old duck blinds and saltworks structures) removed in prior years	SFBBO, CDFW, and volunteers
Kings/San Luis Obispo/Santa Barbara Counties											

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Kettleman City Evaporation Ponds	4	No	3	No							
Oceano Dunes SVRA	1,3	Yes	3	Yes/most nests typically marked 3040 ft. east and west with color coded bamboo sticks	No; cut branches and driftwood are distributed in nesting area	No	No	5; least tern breeding site open to off road vehicle use October to February and this prevents or removes most vegetation. Efforts are made to encourage some vegetation for chick cover.	1,2	Limited amounts of driftwood and woodchips were put out for nest and chick cover.	California Department of Parks and Recreation (Oceano Dunes State Vehicular Recreation Area)
Rancho Guadalupe Dunes Preserve	4	Yes		No		No	No	6	3	No	

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Guadalupe Nipomo Dunes National Wildlife Refuge											
Vandenberg AFB Purisima Pt.	1	Yes	3	No	Yes/43 V-shaped wooden plus 36 teepee snow fence style	No	No	7	2	Electric Fence Maintenance	ManTech
Coal Oil Point Reserve	3	Yes	2	No	No	21	No	7	1		
Ventura County											
Ormond Beach	3	Yes	1	Yes, naturally occurring driftwood	No	No	No	7	3		

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Hollywood Beach	1	Yes	3	Yes, tongue depressor 5 ft away	No	No	No	7	3	No	
Santa Clara River/McGrath State Beach	3	Yes	1	Yes/ Natural Driftwood	No	No	No	7	3	No	
Pt Mugu											
Holiday Beach	4	Yes	3	Yes/ tongue depressor	Yes/25 shelters	No	No	7	1,2	No	
Holiday Salt Panne	4	Yes	3	Yes/ tongue depressor	No	No	No	7	1,2	No	
Eastern Arm	4	Yes	3	Yes/ tongue depressor	No	No	No	7	1,2	No	
Ormond Beach East	4	Yes	3	Yes/ tongue depressor	Yes/50 shelters	No	No	7	1,2	No	
Saticoy United Water Conservation District	3,4	No	3	No	No	No	No	4,5,6	3		

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Los Angeles/Orange Counties											
Venice Beach/Marina del Rey	1	Yes	1	No	yes/15/roof tiles	Yes/15	Yes	2	3		
Malibu Lagoon	3	Yes	3	No	No	No	No	6	3		
LA Harbor	1	No	1	Yes, "popsicle" sticks marked with nest number	Yes/40	No	Yes	4	2	Yes	Quality Sprayers Inc.
Seal Beach National Wildlife Refuge	1	Yes	1	Yes/ wooden tongue depressor	Yes	No	Yes/ 8x12	4	2	No	
Bolsa Chica Ecological Reserve – Totals											
Nest Site 1	3	Yes	1	Yes / tongue depressor	Yes, 48 roof tiles	Yes/20	Yes/ 20m X 20m	2,3	2 (permit prohibits proactive control)		CDFW
Nest Site 2	4	No	1	Yes / tongue depressor	Yes, 12 roof tiles	No	Yes/ 20m X 20m	2,3	2 (permit prohibits proactive control)		CDFW

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Nest Site 3	1	No	1	Yes / tongue depressor	Yes, 20 roof tiles	No	Yes/ 20m X 20m	2,3	2 (permit prohibits proactive control)		CDFW
South Tern Island	4	No	1	Yes / tongue depressor	Yes, 20 roof tiles	No	Yes/ 20m X 20m	2,3	2 (permit prohibits proactive control)		CDFW
Seasonal Ponds	4	No	2	No	No	No	No	7	2 (permit prohibits proactive control)		CDFW
Huntington Beach	1,2	yes	1	yes/numbered tongue depressors	yes, ceramic roof tiles	No	Yes/ 25 m	1,2	2	dividing fence within colony was removed prior to start of season; 10,000CY sand spread in front of colony; chick fencing replaced	CA State Parks
Anaheim Lake											

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Burris Sand Pit/Burris Basin	4	No	1	Yes-Rock painted white	Yes, Dozen but not used	No	No	2	3		
Upper Newport Bay Ecological Reserve	4	No	3	Yes. Popsicle Stick	Yes/~ 50 roofing tiles	No	Yes/ 40 m	3	3		CDFW
San Diego County											
Marine Corps Base Camp Pendleton											
Red Beach	4	No	1	Yes/white paint stick	No	No	No	6	3		
White Beach	3	Yes	1	Yes/white paint stick	No	No	Yes/ 30X30	4	3		
Santa Margarita River – Blue Beach (BBN & BBS)	2	Yes	1	Yes/white paint stick	No	No	Yes/ 30X30	4	3		

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Santa Margarita River Salt flats and Island	3	Yes	1	Yes/white paint stick	No	No	Yes	6	3		
Batiquitos Lagoon Ecological Reserve											
E1	1	Yes	1	YES/tongue depressor	YES / roofing tiles	No	Yes	4	1	No	CDFW
W1	1	Yes	1	YES/tongue depressor	YES / roofing tiles	No	Yes	4	1	No	CDFW
W2	1	Yes	1	YES/tongue depressor	YES / roofing tiles	No	Yes	4	1	No	CDFW
San Elijo Lagoon Ecological Reserve	3	Yes	3	yes/tongue depressor	No	No	No	6	3		
Fairbanks Ranch											

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
San Dieguito Lagoon Ecological Reserve	1,3	No	1	No	yes	yes	yes	4	1		
Mission Bay											
FAA Island	1	Yes	1	Yes	Yes	Yes	Yes	2,3,4	1	No	N/A
North Fiesta Island	1	No	1	Yes	Yes	Yes	Yes	1,2,3	1		
Mariners Point	1	Yes	1	Yes/ tongue depressor	Yes/~ 50	Yes/41	Yes/ approx. 12800 square meters/ squares 400 square meters	2	1	chick fence repairs/decoys/grid system	San Diego Audubon Society/San Diego City Parks Dept
Stony Point	1	Yes	1	Yes/ tongue depressor	Yes	Yes	Yes	4	1	fence repair	SD City Park Rangers

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
San Diego River Mouth											
San Diego Bay											
Lindbergh Field & Former Naval Training Center	2	Yes	1	Yes/nest number spray painted on substrate 1m to S	No	No	Yes/ 30 m	4	1		site prep by SDCRAA staff & ZSSD contractors; monitoring by ZSSD contractors; pred control by USDA WS
US Navy NI MAT	1	Yes	1	No/gps only	Yes/100 to 200	No	Yes/ 30mx 30m	4	1,2		
US Navy – NI Alt	1	No	1	Yes/ green tongue depressor	No	Yes, 100 static, 39 mobile. W/ acoustic system	No	7	1,2		

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Naval Base Coronado Totals											
Delta Beach North	1	Yes	1	Yes/3 inch high PVC ring, painted green/sand colors	Yes/100 to 200	No	Yes/ 30mx 30m	4	1,2		
Delta Beach South	1	Yes	1	Yes/3 inch high PVC ring, painted green/sand colors	Yes/100 to 200	No	Yes/ 30mx 30m	4	1,2		
NAB ON	4	No	1	Yes/green tongue depressor	No	No	Yes/ 30m x variable	7	1,2	7	
NAB OS	3	Yes	1	Yes/green tongue depressor	No	No	Yes/ 30m x variable	2	1,2		

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
D Street Fill/Sweetwater Marsh NWR	3	Yes	1	Yes/ tongue depressor	Yes/174 roofing tiles	Yes/80	Yes/ 30m	4	1 mammals & corvids/2 raptors		Site prep by USFWS NWR & SD Port staff & contractors; monitoring by Port contractors; pred control by USDA WS
Chula Vista Wildlife Refuge	3	Yes	1	Yes/ tongue depressor	Yes/44 roofing tiles	Yes/60	Yes/ 30m	4	1 mammals & corvids/2 raptors		Site prep by ZSSD contractors; pred control by USDA WS
South San Diego Bay Unit, SDNWR - Saltworks	3	No	1	Yes/ tongue depressor	Yes/10 roofing tiles	No	No	6	1 mammal/2 avian		Monitoring by NWR contractors, predator control by USDA WS
Tijuana Estuary NERR											

Site	Fence type	Interpretive signs at site	Site Type	Nest Marking	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Tijuana North	3	Yes	1	Yes/ tongue depressor	yes/41	No	Yes/ 30m	7	1 mammals & corvids/2 raptors		pred control by USDA WS
Tijuana South	3	Yes	1	Yes/ tongue depressor	yes/49	No	Yes/ 30m	7	1 mammals & corvids/2 raptors		pred control by USDA WS
Imperial County											
Salton Sea											

Appendix A-1 Legend:
Note: Information imported directly from "Site Info" tab of 2017 reporting spreadsheet. Blank cells indicate that no data was provided or information is unknown
Fence Type: 1-Fully enclosed site deterring most predators; 2-Fully enclosed site, cantilevered to deter climbing predators; 3-Incomplete, deterring few predators; 4-No fence/exclosure.
Vegetation Management: 1-Mechanical removal; 2-Manual removal; 3-Herbicide; 4-Combination of 1, 2, or 3; 5-Other means; 6-Needed, but not conducted; 7-None needed. Predator management: 1-Proactive predator removal; 2-Reactive predator removal; or 3-None.

Appendix A-2: California least tern band color combinations of current and past California least tern banding studies conducted at breeding areas in California.

Site	Year	Age	Abbreviation	Band Description
Kings/San Luis Obispo/Santa Barbara Counties				
Oceano Dunes SVRA	2004-2016	Chicks	Y/G, G/Y, W/B, B/W, A/B, B/A, A/Y, B/G, B/O, O/B, B/R, R/W, W/R, R/Y, W/Y	Yellow/Green, Green/Yellow, White/Blue, Blue/White, Aqua/Blue, Blue/Aqua, Aqua/Yellow, Blue/Green, Blue/Orange, Orange/Blue, Blue/Red, Red/White, White/Red, Red/Yellow, White/Yellow (left leg)
Los Angeles/Orange Counties				
Seal Beach National Wildlife Refuge	2015-2016	Adults	Y/K, M/R	Yellow/Black, Mauve/Red
Bolsa Chica Ecological Reserve	2016, 2017	Adults		White alphanumeric with black characters
Huntington Beach	2016, 2017	Adults		White alphanumeric with black characters
San Diego County				
Marine Corps Base Camp Pendleton	?-2009	Chicks	K/M	Black/Mauve
Marine Corps Base Camp Pendleton	2016	Adults/Chicks		Service band (left leg), and white alphanumeric with black characters (right leg)
Marine Corps Base Camp Pendleton	2017	Adults/Chicks		Green anodized service band (left leg), and green alphanumeric with white characters (right leg)
Batiquitos Lagoon ER	198?-2011	Chicks/Adults	R/W	Red/White
Batiquitos Lagoon ER	2016, 2017	Adults/Chicks		White alphanumeric with black characters

Site	Year	Age	Abbreviation	Band Description
San Dieguito Lagoon Ecological Reserve	2013	1 Adult	K/F	Black/Fuchsia
North Fiesta Island	2014-2015	Chicks	B/L	Blue/Lime
Mariner's Point	198?-2013, 2015	Chicks	B/G	Blue/Green
Mariner's Point	2014, 2016	Chicks	G/B	Green/Blue
Stony Point	2013-2014	Chicks	B/G	Blue/Green
D Street Fill	2008, 2012, 2014	Chicks/Adults	M/W	Mauve/White
Lindbergh Field	2008-2011	Adults	G/W	Green/White
Lindbergh Field	2012-2014	Adults	K/F	Black/Fuchsia
US Navy NI MAT	198?-2010	Chicks/Adults	O/A	Orange/Aqua
North Island Runway 11		Chicks	K/A	Black/Aqua
Naval Base Coronado	2016	Adults/Chicks		Service band (left leg), and white alphanumeric with black characters (right leg)
Naval Base Coronado	2017	Adults/Chicks		Blue anodized service band (chicks only, left leg), and green alphanumeric with white characters (right leg)
Delta Beach North	198?-2010, 2014	Chicks/Adults	R/Y	Red/Yellow
Delta Beach South	199?-2010, 2014	Chicks/Adults	K/W	Black/White
NABOS	199?-2010, 2014	Chicks/Adults	P/B	Dark Pink/Blue
Chula Vista Wildlife Reserve	2008-2013	Adults	K/Y	Black/Yellow
Chula Vista Wildlife Reserve	2014	Chicks/Adults	A/K	Aqua/Black
Saltworks	2008-2014	Chicks/Adults	M/L	Mauve/Lime
Tijuana Estuary NERR	2008-2014	Chicks/Adults	R/G	Red/Green

Site	Year	Age	Abbreviation	Band Description
Tijuana Estuary NERR	2016, 2017	Adults		White alphanumeric with black characters
Miscellaneous				
Project Wildlife (rehabilitated birds released to the wild)	2002			Anodized Blue
Project Wildlife (rehabilitated birds released to the wild)	2003			Anodized Green
Project Wildlife (rehabilitated birds released to the wild)	2004			Anodized Red
Project Wildlife (rehabilitated birds released to the wild)	2005			Anodized Red
Various	2000	Adults	G	Green
Various	2008	Adults	A	Light Blue
Various	2009	Adults	R	Red
Various	2010	Adults	K	Black
Various	2011	Adults	L	Lime Green
Various	2012	Adults	F	Fuchsia
Various	2013	Adults	W	White
Various	2014	Adults	B	Dark Blue

Note: Blank cells indicate that no data was provided, or information is unknown

Appendix A-3: Pair Estimation in 2017 (Method I).

Site name	Date terns first observed*	Date terns last observed*	Date of first nest found**	Date of last nest found**	Total nests in first wave (prior to 15 June)	Total nests in second wave (June 15 or after)	Total Nests	Total pairs
Sacramento Area								
Bufferlands	5/8/2017	6/22/2017	5/19/2017	5/19/2017	1	0	1	1
San Francisco Bay Area								
Napa Sonoma Marsh Wildlife Area – Totals	4/19/2017	7/20/2017	5/17/2017	7/10/2017			142	
Green Island Unit	4/27/2017	7/20/2017	5/18/2017	7/10/2017			139	
Pond 7/7A	4/19/2017	7/6/2017	5/17/2017	5/25/2917			3	
Montezuma – Totals	5/9/2017	8/21/2017	5/9/2017	7/3/2017	5	4	9	7
Site 12A	5/9/2017	7/12/2017	5/9/2017	5/29/2017	4	0	4	4
Site 3/4	5/15/2017	8/21/2017	6/6/2017	7/3/2017	1	4	5	3
Pittsburg Power Plant								
Alameda Point	4/13/2017	8/17/2017	5/4/2017	7/13/2017	318	129	447	382
Hayward Regional Shoreline	4/18/2017	8/10/2017	5/6/2017	7/3/2017	60	12	72	66
Eden Landing Ecological Reserve	6/1/2017	8/24/2017	6/1/2017	7/17/2017	8	13	21	14
Kings/San Luis Obispo/Santa Barbara Counties								

Site name	Date terns first observed*	Date terns last observed*	Date of first nest found**	Date of last nest found**	Total nests in first wave (prior to 15 June)	Total nests in second wave (June 15 or after)	Total Nests	Total pairs
Kettleman City Evaporation Ponds	No Terns Observed	No Terns Observed	No Nests	No Nests	0	0	0	0
Oceano Dunes SVRA	5/2/2017	7/22/2017	5/24/2017	7/1/2017	44	8	52	48
Rancho Guadalupe Dunes Preserve	No Terns Observed	No Terns Observed	No Nests	No Nests	0	0	0	0
Guadalupe-Nipomo Dunes National Wildlife Refuge	No Terns Observed	No Terns Observed	No Nests	No Nests	0	0	0	0
Vandenberg AFB-Purisima Pt.	5/9/2017	8/11/2017	5/26/2017	7/4/2017	11	17	28	19
Coal Oil Point Reserve	7/2/2017	8/2/2017	No Nests	No Nests	0	0	0	0
Ventura County								
Ormond Beach	5/4/2017	8/22/2017	6/2/2017	7/22/2017	13	25	38	25
Hollywood Beach	5/23/2017	8/16/2017	No Nests	No Nests	0	0	0	0
Santa Clara River/McGrath State Beach	5/5/2017	8/24/2017	6/12/2017	7/28/2017	5	4	9	7
Pt Mugu – Totals	4/24/2017	mid-to late August	5/22/2017	8/2/2017	241	136	377	307
Holiday Beach			5/22/2017	8/2/2017	134	31	165	149
Holiday Salt Panne			5/22/2017	6/29/2017	15	5	20	17
Eastern Arm			5/23/2017	7/21/2017	19	7	26	22

Site name	Date terns first observed*	Date terns last observed*	Date of first nest found**	Date of last nest found**	Total nests in first wave (prior to 15 June)	Total nests in second wave (June 15 or after)	Total Nests	Total pairs
Ormond Beach East			5/25/2017	8/1/2017	73	93	166	119
Saticoy United Water Conservation District	No Terns Observed	No Terns Observed	No Nests	No Nests	0	0	0	0
Los Angeles/Orange Counties								
Venice Beach/Marina del Rey	4/22/2017	6/5/2017	No Nests	No Nests	0	0	0	0
Malibu Lagoon	5/4/2017	9/9/2017	5/29/2017	unknown			31	
LA Harbor	5/8/2017	7/15/2017	5/17/2017	5/24/2017	5	0	5	5
Seal Beach NWR - Anaheim Bay	5/10/2017	5/19/2017	5/10/2017	6/28/2017	115	9	124	119
Bolsa Chica Ecological Reserve – Totals	4/12/2017	7/10/2017	5/8/2017	6/22/2017	173	5	178	175
Nest Site 1 (NS1)	5/19/2017	7/10/2017	5/19/2017	6/20/2017	26	2	28	27
Nest Site 2 (NS2)	5/11/2017	6/27/2017	5/11/2017	6/22/2017	103	2	105	104
Nest Site 3 (NS3)	5/11/2017	6/16/2017	5/11/2017	6/16/2017	35	1	36	35
South Tern Island (STI)	5/9/2017	5/23/2017	5/9/2017	5/16/2017	5	0	5	5

Site name	Date terns first observed*	Date terns last observed*	Date of first nest found**	Date of last nest found**	Total nests in first wave (prior to 15 June)	Total nests in second wave (June 15 or after)	Total Nests	Total pairs
Seasonal Ponds			5/8/2017	5/15/2017	4	0	4	4
Huntington State Beach	4/11/2017	8/8/2017	5/5/2017	8/1/2017	573	106	679	626
Anaheim Lake	No Terns Observed	No Terns Observed	No Nests	No Nests	0	0	0	0
Burris Sand Pit/Burris Basin	5/23/2017	8/28/2017	5/31/2017	7/5/2017	10	4	14	12
Upper Newport Bay Ecological Reserve	4/27/2017	7/21/2017	5/17/2017	6/23/2017	13	4	17	15
San Diego County								
MCB Camp Pendleton – Totals	4/13/2017	8/1/2017	4/26/2017	6/26/2017	1332	73	1405	1368
Red Beach	5/30/2017	6/23/2017	5/30/2017	6/21/2017	25	6	31	28
White Beach	4/18/2017	6/30/2017	5/2/2017	6/26/2017	333	66	399	366
Santa Margarita River – Blue Beach (BBN & BBS)	4/13/2017	8/1/2017	4/26/2017	6/15/2017	971	1	972	971
Santa Margarita River - Salt flats and Island	5/15/2017	6/13/2017	5/19/2017	6/13/2017	3	0	3	3
Batiquitos Lagoon Ecological Reserve – Totals	4/14/2017	8/1/2017	4/28/2017	7/5/2017	651	41	692	671
E1	4/14/2017	7/11/2017	5/2/2017	6/30/2017	82	6	88	85

Site name	Date terns first observed*	Date terns last observed*	Date of first nest found**	Date of last nest found**	Total nests in first wave (prior to 15 June)	Total nests in second wave (June 15 or after)	Total Nests	Total pairs
W1	4/14/2017	7/28/2017	5/2/2017	6/27/2017	50	6	56	53
W2	4/14/2017	8/1/2017	4/28/2017	7/5/2017	519	29	548	533
San Elijo Lagoon Ecological Reserve	6/30/2017	7/10/2017	No Nests	No Nests	0	0	0	0
Fairbanks Ranch								
San Dieguito Lagoon Ecological Reserve	5/17/2017	7/19/2017	No Nests	No Nests	0	0	0	0
Mission Bay								
FAA Island	5/8/2017	7/27/2017	5/31/2017	6/24/2017	38	3	41	39
North Fiesta Island	5/5/2017	5/15/2017	No Nests	No Nests	0	0	0	0
Mariner's Point	5/2/2017	8/8/2017	5/2/2017	7/1/2017	158	18	176	167
Stony Point	5/4/2017	8/3/2017	5/8/2017	6/5/2017	2	0	2	2
San Diego River Mouth								
San Diego Bay								
Lindbergh Field & Former Naval Training Center	4/16/2017	8/19/2017	5/5/2017	6/8/2017	24	0	24	24
US Navy - NI MAT	4/20/2017	7/18/2017	5/10/2017	6/20/2017	20	2	22	21
US Navy – NI Alt	7/26/2017	7/26/2017	No Nests	No Nests	0	0	0	0
Naval Base Coronado - Totals	4/17/2017	8/11/2017	5/1/2017	7/18/2017	839	50	889	863
Delta Beach North	4/18/2017	8/4/2017	5/2/2017	7/18/2017	126	6	132	129

Site name	Date terns first observed*	Date terns last observed*	Date of first nest found**	Date of last nest found**	Total nests in first wave (prior to 15 June)	Total nests in second wave (June 15 or after)	Total Nests	Total pairs
Delta Beach South	4/20/2017	7/31/2017	5/1/2017	6/26/2017	137	6	143	140
NAB Ocean North	4/18/2017	8/11/2017	5/2/2017	7/5/2017	278	15	293	285
NAB Ocean South	4/17/2017	8/3/2017	5/1/2017	7/6/2017	298	23	321	309
D Street Fill/Sweetwater Marsh NWR	4/11/2017	7/29/2017	4/28/2017	7/8/2017	123	4	127	125
Chula Vista Wildlife Reserve	4/15/2017	8/11/2017	5/9/2017	6/20/2017	95	1	96	95
South San Diego Bay Unit, SDNWR - Saltworks	4/15/2017	7/28/2017	5/10/2017	6/28/2017	34	6	40	37
Tijuana Estuary NERR - Totals	4/16/2017	9/9/2017	5/11/2017	7/6/2017	180	45	225	202
Tijuana North	4/21/2017	9/8/2017	5/11/2017	7/6/2017	130	39	169	149
Tijuana South	4/16/2017	9/9/2017	5/11/2017	7/5/2017	50	6	56	53
Imperial County								
Salton Sea	No Terns Observed	No Terns Observed	No Nests	No Nests	0	0	0	0
Totals					5091	719	5983	5442

Appendix A-3 Legend:

Note: Blank cells indicate that no data was provided, or information is unknown

*__Date terns first/last observed__: "No Terns Observed" indicates no California Least Terns appeared within the site

**__Date of first/last nest found__: "No Nests" indicates that no nest with eggs were documented at the site

Appendix A-4: Pair Estimation in 2017 (Method II and III).

	Pair Estimation II				Pair Estimation III						
Site name	**Total nests**	**Number of unsuccessful nests plus estimated broods lost before 20 June**	**Total pairs**	**Date of second wave start (if any) ***	**Total first wave nests (prior to 15 June)**	**Estimated renesters first wave (prior to 15 June)**	**Total Pairs first wave (prior to 15 June)**	**Total nests 2nd wave (June 15 or after)**	**Estimated renesters 2nd wave (June 15 or after)**	**Total Pairs 2nd wave (June 15 or after)**	**Total Pairs**
Sacramento Area											
Bufferlands	1	0	1	None	1	0	1	0	0	0	1
San Francisco Bay Area											
Napa Sonoma Marsh Wildlife Area – Totals	142										
Green Island Unit	139			6/22/2017							
Pond 7/7A	3			None							
Montezuma – Totals	9	1	8	6/15/2017	5	1	4	4	1	3	7
Site 12A	4	1	3	6/15/2017	4			0			
Site 3/4	5	0	5	6/15/2017	1			4			

	Pair Estimation II				Pair Estimation III						
Site name	**Total nests**	**Number of unsuccessful nests plus estimated broods lost before 20 June**	**Total pairs**	**Date of second wave start (if any) ***	**Total first wave nests (prior to 15 June)**	**Estimated renesters first wave (prior to 15 June)**	**Total Pairs first wave (prior to 15 June)**	**Total nests 2nd wave (June 15 or after)**	**Estimated renesters 2nd wave (June 15 or after)**	**Total Pairs 2nd wave (June 15 or after)**	**Total Pairs**
Pittsburg Power Plant											
Alameda Point	447	61	386	6/15/2017	318			129			
Hayward Regional Shoreline	72	4	68	6/15/2017	60	4	56	12	0	12	68
Eden Landing Ecological Reserve	21	1	20	None	8			13			
Kings/San Luis Obispo/Santa Barbara Counties											
Kettleman City Evaporation Ponds	0	0	0	No Nests	0	0	0	0	0	0	0

	Pair Estimation II				Pair Estimation III						
Site name	**Total nests**	**Number of unsuccessful nests plus estimated broods lost before 20 June**	**Total pairs**	**Date of second wave start (if any) ***	**Total first wave nests (prior to 15 June)**	**Estimated renesters first wave (prior to 15 June)**	**Total Pairs first wave (prior to 15 June)**	**Total nests 2nd wave (June 15 or after)**	**Estimated renesters 2nd wave (June 15 or after)**	**Total Pairs 2nd wave (June 15 or after)**	**Total Pairs**
Oceano Dunes SVRA	52	8	44		44			8			
Rancho Guadalupe Dunes Preserve	0	0	0	No Nests	0	0	0	0	0	0	0
Guadalupe-Nipomo Dunes National Wildlife Refuge	0	0	0	No Nests	0	0	0	0	0	0	0
Vandenberg AFB-Purisima Pt.	28	1	27	None	11	0	11	17	1	16	27
Coal Oil Point Reserve	0	0	0	No Nests	0	0	0	0	0	0	0
Ventura County											

	Pair Estimation II				Pair Estimation III						
Site name	**Total nests**	**Number of unsuccessful nests plus estimated broods lost before 20 June**	**Total pairs**	**Date of second wave start (if any) ***	**Total first wave nests (prior to 15 June)**	**Estimated renesters first wave (prior to 15 June)**	**Total Pairs first wave (prior to 15 June)**	**Total nests 2nd wave (June 15 or after)**	**Estimated renesters 2nd wave (June 15 or after)**	**Total Pairs 2nd wave (June 15 or after)**	**Total Pairs**
Ormond Beach	38	1	37	7/6/2017	13	9	4	25	0	25	29
Hollywood Beach	0	0	0	No Nests	0	0	0	0	0	0	0
Santa Clara River/McGrath State Beach	9	0	9	7/28/2017	5	1	4	4	0	4	8
Pt Mugu – Totals	377	115	262		241			136			
Holiday Beach	165	89	76	6/15/2017	134	0	134	31	16	15	149
Holiday Salt Panne	20	1	19	None	15			5			
Eastern Arm	26	2	24	None	19			7			
Ormond Beach East	166	23	143	6/15/2017	73	0	73	93	45	48	121
Saticoy United Water Conservation District	0	0	0	No Nests	0	0	0	0	0	0	0

	Pair Estimation II				Pair Estimation III						
Site name	**Total nests**	**Number of unsuccessful nests plus estimated broods lost before 20 June**	**Total pairs**	**Date of second wave start (if any) ***	**Total first wave nests (prior to 15 June)**	**Estimated renesters first wave (prior to 15 June)**	**Total Pairs first wave (prior to 15 June)**	**Total nests 2nd wave (June 15 or after)**	**Estimated renesters 2nd wave (June 15 or after)**	**Total Pairs 2nd wave (June 15 or after)**	**Total Pairs**
Los Angeles/Orange Counties											
Venice Beach/Marina del Rey	0	0	0	No Nests	0	0	0	0	0	0	0
Malibu Lagoon	31										22
LA Harbor	5	5	0	None	5			0			
Seal Beach NWR - Anaheim Bay	124	0	124	6/18/2017	115	0	115	9	6	3	118
Bolsa Chica Ecological Reserve – Totals	178	20	158		173			5			
Nest Site 1 (NS1)	28	2	26	None	26			2			

	Pair Estimation II				Pair Estimation III						
Site name	**Total nests**	**Number of unsuccessful nests plus estimated broods lost before 20 June**	**Total pairs**	**Date of second wave start (if any) ***	**Total first wave nests (prior to 15 June)**	**Estimated renesters first wave (prior to 15 June)**	**Total Pairs first wave (prior to 15 June)**	**Total nests 2nd wave (June 15 or after)**	**Estimated renesters 2nd wave (June 15 or after)**	**Total Pairs 2nd wave (June 15 or after)**	**Total Pairs**
Nest Site 2 (NS2)	105	11	94	None	103			2			
Nest Site 3 (NS3)	36	2	34	None	35			1			
South Tern Island (STI)	5	5	0	None	5			0			
Seasonal Ponds	4	0	4	None	4			0			
Huntington State Beach	679	109	570	6/13/2017	573	41	532	106	78	28	560
Anaheim Lake	0	0	0	No Nests	0	0	0	0	0	0	0
Burris Sand Pit/Burris Basin	14	0	14	6/28/2017	10	2	8	4	0	4	12
Upper Newport Bay Ecological Reserve	17	1	16	6/9/2017	13			4			
San Diego County											

	Pair Estimation II				Pair Estimation III						
Site name	**Total nests**	**Number of unsuccessful nests plus estimated broods lost before 20 June**	**Total pairs**	**Date of second wave start (if any) ***	**Total first wave nests (prior to 15 June)**	**Estimated renesters first wave (prior to 15 June)**	**Total Pairs first wave (prior to 15 June)**	**Total nests 2nd wave (June 15 or after)**	**Estimated renesters 2nd wave (June 15 or after)**	**Total Pairs 2nd wave (June 15 or after)**	**Total Pairs**
MCB Camp Pendleton – Totals	1405	1193	212		1332			73			
Red Beach	31	4	27	None	25			6			
White Beach	399	271	128	None	333			66			
Santa Margarita River – Blue Beach (BBN & BBS)	972	916	56	None	971			1			
Santa Margarita River - Salt flats and Island	3	2	1	None	3			0			
Batiquitos Lagoon Ecological Reserve – Totals	692	34	658		651			41			
E1	88	7	81	6/2/2017	82			6			

	Pair Estimation II				Pair Estimation III						
Site name	**Total nests**	**Number of unsuccessful nests plus estimated broods lost before 20 June**	**Total pairs**	**Date of second wave start (if any) ***	**Total first wave nests (prior to 15 June)**	**Estimated renesters first wave (prior to 15 June)**	**Total Pairs first wave (prior to 15 June)**	**Total nests 2nd wave (June 15 or after)**	**Estimated renesters 2nd wave (June 15 or after)**	**Total Pairs 2nd wave (June 15 or after)**	**Total Pairs**
W1	56	2	54	None	50			6			
W2	548	25	523	5/30/2017	519			29			
San Elijo Lagoon Ecological Reserve	0	0	0	No Nests	0	0	0	0	0	0	0
Fairbanks Ranch											
San Dieguito Lagoon Ecological Reserve	0	0	0	No Nests	0	0	0	0	0	0	0
Mission Bay											
FAA Island	41	5	36	6/8/2017	38	5	33	3	3	0	33
North Fiesta Island	0	0	0	No Nests	0	0	0	0	0	0	0
Mariner's Point	176	24	152	6/15/2017	158	30	128	18	0	18	146

	Pair Estimation II				Pair Estimation III						
Site name	**Total nests**	**Number of unsuccessful nests plus estimated broods lost before 20 June**	**Total pairs**	**Date of second wave start (if any) ***	**Total first wave nests (prior to 15 June)**	**Estimated renesters first wave (prior to 15 June)**	**Total Pairs first wave (prior to 15 June)**	**Total nests 2nd wave (June 15 or after)**	**Estimated renesters 2nd wave (June 15 or after)**	**Total Pairs 2nd wave (June 15 or after)**	**Total Pairs**
Stony Point	2	0	2	6/5/2017	2	0	2	0	0	0	2
San Diego River Mouth							0				
San Diego Bay											
Lindbergh Field & Former Naval Training Center	24	3	21	None	24	3	21	0	0	0	21
US Navy - NI MAT	22	6	16	None	20			2			
US Navy – NI Alt	0	0	0	No Nests	0	0	0	0	0	0	0
Naval Base Coronado - Totals	889	85	804	None	839			50			
Delta Beach North	132	10	122	None	126			6			

	Pair Estimation II				Pair Estimation III						
Site name	**Total nests**	**Number of unsuccessful nests plus estimated broods lost before 20 June**	**Total pairs**	**Date of second wave start (if any) ***	**Total first wave nests (prior to 15 June)**	**Estimated renesters first wave (prior to 15 June)**	**Total Pairs first wave (prior to 15 June)**	**Total nests 2nd wave (June 15 or after)**	**Estimated renesters 2nd wave (June 15 or after)**	**Total Pairs 2nd wave (June 15 or after)**	**Total Pairs**
Delta Beach South	143	11	132	None	137			6			
NAB Ocean North	293	37	256	None	278			15			
NAB Ocean South	321	27	294	None	298			23			
D Street Fill/Sweetwater Marsh NWR	127	2	125	None	123	14	109	4	1	3	112
Chula Vista Wildlife Reserve	96	0	96	None	95	9	86	1	1	0	86
South San Diego Bay Unit, SDNWR - Saltworks	40	0	40	6/14/2017	34	1	33	6	6	0	33
Tijuana Estuary NERR - Totals	225	4	221		180	16	164	45	12	33	197

	Pair Estimation II				Pair Estimation III						
Site name	**Total nests**	**Number of unsuccessful nests plus estimated broods lost before 20 June**	**Total pairs**	**Date of second wave start (if any) ***	**Total first wave nests (prior to 15 June)**	**Estimated renesters first wave (prior to 15 June)**	**Total Pairs first wave (prior to 15 June)**	**Total nests 2nd wave (June 15 or after)**	**Estimated renesters 2nd wave (June 15 or after)**	**Total Pairs 2nd wave (June 15 or after)**	**Total Pairs**
Tijuana North	169	0	169	None	130	7	123	39	11	28	151
Tijuana South	56	4	52	None	50	9	41	6	1	5	46
Imperial County											
Salton Sea	0	0	0	No Nests	0	0	0	0	0	0	0
State Total	5983	1683	4127	None	5091	136	1518	719	170	212	1752

Appendix A-4 II & II Legend:

Note: Blank cells indicate that no data was provided, or information is unknown.

*__Date of second wave start (if any)__: Method II defines "Date of second wave" as, “after early breeding season when nest initiation rates decline, the date when nest initiation rates begin to uptick again”. If there were no nests (with eggs) found at the site, “No Nests” was recorded. If there were nests, but no second wave of nesters (i.e., no uptick in nest initiation rates after early breeding season) then “None” was recorded.

Appendix A-5: Productivity in 2017.

Site name	Date of first hatch*	Date of last hatch	Max # active nests & broods	Date of max active nests	Date of first fledgling**	Fledgling estimate method***	Total fledglings
Sacramento Area							
Bufferlands	6/12/2017	6/10/2017	1	5/19/2017	None	Exact count. Only one nest.	0
San Francisco Bay Area							
Napa Sonoma Marsh Wildlife Area – Totals							80
Green Island Unit	6/15/2017	7/17/2017	76	6/26/2017			
Pond 7/7A			2	5/17/2017			
Montezuma – Totals							5
Site 12A	6/10/2017	6/10/2017	2	5/29/2017		Other - chicks were easy to track individually.	
Site 3/4	7/9/2017	7/25/2017	3	7/6/2017	8/3/2017	Other - chicks were easy to track individually.	
Pittsburg Power Plant							
Alameda Point	5/26/2017	7/24/2017	235	5/30/2017	6/16/2017	3WD	182-250

Site name	Date of first hatch*	Date of last hatch	Max # active nests & broods	Date of max active nests	Date of first fledgling**	Fledgling estimate method***	Total fledglings
Hayward Regional Shoreline	5/26/2017	7/3/2017	50	5/31/2017	6/21/2017	3WD	71-77
Eden Landing Ecological Reserve	6/19/2017	7/24/2017	11	7/5/2017	7/3/2017	Other - counted observed fledglings 1-2 times weekly (once during SNPL survey, once during CLTE survey later in season	20-28
Kings/San Luis Obispo/Santa Barbara Counties							
Kettleman City Evaporation Ponds	No Nests	No Nests	0	No Nests	N/A	N/A	0

Site name	Date of first hatch*	Date of last hatch	Max # active nests & broods	Date of max active nests	Date of first fledgling**	Fledgling estimate method***	Total fledglings
Oceano Dunes SVRA	6/14/2017	7/21/2017	39	6/16/2017	7/5/2017	Other: A combination of field resightings of individually color banded fledglings plus the high count of concurrently seen young unbanded fledglings.	7
Rancho Guadalupe Dunes Preserve	No Nests	No Nests	0	No Nests	N/A	N/A	0
Guadalupe-Nipomo Dunes National Wildlife Refuge		No Nests					
Vandenberg AFB-Purisima Pt.	6/20/2017	7/28/2017	18	6/20/2017	7/10/2017	3WD	8
Coal Oil Point Reserve	No Nests	No Nests	0	No Nests	N/A	N/A	0
Ventura County							
Ormond Beach	6/19/2017	8/1/2017	28	6/19/2017	7/9/2017	3WD	20
Hollywood Beach	No Nests	No Nests	0	No Nests	N/A	N/A	0

Site name	Date of first hatch*	Date of last hatch	Max # active nests & broods	Date of max active nests	Date of first fledgling**	Fledgling estimate method***	Total fledglings
Santa Clara River/McGrath State Beach	None	None	5	6/14/2017	None	3WD	0
Pt Mugu – Totals							27-51
Holiday Beach	6/15/2017	7/31/2017	108	6/5/2017	7/11/2017	Other	7-24
Holiday Salt Panne	6/12/2017	7/19/2017	15	6/15/2017	7/7/2017	Other	1
Eastern Arm	6/20/2017	7/7/2017	22	6/16/2017	7/27/2017	Other	3
Ormond Beach East	6/22/2017	8/1/2017	114	6/22/2017	7/4/2017	Other	16-23
Saticoy United Water Conservation District	No Nests	No Nests	0	No Nests	N/A	N/A	0
Los Angeles/Orange Counties							
Venice Beach/Marina del Rey	No Nests	No Nests	0	No Nests	N/A	N/A	0
Malibu Lagoon			22	7/13/2017			13-25
LA Harbor	None	None	4	5/20/2017	None	3WD	0
Seal Beach NWR - Anaheim Bay	5/28/2017	6/4/2017	98	5/31/2017	6/25/2017		4-8
Bolsa Chica Ecological Reserve – Totals	5/30/2018	6/25/2017			6/27/2017		6
Nest Site 1 (NS1)	5/30/2018	6/6/2017	16	6/6/2017	6/27/2017	Other: Counts by monitors	

Site name	Date of first hatch*	Date of last hatch	Max # active nests & broods	Date of max active nests	Date of first fledgling**	Fledgling estimate method***	Total fledglings
Nest Site 2 (NS2)	6/1/2018	6/27/2017	84	5/25/2017	6/27/2017	Other: Counts by monitors	
Nest Site 3 (NS3)	6/1/2018	6/8/2017	32	6/8/2017	None	Other: Counts by monitors	
South Tern Island (STI)	None	None	3	5/16/2017	None	Other: Counts by monitors	
Seasonal Ponds	6/9/2018	6/25/2017	4	5/17/2017	None	Other: Counts by monitors	
Huntington State Beach	5/26/2017	7/11/2017	294	5/26/2017	6/15/2017	other: fledgling range determined using combination of 3WD and a 2-week daytime count	26-140
Anaheim Lake		No Nests					
Burris Sand Pit/Burris Basin	6/22/2017	7/26/2017	10	6/14/2017	7/12/2017	Other-High count day used	10
Upper Newport Bay Ecological Reserve	6/9/2017	6/30/2017	11	5/26/2017			13
San Diego County							

Site name	Date of first hatch*	Date of last hatch	Max # active nests & broods	Date of max active nests	Date of first fledgling**	Fledgling estimate method***	Total fledglings
MCB Camp Pendleton – Totals							4
Red Beach	None	None	23	6/12/2017	None	R	0
White Beach	5/23/2017	6/26/2017	156	6/14/2017	6/16/2017	R	
Santa Margarita River – Blue Beach (BBN & BBS)	5/20/2017	5/29/2017	255	5/5/2017	6/13/2017	R	
Santa Margarita River - Salt flats and Island	None	None	1	5/19/2017	None	R	0
Batiquitos Lagoon Ecological Reserve – Totals	5/23/2017				6/9/2017		175-225
E1	5/23/2017	6/20/2017	52	5/23/2017	6/16/2017	Other: estimates provided by USDA Wildlife Services	25-30
W1	5/23/2017	6/30/2017	37	5/19/2017	6/13/2017	Other: estimates provided by USDA Wildlife Services	25-30

Site name	Date of first hatch*	Date of last hatch	Max # active nests & broods	Date of max active nests	Date of first fledgling**	Fledgling estimate method***	Total fledglings
W2	5/23/2017	6/27/2017	359	5/23/2017	6/9/2017	Other: estimates provided by USDA Wildlife Services	125-165
San Elijo Lagoon Ecological Reserve	No Nests	No Nests	0	No Nests	N/A	N/A	0
Fairbanks Ranch							
San Dieguito Lagoon Ecological Reserve	No Nests	No Nests	0	No Nests	N/A	N/A	0
Mission Bay							
FAA Island	5/31/2017	6/29/2017	25	5/31/2017	6/20/2017	R/3WD	16-21
North Fiesta Island	No Nests	No Nests	0	No Nests	N/A	N/A	0
Mariner's Point	5/24/2017	6/28/2017	61	5/24/2017	6/20/2017	3WD	30-50
Stony Point	5/31/2017	6/30/2017	2	5/8/2017	7/23/2017	R, 3WD	1
San Diego River Mouth							
San Diego Bay							

Site name	Date of first hatch*	Date of last hatch	Max # active nests & broods	Date of max active nests	Date of first fledgling**	Fledgling estimate method***	Total fledglings
Lindbergh Field & Former Naval Training Center	5/30/2017	6/18/2017	19	5/30/2017	6/18/2017	Other - combination of daytime counts of fledglings beginning at peak 2 weeks after first fledgling, and band recapture results	13-17
US Navy - NI MAT (NB Coronado)	6/6/2017	6/27/2017	14	6/6/2017	6/30/2017	3WD	1
US Navy – NI Alt	No Nests	No Nests	0	No Nests	N/A	N/A	0
Naval Base Coronado - Totals	5/23/2017	7/13/2017			6/19/2017		278-472
Delta Beach North	5/26/2017	7/5/2017	71	5/23/2017	6/20/2017	3WD	48-77
Delta Beach South	5/25/2017	7/4/2017	60	5/29/2017	6/22/2017	R/3WD	37-87
NAB Ocean North	5/23/2017	7/11/2017	199	5/30/2017	6/20/2017	R/3WD	102-170
NAB Ocean South	5/25/2017	7/13/2017	144	5/22/2017	6/19/2017	R/3WD	91-138

Site name	Date of first hatch*	Date of last hatch	Max # active nests & broods	Date of max active nests	Date of first fledgling**	Fledgling estimate method***	Total fledglings
D Street Fill/Sweetwater Marsh NWR	5/23/2017	7/1/2017	89	5/23/2017	6/9/2017	Other - combination of daytime counts of fledglings beginning at peak 2 weeks after first fledgling, and band recapture results	25-27
Chula Vista Wildlife Reserve	5/30/2017	7/4/2017	78	5/30/2017	6/20/2017	Other - combination of daytime counts of fledglings beginning at peak 2 weeks after first fledgling, and band recapture results	17-23

Site name	Date of first hatch*	Date of last hatch	Max # active nests & broods	Date of max active nests	Date of first fledgling**	Fledgling estimate method***	Total fledglings
South San Diego Bay Unit, SDNWR - Saltworks	5/31/2017	7/12/2017	28	5/31/2017	6/25/2017	Other - combination of daytime counts of fledglings beginning at peak 2 weeks after first fledgling, and band recapture results	2-3
Tijuana Estuary NERR - Totals	6/1/2017	7/13/2017		6/1/2017	6/22/2017		77-83
Tijuana North	6/1/2017	7/13/2017	108	6/1/2017	6/22/2017	Other - combination of daytime counts of fledglings beginning at peak 2 weeks after first fledgling, and band recapture results	51

Site name	Date of first hatch*	Date of last hatch	Max # active nests & broods	Date of max active nests	Date of first fledgling**	Fledgling estimate method***	Total fledglings
Tijuana South	6/8/2017	6/29/2017	46	6/1/2017	6/22/2017	Other - combination of daytime counts of fledglings beginning at peak 2 weeks after first fledgling, and band recapture results	26-32
Imperial County							
Salton Sea	No Nests	No Nests	0	No Nests	N/A	N/A	0
State Total							1131-1655

Appendix A-5 Productivity Legend

Note: Blank cells indicate that no data was provided, or information is unknown.

*__Date of first hatch:__ "No Nest" indicates that there were no nests with eggs found. None indicates that there were no successful hatches.

**__Date of first fledgling:__ Within column, "None" indicates that there were no nests that successfully produced a fledgling. "N/A" indicates that the site had no nests, and therefore no fledglings.

***__Fledgling estimate method:__ Within column, "N/A" indicates that there were no fledglings present, therefore no fledgling estimate was used.

Appendix A-6: Clutch sizes in 2017.

Site name	Nest total	Egg total	1 egg clutch	2 egg clutch	3 egg clutch	4 egg clutch
Sacramento Area						
Bufferlands	1	3	0	0	1	0
San Francisco Bay Area						
Napa Sonoma Marsh Wildlife Area – Totals	142					
Green Island Unit	139					
Pond 7/7A	3					
Montezuma – Totals	9	19	1	6	2	0
Site 12A	4	10	0	2	2	0
Site 3/4	5	9	1	4	0	0
Pittsburg Power Plant						
Alameda Point	447	697	206	232	9	0
Hayward Regional Shoreline	72	126	18	54	0	0
Eden Landing Ecological Reserve	21	34	8	13	0	0
Kings/San Luis Obispo/Santa Barbara Counties						
Kettleman City Evaporation Ponds						
Oceano Dunes SVRA	52	68	11	27	1	0
Rancho Guadalupe Dunes Preserve	0	0	0	0	0	0
Guadalupe-Nipomo Dunes National Wildlife Refuge	0	0	0	0	0	0
Vandenberg AFB-Purisima Pt.	28	51	6	21	1	0

Site name	Nest total	Egg total	1 egg clutch	2 egg clutch	3 egg clutch	4 egg clutch
Coal Oil Point Reserve	0	0	0	0	0	0
Ventura County						
Ormond Beach	38	69	7	31	0	0
Hollywood Beach	0	0	0	0	0	0
Santa Clara River/McGrath State Beach	9	13	5	4	0	0
Pt Mugu – Totals	377	608	145	230	1	0
Holiday Beach	165	263	68	96	1	0
Holiday Salt Panne	20	33	5	14	0	0
Eastern Arm	26	44	8	18	0	0
Ormond Beach East	166	268	64	102	0	0
Saticoy United Water Conservation District	0	0	0	0	0	0
Los Angeles/Orange Counties						
Venice Beach/Marina del Rey	0	0	0	0	0	0
Malibu Lagoon	31	45				
LA Harbor	5	9	2	2	1	0
Seal Beach NWR - Anaheim Bay	124	216	33	90	1	0
Bolsa Chica Ecological Reserve – Totals	178	297	62	114	1	1
Nest Site 1 (NS1)	28	42	14	14	0	0
Nest Site 2 (NS2)	105	175	37	67	0	1
Nest Site 3 (NS3)	36	67	6	29	1	0
South Tern Island (STI)	5	7	3	2	0	0
Seasonal Ponds	4	6	2	2	0	0

Site name	Nest total	Egg total	1 egg clutch	2 egg clutch	3 egg clutch	4 egg clutch
Huntington State Beach	679	1093	269	406	4	0
Anaheim Lake	0	0	0	0	0	0
Burris Sand Pit/Burris Basin	14	26	3	10	1	0
Upper Newport Bay Ecological Reserve	17	30	4	13	0	0
San Diego County						
MCB Camp Pendleton – Totals	1405	2097	719	680	6	0
Red Beach	31	43	19	12	0	0
White Beach	399	616	183	215	1	0
Santa Margarita River – Blue Beach (BBN & BBS)	972	1435	514	453	5	0
Santa Margarita River - Salt flats and Island	3	3	3	0	0	0
Batiquitos Lagoon Ecological Reserve – Totals	692	1264	127	558	7	0
E1	88	167	11	75	2	0
W1	56	107	6	49	1	0
W2	548	990	110	434	4	0
San Elijo Lagoon Ecological Reserve	0	0	0	0	0	0
Fairbanks Ranch						
San Dieguito Lagoon Ecological Reserve	0	0	0	0	0	0
Mission Bay						
FAA Island	41	75	7	34	0	0
North Fiesta Island	0	0	0	0	0	0

Site name	Nest total	Egg total	1 egg clutch	2 egg clutch	3 egg clutch	4 egg clutch
Mariner's Point	176	319	36	137	3	0
Stony Point	2	4	0	2	0	0
San Diego River Mouth						
San Diego Bay						
Lindbergh Field & Former Naval Training Center	24	45	3	21	0	0
US Navy - NI MAT	22	44	2	18	2	0
US Navy – NI Alt	0	0	0	0	0	0
Naval Base Coronado - Totals	889	1446	337	547	5	0
Delta Beach North	132	222	44	86	2	0
Delta Beach South	143	216	70	73	0	0
NAB Ocean North	293	490	98	193	2	0
NAB Ocean South	321	518	125	195	1	0
D Street Fill/Sweetwater Marsh NWR	127	210	44	83	0	0
Chula Vista Wildlife Reserve	96	160	32	64	0	0
South San Diego Bay Unit, SDNWR - Saltworks	40	63	17	23	0	0
Tijuana Estuary NERR - Totals	225	387	64	160	1	0
Tijuana North	169	288	51	117	1	0
Tijuana South	56	99	13	43	0	0
Imperial County						
Salton Sea	0	0	0	0	0	0
State Total	5983	9518	2168	3580	47	1

Appendix A-6 Clutch Legend:

Note: Blank cells indicate that no data was provided, or information is unknown.

Appendix A-7: Egg Fate 2017.

Site name	Damaged (includes human caused)	Lost to flooding	Abandoned Pre-term (includes buried)	Abandoned Post-term/Nonviable	Died Hatching	Depredation Total (predator species*, number, observation type**)	Outcome Unknown	Hatched (C+H+PH+DC)	Total Eggs
Sacramento Area									
Bufferlands	0	0	0	0	0	0	0	3	3
San Francisco Bay Area									
Napa Sonoma Marsh Wildlife Area – Totals									
Green Island Unit									
Pond 7/7A									
Montezuma – Totals	0	0	1	0	0	3	7	8	19
Site 12A	0	0	0	0	0	3 (Unknown 3)	4	3	10
Site 3/4	0	0	1	0	0	0	3	5	9
Pittsburg Power Plant									
Alameda Point	0	0	95	72	13	4 (PEFA 1P, Unknown 3)	3	510	697
Hayward Regional Shoreline	0	0	8	0	1	24 (CAGU 24D)	0	93	126

Site name	Damaged (includes human caused)	Lost to flooding	Abandoned Pre-term (includes buried)	Abandoned Post-term/Nonviable	Died Hatching	Depredation Total (predator species*, number, observation type**)	Outcome Unknown	Hatched (C+H+PH+DC)	Total Eggs
Eden Landing Ecological Reserve	0	0	0	2	1	1 (Unknown 1)	10	20	34
Kings/San Luis Obispo/Santa Barbara Counties									
Kettleman City Evaporation Ponds	0	0	0	0	0	0	0	0	0
Oceano Dunes SVRA	0	0	9	3	0	6 (MEME 6D)	9	41	68
Rancho Guadalupe Dunes Preserve	0	0	0	0	0	0	0	0	0
Guadalupe-Nipomo Dunes National Wildlife Refuge	0	0	0	0	0	0	0	0	0
Vandenberg AFB-Purisima Pt.	0	0	9	1	0	0	0	41	51
Coal Oil Point Reserve	0	0	0	0	0	0	0	0	0
Ventura County									

Site name	Damaged (includes human caused)	Lost to flooding	Abandoned Pre-term (includes buried)	Abandoned Post-term/Nonviable	Died Hatching	Depredation Total (predator species*, number, observation type**)	Outcome Unknown	Hatched (C+H+PH+DC)	Total Eggs
Ormond Beach	1	2	3	4	0	7 (OTBE 6S, Unknown 1)	7	45	69
Hollywood Beach	0	0	0	0	0	0	0	0	0
Santa Clara River/McGrath State Beach	0	4	1	0	0	8 (CORVID 8P)	0	0	13
Pt Mugu – Totals	0	76	62	24	0	176	60	211	609
Holiday Beach	0	41	12	1	0	134 (DIVI 34D, OTBE 3P, Unknown 97)	30	45	263
Holiday Salt Panne	0	1	0	4	0	1 (Unknown 1)	1	27	34
Eastern Arm	0	32	1	2	0	4 (CALA 4D)	0	5	44
Ormond Beach East	0	2	49	17	0	37 (CALA 1D, OTBE 2D, Owl 6D, Unknown 9, Unknown Avian 1P, Unknown Mammal 18P)	29	134	268

Site name	Damaged (includes human caused)	Lost to flooding	Abandoned Pre-term (includes buried)	Abandoned Post-term/Nonviable	Died Hatching	Depredation Total (predator species*, number, observation type**)	Outcome Unknown	Hatched (C+H+PH+DC)	Total Eggs
Saticoy United Water Conservation District	0	0	0	0	0	0	0	0	0
Los Angeles/Orange Counties									
Venice Beach/Marina del Rey	0	0	0	0	0	0	0	0	0
Malibu Lagoon						Unknown (RBGU 1D)			45
LA Harbor	0	0	0	0	0	9 (CORA 9D)	0	0	9
Seal Beach NWR - Anaheim Bay	0	0	0	47	0	3 (Unknown 3)	0	166	216
Bolsa Chica Ecological Reserve – Totals	1	0	43	33	1	22	23	174	297
Nest Site 1 (NS1)	1	0	16	5	0	2 (Unknown Avian 2P)	2	16	42

Site name	Damaged (includes human caused)	Lost to flooding	Abandoned Pre-term (includes buried)	Abandoned Post-term/Nonviable	Died Hatching	Depredation Total (predator species*, number, observation type**)	Outcome Unknown	Hatched (C+H+PH+DC)	Total Eggs
Nest Site 2 (NS2)	0	0	2	18	1	11 (ANTS 2D, Unknown 2, Unknown Avian 4D, Unknown Avian 3)	16	127	175
Nest Site 3 (NS3)	0	0	25	10	0	2 (Unknown 2)	4	26	67
South Tern Island (STI)	0	0	0	0	0	7 (Unknown 7)	0	0	7
Seasonal Ponds	0	0	0	0	0	0	1	5	6
Huntington State Beach	0	0	121	126	3	135 (AMCR 3P, AMCR 72S, rat 31P, Unknown 29)	5	703	1093
Anaheim Lake	0	0	0	0	0	0	0	0	0
Burris Sand Pit/Burris Basin	2	0	4	1	0	2 (Unknown Avian 2)	2	15	26
Upper Newport Bay Ecological Reserve	0	0	6	0	0	0	5	19	30
San Diego County									

Site name	Damaged (includes human caused)	Lost to flooding	Abandoned Pre-term (includes buried)	Abandoned Post-term/Nonviable	Died Hatching	Depredation Total (predator species*, number, observation type**)	Outcome Unknown	Hatched (C+H+PH+DC)	Total Eggs
MCB Camp Pendleton – Totals	2	141	48	17	0	1764	51	74	2097
Red Beach	0	15	0	0	0	23 (CALA 13D, CALA 3S, CORA 4S, CORVID 1D, Unknown 2)	5	0	43
White Beach	1	100	16	12	0	447 (CALA 182D, CALA 29P, CALA 137S, CORA 17D, CORA 13S, CORVID 5D, CORVID 13P, CORVID 17S, Unknown 34)	11	29	616

Site name	Damaged (includes human caused)	Lost to flooding	Abandoned Pre-term (includes buried)	Abandoned Post-term/Nonviable	Died Hatching	Depredation Total (predator species*, number, observation type**)	Outcome Unknown	Hatched (C+H+PH+DC)	Total Eggs
Santa Margarita River – Blue Beach (BBN & BBS)	1	26	32	5	0	1292 (AMCR 1D, AMCR 1S, CALA 206D, CALA 85P, CALA 315S, CORA 118D, CORA 9P, CORA 57S, CORVID 17D, CORVID 18P, CORVID 43S, GULL 2D, Unknown 420)	34	45	1435
Santa Margarita River - Salt flats and Island	0	0	0	0	0	2 (CALA 1D, CALA 1S)	1	0	3

Site name	Damaged (includes human caused)	Lost to flooding	Abandoned Pre-term (includes buried)	Abandoned Post-term/Nonviable	Died Hatching	Depredation Total (predator species*, number, observation type**)	Outcome Unknown	Hatched (C+H+PH+DC)	Total Eggs
Batiquitos Lagoon Ecological Reserve – Totals	3	0	140	164	1	47	18	895	1268
E1	0	0	7	5	1	39 (AMCR 10D, AMCR 6S, CALA 8D, CORA 13S, GREG 2D)	10	105	167
W1	0	0	16	15	0	0	1	75	107
W2	3	0	117	144	0	8 (CORA 1, Unknown 3, Unknown Avian 2D, Unknown Avian 1S, Unknown Avian 1)	7	715	994
San Elijo Lagoon Ecological Reserve	0	0	0	0	0	0	0	0	0
Fairbanks Ranch									

Site name	Damaged (includes human caused)	Lost to flooding	Abandoned Pre-term (includes buried)	Abandoned Post-term/Nonviable	Died Hatching	Depredation Total (predator species*, number, observation type**)	Outcome Unknown	Hatched (C+H+PH+DC)	Total Eggs
San Dieguito Lagoon Ecological Reserve	0	0	0	0	0	0	0	0	0
Mission Bay									
FAA Island	0	0	15	5	0	5 (Unknown 3, Unknown Avian 2P)	7	43	75
North Fiesta Island	0	0	0	0	0	0	0	0	0
Mariner's Point	0	0	96	0	0	19 (AMCR 10P, Unknown 9)	2	202	319
Stony Point	0	0	0	2	0	0	0	2	4
San Diego River Mouth									
San Diego Bay									
Lindbergh Field & Former Naval Training Center	0	0	2	7	0	8 (CORA 1D, CORA 6S, unknown 1)	1	27	45
US Navy - NI MAT	0	0	1	6	0	11 (CORA 2D, CORVID 9D)	0	26	44
US Navy – NI Alt	0	0	0	0	0	0	0	0	0

Site name	Damaged (includes human caused)	Lost to flooding	Abandoned Pre-term (includes buried)	Abandoned Post-term/Nonviable	Died Hatching	Depredation Total (predator species*, number, observation type**)	Outcome Unknown	Hatched (C+H+PH+DC)	Total Eggs
Naval Base Coronado - Totals	35	2	111	125	8	14	313	840	1448
Delta Beach North	1	0	14	19	2	1 (Unknown 1)	63	122	222
Delta Beach South	1	0	16	20	0	1 (FECA 1D)	76	102	216
NAB Ocean North	30	0	28	46	4	7 (AMCR 2S, Unknown 3, Unknown Avian 1D, Unknown Avian 1P)	2	373	490
NAB Ocean South	3	2	53	40	2	5 (Unknown 3, Unknown Avian 2S)	172	243	520
D Street Fill/Sweetwater Marsh NWR	0	0	23	10	7	6 (CORA 3D, CORA 1P, CORA 2S)	2	162	210
Chula Vista Wildlife Reserve	0	0	19	4	0	5 (GBHE 2S, NOHA 2S, Unknown 1)	12	120	160
South San Diego Bay Unit, SDNWR - Saltworks	2	0	11	0	0	2 (GULL 2S)	14	34	63

Site name	Damaged (includes human caused)	Lost to flooding	Abandoned Pre-term (includes buried)	Abandoned Post-term/Nonviable	Died Hatching	Depredation Total (predator species*, number, observation type**)	Outcome Unknown	Hatched (C+H+PH+DC)	Total Eggs
Tijuana Estuary NERR - Totals	0	0	55	13	1	0	36	282	387
Tijuana North	0	0	43	10	1	0	31	203	288
Tijuana South	0	0	12	3	0	0	5	79	99
Imperial County									
Salton Sea	0	0	0	0	0	0	0	0	0
State Total	46	225	883	666	36	2282	587	4756	9525

Appendix A-7 Legend:
Note: Blank cells indicate that no data was provided, or information is unknown.

***Predator Species Codes:**

American crow (AMCR), American kestrel (AMKE), Ant, Barn owl (BAOW), Black skimmer (BLSK), Black-bellied plover (BBPL), Black-crowned night-heron (BCNH), Black-tailed jackrabbit (LECA), Bobcat (LYRU), Brown pelican (BRPE), California ground squirrel (OTBE), California gull (CAGU), Canid, Caspian tern (CATE), Common raven (CORA), Cooper's hawk (COHA), Corvid, Coyote (CALA), Domestic cat (FECA), Domestic dog (CAFA), European starling (EUST), *Glaucous-winged gull (GWGU),* Gopher snake (PICA), Gray fox (URCI), Great blue heron (GBHE), Great egret (GREG), Great horned owl (GHOW), Great-tailed grackle (GTGR), Gull-billed tern (GBTE), Gull, Horned lark (HOLA), Least tern (LETE), Loggerhead shrike (LOSH), Long-billed curlew (LBCU), Merlin (MERL), Mice, Northern harrier (NOHA), Northern mockingbird (NOMO), Opossum (DIVI), Osprey (OSPR), Owl, Parasitic Jaeger (PAJA), Peregrine falcon (PEFA), Raccoon (PRLO), Rat, Red fox (VUVU), Red-tailed hawk (RTHA), Red-winged blackbird (RWBL), Ring-billed gull (RBGU), River otter (LOCA), Rodent, Short-eared owl (SEOW), Snake, Snapping turtle (CHSE), Southern Pacific rattlesnake (CROR), Striped skunk (MEME), Unknown, Unknown Avian, Unknown Mammal, Unknown Raptor, Western gull (WEGU), Western meadowlark (WEME), White-tailed kite (WTKI)

****Observation type**: Describes certainty level for each predator species that is associated with a predation event. In other words, what evidence suggests a predation was committed by the predator species in question.

P=possible (if predation of terns occurred and a potential predator was known to be on or near the site through direct observation or other signs such as tracks or scat)

S=suspected (when loss of terns directly corresponded to the presence of a predator)

D=documented (direct observation of a predator killing a tern or substantial evidence to indicate responsibility. This evidence could be characteristic feeding patterns or tracks leading to a carcass or shell remains)

Appendix A-8: Bird Mortality 2017.

Site name	Summary of Chick Mortality		Summary of Fledgling Mortality		Total Fledglings (minimum numbers from Table 1)	Summary of Adult Mortality		Total Adults (minimum breeding pairs from Table 1****)
	Depredation Total (species, number, observation type*)	Total Mortality*	Depredation Total (predator species**, number, observation type***)	Total Mortality*		Depredation Total (predator species**, number, observation type***)	Total Mortality*	
Sacramento Area								
Bufferlands	0	3	0	0	0	0	0	2
San Francisco Bay Area								
Napa Sonoma Marsh Wildlife Area – Totals					80			130
Green Island Unit								See Site Total
Pond 7/7A								See Site Total
Montezuma – Totals					5			14
Site 12A	0	3	0	0		0	0	See Site Total
Site 3/4	0	0	0	0		0	0	See Site Total
Pittsburg Power Plant								
Alameda Point	3 (AMKE 1D, AMKE 1S, Unknown 1)	133	6 (AMKE 3S, PEFA 1D, PEFA 1S NOHA 1D)	7	182	5 (PEFA 2S, PEFA 1P, PEFA 1D, Unknown 1)	10	764

Site name	Summary of Chick Mortality		Summary of Fledgling Mortality		Total Fledglings (minimum numbers from Table 1)	Summary of Adult Mortality		Total Adults (minimum breeding pairs from Table 1****)
	Depredation Total (species, number, observation type*)	Total Mortality*	Depredation Total (predator species**, number, observation type***)	Total Mortality*		Depredation Total (predator species**, number, observation type***)	Total Mortality*	
Sacramento Area								
Hayward Regional Shoreline	0	17	0	0	71	0	0	132
Eden Landing Ecological Reserve	0	0	0	0	20	0	0	28
Kings/San Luis Obispo/Santa Barbara Counties								
Kettleman City Evaporation Ponds	0	0	0	0	0	0	0	0
Oceano Dunes SVRA	0	0	0	0	7	0	0	88
Rancho Guadalupe Dunes Preserve	0	0	0	0	0	0	0	0
Guadalupe-Nipomo Dunes National Wildlife Refuge	0	0	0	0	0	0	0	0
Vandenberg AFB-Purisima Pt.	0	3	1 (PEFA 1S)	1	8	1 (PEFA 1D)	1	38

Site name	Summary of Chick Mortality		Summary of Fledgling Mortality		Total Fledglings (minimum numbers from Table 1)	Summary of Adult Mortality		Total Adults (minimum breeding pairs from Table 1****)
	Depredation Total (species, number, observation type*)	Total Mortality*	Depredation Total (predator species**, number, observation type***)	Total Mortality*		Depredation Total (predator species**, number, observation type***)	Total Mortality*	
Sacramento Area								
Coal Oil Point Reserve	0	0	0	0	0	0	0	0
Ventura County								
Ormond Beach	0	2	0	0	20	0	0	50
Hollywood Beach	0	0	0	0	0	0	0	0
Santa Clara River/McGrath State Beach	0	0	0	0	0	0	1	14
Pt Mugu – Totals					27			524
Holiday Beach	1 (DIVI 1D)	1	1 (NOHA 1D)	1		0	0	See Site Total
Holiday Salt Panne	0	0	1 (Unknown Avian 1S)	1		3 (Unknown Avian 3S)	3	See Site Total
Eastern Arm	0	0	0	0		0	0	See Site Total
Ormond Beach East	4 (LOSH 1D, WEGU 3D)	9	1 (Unknown Avian 1S)	1		0	0	See Site Total
Saticoy United Water Conservation District	0	0	0	0	0	0	0	0

Site name	Summary of Chick Mortality		Summary of Fledgling Mortality		Total Fledglings (minimum numbers from Table 1)	Summary of Adult Mortality		Total Adults (minimum breeding pairs from Table 1****)
	Depredation Total (species, number, observation type*)	Total Mortality*	Depredation Total (predator species**, number, observation type***)	Total Mortality*		Depredation Total (predator species**, number, observation type***)	Total Mortality*	
Sacramento Area								
Los Angeles/Orange Counties								
Venice Beach/Marina del Rey	0	0	0	0	0	0	0	0
Malibu Lagoon					13			44
LA Harbor	0	0	0	0	0	0	0	0
Seal Beach NWR - Anaheim Bay	1 (Ant 1D)	15	2 (PEFA 2D)	2	4	3 (PEFA 2D, Unknown 1)	3	236
Bolsa Chica Ecological Reserve – Totals					6			316
Nest Site 1 (NS1)	0	3	0	0		0	0	See Site Total
Nest Site 2 (NS2)	7 (ANTS 6D, RTHA 1D)	7	0	0		0	0	See Site Total
Nest Site 3 (NS3)	0	0	0	0		0	0	See Site Total
South Tern Island (STI)	0	0	0	0		0	0	See Site Total
Seasonal Ponds	0	0	0	0		0	0	See Site Total

Site name	Summary of Chick Mortality		Summary of Fledgling Mortality		Total Fledglings (minimum numbers from Table 1)	Summary of Adult Mortality		Total Adults (minimum breeding pairs from Table 1****)
	Depredation Total (species, number, observation type*)	Total Mortality*	Depredation Total (predator species**, number, observation type***)	Total Mortality*		Depredation Total (predator species**, number, observation type***)	Total Mortality*	
Sacramento Area								
Huntington State Beach	10 (AMKE 10D)	162	0	18	26	3 (AMKE 1D, PEFA 2D)	6	1120
Anaheim Lake	0	0	0	0	0	0	0	0
Burris Sand Pit/Burris Basin	0	0	0	1	10	0	0	24
Upper Newport Bay Ecological Reserve	0	6	0	0	13	0	0	30
San Diego County								
MCB Camp Pendleton – Totals					4			424
Red Beach	0	0	0	0		0	1	See Site Total
White Beach	0	2	1 (Raptor 1S)	1		5 (Raptor 5S)	5	See Site Total
Santa Margarita River – Blue Beach (BBN & BBS)	0	3	0	0		1 (Raptor 1S)	2	See Site Total
Santa Margarita River - Salt flats and Island	0	0	0	0		0	0	See Site Total

Site name	Summary of Chick Mortality		Summary of Fledgling Mortality		Total Fledglings (minimum numbers from Table 1)	Summary of Adult Mortality		Total Adults (minimum breeding pairs from Table 1****)
	Depredation Total (species, number, observation type*)	Total Mortality*	Depredation Total (predator species**, number, observation type***)	Total Mortality*		Depredation Total (predator species**, number, observation type***)	Total Mortality*	
Sacramento Area								
Batiquitos Lagoon Ecological Reserve – Totals					175			1316
E1	15 (GBHE 10D, GHOW 3D, GREG 1D, RTHA 1D)	32	3 (GHOW 3D)	6		0	0	See Site Total
W1	0	27	1 (PEFA 1D)	13		0	0	See Site Total
W2	2 (CLTE 1D, Rat 1D)	303	0	158		3 (COHA 1D, PEFA 2D)	7	See Site Total
San Elijo Lagoon Ecological Reserve	0	0	0	0	0	0	0	0
Fairbanks Ranch	0	0	0	0	0	0	0	0
San Dieguito Lagoon Ecological Reserve	0	0	0	0	0	0	0	0
Mission Bay								
FAA Island	1 (ANT 1S)	4	1 (PEFA 1S)	1	16	0	0	66

Site name	Summary of Chick Mortality		Summary of Fledgling Mortality		Total Fledglings (minimum numbers from Table 1)	Summary of Adult Mortality		Total Adults (minimum breeding pairs from Table 1****)
	Depredation Total (species, number, observation type*)	Total Mortality*	Depredation Total (predator species**, number, observation type***)	Total Mortality*		Depredation Total (predator species**, number, observation type***)	Total Mortality*	
Sacramento Area								
North Fiesta Island	0	0	0	0	0	0	0	0
Mariner's Point	0	52	2 (PEFA 2S)	11	30	2 (GHOW 1S, PEFA 1S)	3	292
Stony Point	1 (AMKE 1P)	1	0	0	1	0	0	4
San Diego River Mouth								
San Diego Bay								
Lindbergh Field & Former Naval Training Center	0	1	0	0	13	1 (PEFA 1P)	1	42
US Navy - NI MAT	0	4	0	0	1	0	1	32
US Navy – NI Alt	0	0	0	0	0	0	0	0
Naval Base Coronado - Totals					278			1608
Delta Beach North	0	61	0	5		1 (Unknown Raptor 1D)	1	See Site Total
Delta Beach South	2 (GBHE 2D)	61	1 (PEFA 1D)	3		2 (PEFA 2D)	2	See Site Total
NAB Ocean North	0	149	0	9		0	4	See Site Total

Site name	Summary of Chick Mortality		Summary of Fledgling Mortality		Total Fledglings (minimum numbers from Table 1)	Summary of Adult Mortality		Total Adults (minimum breeding pairs from Table 1****)
	Depredation Total (species, number, observation type*)	Total Mortality*	Depredation Total (predator species**, number, observation type***)	Total Mortality*		Depredation Total (predator species**, number, observation type***)	Total Mortality*	
Sacramento Area								
NAB Ocean South	0	205	2 (PEFA 1D, Unknown Raptor 1D)	16		1 (GHOW 1D)	3	See Site Total
D Street Fill/Sweetwater Marsh NWR	4 (GBTE 1S, NOHA 3D)	38	6 (NOHA 1P, PEFA 1D, PEFA 3P, PEFA 1S)	9	25	0	0	224
Chula Vista Wildlife Reserve	7 (GBTE 7D)	30	6 (PEFA 6S)	8	17	1 (PEFA 1S)	1	172
South San Diego Bay Unit, SDNWR - Saltworks	3 (GBTE 3D)	5	2 (PEFA 1D, Unknown avian 1S)	2	2	5 (BUOW 2D, BUOW 2S, Unknown avian 1S)	5	66
Tijuana Estuary NERR - Totals					77			394
Tijuana North	0	39	4 (PEFA 3P, PEFA 1S)	12		1 (PEFA 1P)	2	See Site Total
Tijuana South	1 (AMKE 1D)	5	0	3		0	0	See Site Total
Imperial County								
Salton Sea	0	0	0	0	0	0	0	0
State Total	62	1386	41	289	1131	38	62	8194

Appendix A-8 Legend:

Note: Blank cells indicate that no data was provided, or information is unknown.

***Total Mortality:** For each class (chick, fledgling, adult) total mortality includes both predation and non-depredation (e.g., natural causes, unknown) mortalities.

****Predator Species Codes:**

American crow (AMCR), American kestrel (AMKE), Ant, Barn owl (BAOW), Black skimmer (BLSK), Black-bellied plover (BBPL), Black-crowned night-heron (BCNH), Black-tailed jackrabbit (LECA), Bobcat (LYRU), Brown pelican (BRPE), California ground squirrel (OTBE), California gull (CAGU), Canid, Caspian tern (CATE), Common raven (CORA), Cooper's hawk (COHA), Corvid, Coyote (CALA), Domestic cat (FECA), Domestic dog (CAFA), European starling (EUST), Glaucous-winged gull (GWGU), Gopher snake (PICA), Gray fox (URCI), Great blue heron (GBHE), Great egret (GREG), Great horned owl (GHOW), Great-tailed grackle (GTGR), Gull-billed tern (GBTE), Gull, Horned lark (HOLA), Least tern (LETE), Loggerhead shrike (LOSH), Long-billed curlew (LBCU), Merlin (MERL), Mice, Northern harrier (NOHA), Northern mockingbird (NOMO), Opossum (DIVI), Osprey (OSPR), Owl, Parasitic Jaeger (PAJA), Peregrine falcon (PEFA), Raccoon (PRLO), Rat, Red fox (VUVU), Red-tailed hawk (RTHA), Red-winged blackbird (RWBL), Ring-billed gull (RBGU), River otter (LOCA), Rodent, Short-eared owl (SEOW), Snake, Snapping turtle (CHSE), Southern Pacific rattlesnake (CROR), Striped skunk (MEME), Unknown, Unknown Avian, Unknown Mammal, Unknown Raptor, Western gull (WEGU), Western meadowlark (WEME), White-tailed kite (WTKI)

*****Observation type**: Describes certainty level for each predator species that is associated with a predation event. In other words what evidence suggests a predation was committed by the predator species in question.

P=possible (if predation of terns occurred and a potential predator was known to be on or near the site through direct observation or other signs such as tracks or scat)

S=suspected (when loss of terns directly corresponded to the presence of a predator)

D=documented (direct observation of a predator killing a tern or substantial evidence to indicate responsibility. This evidence could be characteristic feeding patterns or tracks leading to a carcass or shell remains)

******Total Adults (Minimum breeding pairs from Table 1):** Minimum breeding pairs are derived by selecting minimum breeding pair estimates from Method I, II, and III. Estimates were generated at both the site, and sub-site level. However, because sub-site and site level estimates may not be exact, only site level estimates are reported in Appendix A-8 to remain consistent with Table 1. Refer to Appendix A-3 (Method I pair estimation), and A-4 (Methods II & III pair estimation) for sub-site specific breeding pair estimates.

Appendix A-9: Site-specific Summaries and Notes.
(excerpts taken from 2017 California least tern data reporting spreadsheets unless indicated otherwise).

Site name:	Summary of breeding season at site:
Sacramento Area	
Bufferlands	
San Francisco Bay Area	
Napa Sonoma Marsh Wildlife Area	
Montezuma	
Pittsburg Power Plant	
Alameda Point	
Hayward Regional Shoreline	1: Annually (before and after terns arrive) maintain the site by mechanically removing vegetation and adding additional substrate (sand/oyster shell) to the site. Additional 100 meters of straw waddles were placed to help slow the wave erosion along the western side of the island. Starting in 2001, we moved 335,000 pounds of materials onto the island. People of all ages spread out 200 tons of sand, salt, and oyster shells to encourage California least terns to nest on the island. Youths participating in service-learning opportunities painted and installed decoys to attract terns to the island. Starting in the spring of 2005, a solar-recharged sound system was installed specifically for attracting California least terns. 2: East Bay Regional Park District Wildlife Biologist, and 4,708 volunteers who have contributed nearly 21,970 hours in support of this stewardship effort (cumulative numbers). A very important component of this stewardship project involves the financial support from the community. More than $120,000 in grant funds and donations were secured for the Tern Island Project from the Regional Parks Foundation, U.S. Fish & Wildlife Service Coastal Program, Fremont Bank Foundation, Alameda Countywide Clean Water Community Stewardship Program, New United Motor Manufacturing, Orchard Supply Hardware and Johnston's & Drake's Bay Oyster Farms.

Site name:	Summary of breeding season at site:
Eden Landing Ecological Reserve	CLTE nesting was a surprise this year, as CLTE have not attempted to nest at ELER since 2009. Most CLTE monitoring was conducted concurrently with SNPL survey, thus explaining gaps in data. Dedicated monitor was used weekly beginning July 18 to better document adult, chick, and fledge counts, though nest monitoring was not conducted during these dedicated CLTE surveys as monitor was not currently listed on 10a1A permit.
San Luis Obispo/Santa Barbara Counties	
Kettleman City Evaporation Ponds	
Oceano Dunes SVRA	
Rancho Guadalupe Dunes Preserve	
Guadalupe Nipomo Dunes National Wildlife Refuge	
Vandenberg AFB-Purisima Pt.	
Coal Oil Point Reserve	
Ventura County	
Ormond Beach	
Hollywood Beach	On May 23rd 18 California least terns (CLTs) were observed on the beach, some displaying breeding behavior, including carrying fish and copulating. CLTs were also observed making scrapes over several weeks and even exhibited defense tactics (e.g., dive-bombing) with the ever-present crows. However, no nests were initiated by CLTs in 2017. Small groups continued to be observed flying over the beach through August 16th.

Site name:	Summary of breeding season at site:
Santa Clara River/McGrath State Beach	Nests #1,2,3,4,5 all were predated by a CORVID. Nests #6, 7, 8 all were flooded by hightide. CLT #8, 1E Collected from wrack line and taken to WFVZ - 6/29: CLT#6 E coll. At: 34.208908 / -119.254981 Dead (male) least tern collected @ campground fence 6/14/17 34.225218N / -119.262398W; taken to Western Foundation of Vertebrate Zoology. Necropsy could not indicate cause of death, no sign of blunt force trauma, stomach empty except for a few fish scales. Confirmed to be a male bird. June 12 - Illegal OHV at McG N. Lake; tire tracks narrowly missed active 1 egg tern nest. Any fledglings observed were post-dispersal from other sites, McGrath did not hatch any chicks in 2017

Site name:	Summary of breeding season at site:
Pt Mugu	"SUMMARY California least terns established a similar number of nests at Naval Base Ventura County in 2017 (n = 377) and in 2016 (n = 361). However, productivity was significantly lower in the current year, with only 125 nests hatching compared to 205 in 2016. A minimum of 27-51 fledglings were documented, fewer than the 54-86 fledglings recorded in 2016. At least 115 or 30.5% of nests were predated; most of them during large predation events early in the season. Wind erased many of the tracks but terrestrial predators, including opossums and ground squirrels, and possibly weasels, were documented or suspected to be responsible for most of the losses. High tide and flooding events caused the loss 12.5% (n = 47) of nests. The majority were located on Holiday Beach and on Eastern Arm. The Eastern Arm colony is particularly prone to flooding, with 19 of 26 nests washed out this season. The first nests were documented on 22-May-17, which was the latest breeding season start since 2007. The high number of early season losses resulted in later re-nesting than usually is observed. The final nest hatched on 1-Aug-17, which was also the latest a nest has hatched at NBVC Point Mugu since 2007. Holiday Beach (n = 165) and the Ormond East (n = 166) colonies had similar number of nests, but Holiday Beach experienced the most severe predation. Afterwards Ormond East had an increase in nest initiations. The chicks that hatched appeared to be well attended and adults were frequently observed provisioning them, even after the majority of adults had departed the colonies. " "WORKSHEET: SITE INFO Column: Fledgling Estimate Method If we waited 2-3 weeks after seeing first fledglings and 2-3 weeks between counts, most of our birds would have left and we would only have one good count. Conducted surveys 2x/week for the month of July. Added together counts that were at least 8 days apart. Column: 'start_date_2nd_wave' and 'estimated_num_renesters_from_1st_&_2nd_wave' Due to the lack of banded birds at NBVC, it is very difficult to provide an accurate estimate of renesters. The date 15-Jun-2017 was used on the two main colonies (Holiday Beach and Ormond Beach East), because of the failure of 81 nests and 20 nests, respectively, by that date. On Holiday Beach, approximately 50 failed during one event on 8-June-2017. Many of these birds are presumed to have re-nested, but they may have moved from Holiday Beach to Ormond East Beach for their second attempts. On or after 15-June-2017, Holiday Beach only had 32 nests initiated, while Ormond East Beach had 92. For this column, estimated that at least half the nests initiated after 15-June-2017 were re-nesters." "WORKSHEET: SEASON CHRONOLOGY Column: Number observed predators There are always other avian species in or near the colony including groups of gulls roosting on the shoreline, etc. The information in this column reflects only those individuals that A) were actively seen hunting or B) may have only been transiting the area but the least terns reacted negatively to their presence by alarming or mobbing. "

Site name:	Summary of breeding season at site:
Saticoy United Water Conservation District	
Los Angeles/Orange Counties	
Venice Beach/Marina del Rey	
Malibu Lagoon	We were not able to track the fate of individual nests this season. Date Total /nests observed: 8-Jun-17/ 9, 21-Jun-17/ 14, 28-Jun-17 /7 (3 one-egg, 4 two-egg),5-Jul-17/ 15 (4 one-egg, 11 two-egg),13-Jul-17/ 22 (6 one-egg, 13 two-egg, 3 unk-egg),19-Jul-17/16 (5 one-egg, 8 two-egg, 3 unk-egg), 26-Jul-17/ 11, 1-Aug-17/3 Estimates provided: Breeding pairs: 22 (range 22-25) between 5/29/17 and 8/27/17, likely birds that abandoned Venice. Nests: 31 estimated (range 22-35) Eggs: 45 eggs estimated (range 32-50) Chicks Fledged: 17 (range 13 to 25) **Below is from Breeding Biology of the California Least Tern** at Venice, Marina Del Rey, and Malibu Lagoon State Beach, Malibu, Los Angeles County, California **in** the 2017 Breeding Season by Thomas Ryan, Carlos Jauregui, Joyce Realegueno, and Stacy Vigallon Malibu Lagoon was monitored by biologists from June 8 to August 1, 2017. Least Terns were first reported on May 4, and the first nest was detected on May 29 as part of monitoring of nearby Snowy Plover nests. Between 19 and 50 least terns were detected at the colony by biologist: as many as 63 by volunteers. Nests were observed between May 29 and August 1 with a peak of 22 nests on July 13, 2017. Young were first observed on June 25, with pre-fledge chicks present until August 27. Fledglings were reported on July 11, with a peak of 13 fledglings reported on August 15. The last least tern was reported on September 9.
LA Harbor	
Seal Beach National Wildlife Refuge	
Bolsa Chica Ecological Reserve	

Site name:	Summary of breeding season at site:
Huntington State Beach	
Anaheim Lake	
Burris Sand Pit/Burris Basin	
Upper Newport Bay Ecological Reserve	
San Diego County	
MCB Camp Pendleton	Due to lack of predator control very few nests hatched. The large increase in nests seen at White beach we believe was due to excess predation occurring at Blue beach.
Batiquitos Lagoon Ecological Reserve	
San Elijo Lagoon Ecological Reserve	
Fairbanks Ranch	
San Dieguito Lagoon Ecological Reserve	
Mission Bay	
FAA Island	A PEFA kill of a pigeon was found on the site inside the walled compound on 7/5 by predator control. This date correlates to the decline in adult and fledgling numbers observed on 7/6. Regular PEFA visits to FAA when no monitor is on site may account for nest abandonment observed. At least one documented fledgling kill indicated PEFA depredation had occurred, although no direct observation was made. Fledgling numbers obtained by 3WD are probably overestimated and do not account for any fledglings taken off site by the predator. Also note that monitoring at this site did not begin until May 31, resulting in unknown outcomes for early nests. Observations from shore indicated the first bird on site was May 8.
North Fiesta Island	No nesting at this site. Initial site selection by 1-2 CLTs probably terminated due to presence of predators, most notably Northern Harrier. Prior nest failure in 2016 may have also contributed to lack of CLT nesting this year.
Mariner's Point	For some unknown reason most of the adults and new fledglings left the site on 22 June. It was thought to be a problem related to food availability.

Site name:	Summary of breeding season at site:
Stony Point	
San Diego River Mouth	
San Diego Bay	
Lindbergh Field & Former Naval Training Center	
US Navy NI MAT	
US Navy – NI Alt	
Naval Base Coronado	
Chula Vista Wildlife Reserve	
South San Diego Bay Unit, SDNWR - Saltworks	
Tijuana Estuary	
Imperial County	
Salton Sea	

Appendix B-7 Legend:

Note: Blank cells indicate that no additional notes were provided.