

**State of California
The Resources Agency
Department of Fish and Game
Wildlife Branch**

California Least Tern Breeding Survey

2008 Season

**by
Daniel A. Marschalek**

Final Report

To

State of California
Department of Fish and Game
South Coast Region
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ABSTRACT

Monitoring to document breeding success of California least terns (*Sternula antillarum browni*) continued in 2008, with observers at 36 nesting sites providing data. An estimated 6998-7698 California least tern breeding pairs established 8223-8226 nests and produced 2254-2573 fledglings at 47 documented locations. The fledgling to breeding pair ratio was 0.29-0.37. Statewide, 13,847 eggs were reported, with a Site Mean clutch size of 1.77 eggs per nest (St Dev = 0.124) and the statewide clutch size of 1.75 eggs (St Dev = 0.452) for Type 1 sites (clutch sizes for each nesting site are provided for 2004-2008). Numbers of nesting least terns were not uniformly distributed across all sites. Camp Pendleton, Naval Base Coronado, Batiquitos Lagoon, Los Angeles Harbor, and Venice Beach represented 64% of the breeding pairs while Alameda Point, Venice Beach, Huntington Beach and Los Angeles Harbor produced 50% of the fledglings. The 2008 chick mortality rate of 14% represented the first increase since 2004 but the actual rate was less than those of 2004 (32%) and 2005 (28%). Camp Pendleton, Venice Beach, LA Harbor, Seal Beach, and Batiquitos Lagoon Ecological Reserve represented 87% of the total reported chick deaths, but only 45% of the total chicks. The main predator of least terns in 2008 was the American crow (*Corvus brachyrhynchos*), resulting from depredation of 760 eggs at Venice Beach. Gull-billed tern (*Gelochelidon nilotica*), common raven (*Corvus corax*), and coyote (*Canis latrans*) predation each comprised 8-10% of all predation. Common ravens, peregrine falcons (*Falco peregrinus*), American crows, gulls (*Larus* sp.), great blue herons (*Ardea herodias*) and American kestrels (*Falco sparverius*) were reported from the most sites. The monitoring effort of 2008 is scheduled to continue in 2009.

¹ Marschalek, D.A. 2009. California least tern breeding survey, 2008 season. California Department of Fish and Game, Wildlife Branch, Nongame Wildlife Program Report, 2009-02. Sacramento, CA. 23 pp. + app.

INTRODUCTION

The California least tern (*Sternula antillarum browni*) is the 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). 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 (Whittier et al. 2006). A recent taxonomic change by the AOU (Banks et al. 2006) resurrected the genus *Sternula* for the least tern based on the work of Bridge et al. (2005).

California least terns establish nesting colonies on sandy soils with little vegetation along the ocean, lagoons, and bays. Their nests are shallow depressions lined with shells or other debris (Massey 1974, Cogswell 1977). Least terns are generally present at nesting areas between mid-April and late September (Massey 1974, Cogswell 1977, Patton 2002), often with two waves of nesting during this time period (Massey and Atwood 1981). This species 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.

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 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 quickly leave the nesting area.

Since 1971, the frequency of 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 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 pre-flying young 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 renesting pairs a site may produce rather than the number of renesting pairs actually at the site (Caffrey 1998). These equations have been used to some extent since the 1998 nesting season (Keane 2000). Over the last decade, monitors continued to provide comparable data of California least tern breeding success and these data were compiled into annual summary reports. These latest monitoring efforts were continued for the 2008 breeding season in California.

METHODS

Monitors for each site that had least tern nesting in 2007 or who planned monitoring activities for 2008 were provided datasheets prior to the arrival of adult terns (Appendix A). These forms were similar to those used since the 1998 nesting season to continue standardized data collection for the entire state. Forms and instructions to report final breeding data were provided at the same time so monitors could collect and prepare data requested for the annual report. General updates from each site were compiled about every two weeks throughout the breeding season and distributed to California Department of Fish and Game (CDFG) and U.S. Fish and Wildlife Service (USFWS) representatives so that any potential problems could be dealt with quickly.

Site Preparation

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 or the site as a whole. 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 required a yes/no response. However, fence type and vegetation management were more variable. In an attempt to standardize and simplify these two 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 (Roundup or Rodeo) use, (4) combination of 1, 2 or 3, (5) vegetation removed by other means, (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.

Monitoring

Sampling Type and Intensity

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 whether nests were marked (generally with a tongue depressor or wooden stake), eggs marked (numbering the shell), or birds banded. When color-banding studies were conducted, the band color was requested.

Sampling intensity was reported as the total number of visits to a site and dates of first and last visits. Optional data included monthly averages of visits per week, number of hours per visit (total, within colony and within colony in blind) and number of monitors per visit.

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 total 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. If there is a time period with an obvious lull in nest initiation, dates of nest initiation dictate the start of the second wave. 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.

$$\text{Total Pairs} = \# \text{ nests prior to 15 June} + [(\# \text{ nests 15 June or after}) / 2]$$

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.

$$\text{Total Pairs} = \text{total nests} - (\# \text{ unsuccessful nests prior 20 June} + \# \text{ broods lost prior 20 June})$$

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

Productivity

Productivity was measured by counting the number of nests, eggs, eggs hatched, hatching success 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. “Window surveys” of active nests, fledglings, and adults were conducted at two-week intervals throughout the breeding season for statewide comparison.

The mean clutch size was calculated by dividing the total number of eggs by the total number of nests for each site, then averaging site values (Site Mean clutch size). To reduce the influence of sites with only a couple nests of small or large clutch size, only the sites totaling more than 50 eggs are included. Sites were treated as independent samples in this calculation. Clutch size was also 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). At least four specific techniques may be used and are reported as an abbreviation: (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, and (other) description of alternate method.

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). Numbers of lost nests and individuals of each age class (egg, chick, fledgling, and adult) were recorded. Causes of mortality were further separated into either non-predation events or predation. Non-predation causes of death included abandonment, flooding, and human damage.

Predators were characterized as either “potential,” “possible,” “suspected,” and/or “documented.” *Potential* predators were classified as species known to feed on least terns and observed on or near the site without the loss of terns. 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. These three predator classifications rely on the expertise of the monitors. *Documented* predators required a direct observation of a predator killing a least tern or substantial evidence to indicate responsibility. This evidence could be characteristic feeding patterns or tracks leading to a carcass or shell remains.

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 sub-colonies they were documented as predators. 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 (1) only documented predation and (2) combining suspected and documented predation (Marschalek 2008).

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.

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. Fences to protect nesting sites were extremely variable, ranging from no fence to a chain link fence completely enclosing the site. While the majority of sites used chick shelters, few used decoys. Site specific and complete site preparation data are provided in Appendix B-1.

Monitoring

Twenty-seven of 36 sites monitored in 2008 were Type I sites, the majority monitored at least one or two times per week. A grid system to assist in locating nests was not used at every site but almost every monitor marked nests in some fashion. Site-specific and complete monitoring data are located in Appendix B-2.

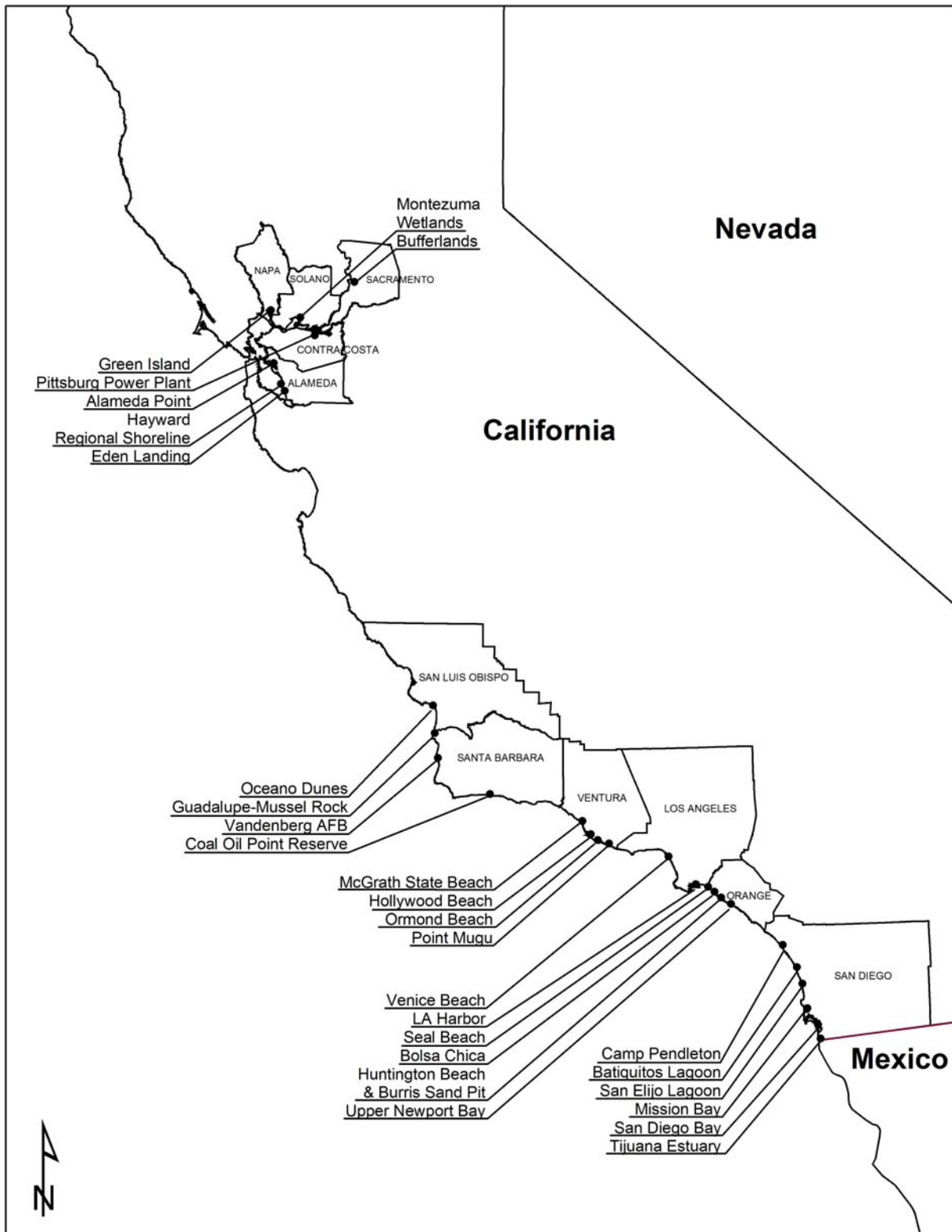


Figure 1. California sites monitored for California least tern nesting in 2008. Some listed areas include multiple sites, sites with nesting at more than one location, or both.

Productivity

At least partial data were received and analyzed for all monitored least tern nesting areas in California for 2008. An estimated 6998-7698 California least tern breeding pairs established 8223-8226 nests and produced 2254-2573 fledglings at 47 documented locations (Table 2). The fledgling to breeding pair ratio was 0.29 to 0.37 fledglings per pair. Statewide, 13,847 eggs were reported, with a Site Mean clutch size of 1.77 eggs per nest (St Dev = 0.124) and a Statewide clutch size of 1.75 eggs (St Dev = 0.452). Appendix B-4 contains site specific clutch size data for years 2004-2007 in addition to data for 2008.

The 2008 California least tern nesting season lasted approximately five months. The first recorded least tern at a nesting site was on 9 April at Chula Vista Wildlife Reserve and the last observed on 18 September at Tijuana Estuary. The first nest was detected on 4 May at Bolsa Chica Ecological Reserve, the first chick at NAB Ocean on 28 May, and first fledgling at Delta Beach North on 18 June. Least terns did not nest at three sites used in 2007 (Guadalupe-Mussel Rock, FAA Island and Stony Point), however, they nested at one location not used last year (Bufferlands). The three locations used in 2007 and not in 2008 had 74 nests total. Site-specific and complete productivity data are located in Appendix B-3 (breeding pair estimation) and B-4 (productivity).

The 6998 recorded minimum breeding pairs in 2008 was about 4% higher than the 6744 total in 2007 (Marschalek 2008). This represents the second highest count recorded for California, just below the 7006 total from 2006 (Figure 2) (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 unpubl. Table; Marschalek 2005, 2006, 2007, 2008).

Due to concerns regarding late nesting, any technique monitors determined to be most representative of the actual number of breeding pairs was used as the estimate. Late nest initiation will often result in an underestimation when calculating the number of breeding pairs using any of the three traditional estimates. For consistency, the traditional estimates are provided in the appendices. Fledgling numbers were nearly identical (1.7% lower) to the 2007 count (Marschalek 2008), representing an average number over the last decade and the seventh highest total recorded.

The majority of breeding pairs nested in San Diego County (4240 pairs, 60.4%) and the fewest in San Luis Obispo and Santa Barbara Counties (74 pairs, 1.1%) (Table 3). Breeding pairs were not a predictor for fledgling numbers, however. The fledgling-to-pair ratio ranged from a low of 0.134 in San Diego County to a high of 1.203 in San Luis Obispo and Santa Barbara Counties.

Table 2. California least tern productivity in 2008.

| 2008 Site | Estimated Number of Breeding Pairs | | Number of Nests | Estimated Number of Fledglings | | Fledgling per Pair Ratio | |
|--|------------------------------------|-------------|------------------|--------------------------------|-------------|--------------------------|-------------|
| | Minimum | Maximum | | Minimum | Maximum | Minimum | Maximum |
| Sacramento Area | | | | | | | |
| Bufferlands | 1 | 1 | 1 | 0 | 0 | 0.00 | 0.00 |
| San Francisco Bay Area | | | | | | | |
| Green Island/Napa Plant | 16 | 18 | 16 to 18 | 1 | 2 | 0.06 | 0.13 |
| Montezuma Wetlands | 35 | 35 | 35 | 11 | 18 | 0.31 | 0.51 |
| Pittsburg Power Plant | 10 | 10 | 1 | 0 | 0 | 0.00 | 0.00 |
| Alameda Point | 323 | 324 | 336 | 357 | 507 | 1.10 | 1.57 |
| Hayward Regional Shoreline | 57 | 62 | 62 | 73 | 73 | 1.18 | 1.28 |
| Eden Landing | 2 | 2 | 2 | 0 | 0 | 0.00 | 0.00 |
| San Luis Obispo/Santa Barbara Counties | | | | | | | |
| Oceano Dunes SVRA | 55 | 55 | 56 | 70 | 70 | 1.27 | 1.27 |
| Guadalupe-Mussel Rock | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 |
| Vandenberg AFB | 18 | 18 | 18 | 19 | 19 | 1.06 | 1.06 |
| Coal Oil Point Reserve | 1 | 1 | 1 | 0 | 0 | 0.00 | 0.00 |
| Ventura County | | | | | | | |
| Santa Clara River/McGrath State Beach | 89 | 97 | 97 | 77 | 77 | 0.79 | 0.87 |
| Hollywood Beach | 24 | 24 | 24 | 28 | 28 | 1.17 | 1.17 |
| Ormond Beach | 79 | 81 | 81 | 30 | 30 | 0.37 | 0.38 |
| Pt Mugu- Totals | 380 | 456 | 506 | 79 | 79 | 0.17 | 0.21 |
| Ormond Beach East | 277 | 337 | 362 | 59 | 59 | 0.18 | 0.21 |
| Holiday Beach | 52 | 66 | 74 | 12 | 12 | 0.18 | 0.23 |
| Holiday Beach Salt Panne | 13 | 16 | 17 | 4 | 4 | 0.25 | 0.31 |
| Eastern Arm | 35 | 41 | 53 | 4 | 4 | 0.10 | 0.11 |
| Los Angeles/Orange Counties | | | | | | | |
| Venice Beach | 460 | 698 | 928 | 296 | 296 | 0.42 | 0.64 |
| LA Harbor | 486 | 515 | 529 | 210 | 210 | 0.41 | 0.43 |
| Seal Beach NWR - Anahiem Bay | 166 | 200 | 206 | 44 | 44 | 0.22 | 0.27 |
| Bolsa Chica Ecological Reserve | 211 | 217 | 242 | 100 | 150 | 0.46 | 0.71 |
| Huntington State Beach | 344 | 411 | 454 | 267 | 267 | 0.65 | 0.78 |
| Burris Sand Pit/Burris Basin | 4 | 4 | 10 | 2 | 2 | 0.50 | 0.50 |
| Upper Newport Bay Ecological Reserve | 22 | 26 | 25 | 20 | 20 | 0.77 | 0.91 |
| San Diego County | | | | | | | |
| MCB Camp Pendleton- Totals | 1604 | 1604 | 1665 | 107 | 139 | 0.07 | 0.09 |
| Red Beach | 5 | 5 | 5 | 0 | 0 | 0.00 | 0.00 |
| White Beach | 114 | 114 | 119 | 2 | 3 | 0.02 | 0.03 |
| Cockleburrr Beach | 1 | 1 | 1 | 0 | 0 | 0.00 | 0.00 |
| Santa Margarita River - North Beach North | 432 | 432 | 458 | 17 | 17 | 0.04 | 0.04 |
| Santa Margarita River - North Beach South | 987 | 987 | 1012 | 85 | 116 | 0.09 | 0.12 |
| Santa Margarita River - Saltflats | 44 | 44 | 48 | 3 | 3 | 0.07 | 0.07 |
| Santa Margarita River - Saltflats Island | 21 | 21 | 22 | 0 | 0 | 0.00 | 0.00 |
| Batiquitos Lagoon Ecological Reserve- Totals | 598 | 598 | 610 | 123 | 176 | 0.21 | 0.29 |
| W1 | 35 | 35 | 35 | 24 | 32 | 0.69 | 0.91 |
| W2 | 397 | 397 | 404 | 73 | 98 | 0.18 | 0.25 |
| E1 | 165 | 165 | 170 | 25 | 45 | 0.15 | 0.27 |
| E2 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 |
| E3 | 1 | 1 | 1 | 1 | 1 | 1.00 | 1.00 |
| San Elijo Lagoon Ecological Reserve | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 |
| Mission Bay | | | | | | | |
| FAA Island | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 |
| North Fiesta Island | 10 | 10 | 10 | 0 | 0 | 0.00 | 0.00 |
| Mariner's Point | 12 | 13 | 14 | 0 | 0 | 0.00 | 0.00 |
| Stony Point | 0 | 1 | 0-1 | 0 | 0 | 0.00 | 0.00 |
| San Diego River Mouth | 1 | 1 | 1 | 0 | 0 | 0.00 | 0.00 |
| San Diego Bay | | | | | | | |
| Lindbergh Field & Former Naval Training Center | 122 | 124 | 139 | 115 | 128 | 0.93 | 1.05 |
| USN- Totals | 1451 | 1671 | 1671 | 155 | 155 | 0.09 | 0.11 |
| NI MAT | 104 | 146 | 146 | 25 | 25 | 0.17 | 0.24 |
| Delta Beach North | 272 | 295 | 295 | 30 | 30 | 0.10 | 0.11 |
| Delta Beach South | 163 | 174 | 174 | 35 | 35 | 0.20 | 0.21 |
| NAB Ocean | 912 | 1056 | 1056 | 65 | 65 | 0.06 | 0.07 |
| D Street Fill/Sweetwater Marsh NWR | 133 | 135 | 148 | 17 | 24 | 0.13 | 0.18 |
| Chula Vista Wildlife Reserve | 28 | 28 | 33 | 2 | 2 | 0.07 | 0.07 |
| South San Diego Bay Unit, SDNWR - Saltworks | 79 | 80 | 102 | 6 | 6 | 0.08 | 0.08 |
| Tijuana Estuary NERR | 177 | 178 | 201 | 45 | 51 | 0.25 | 0.29 |
| Totals: | 6998 | 7698 | 8223-8226 | 2254 | 2573 | 0.29 | 0.37 |

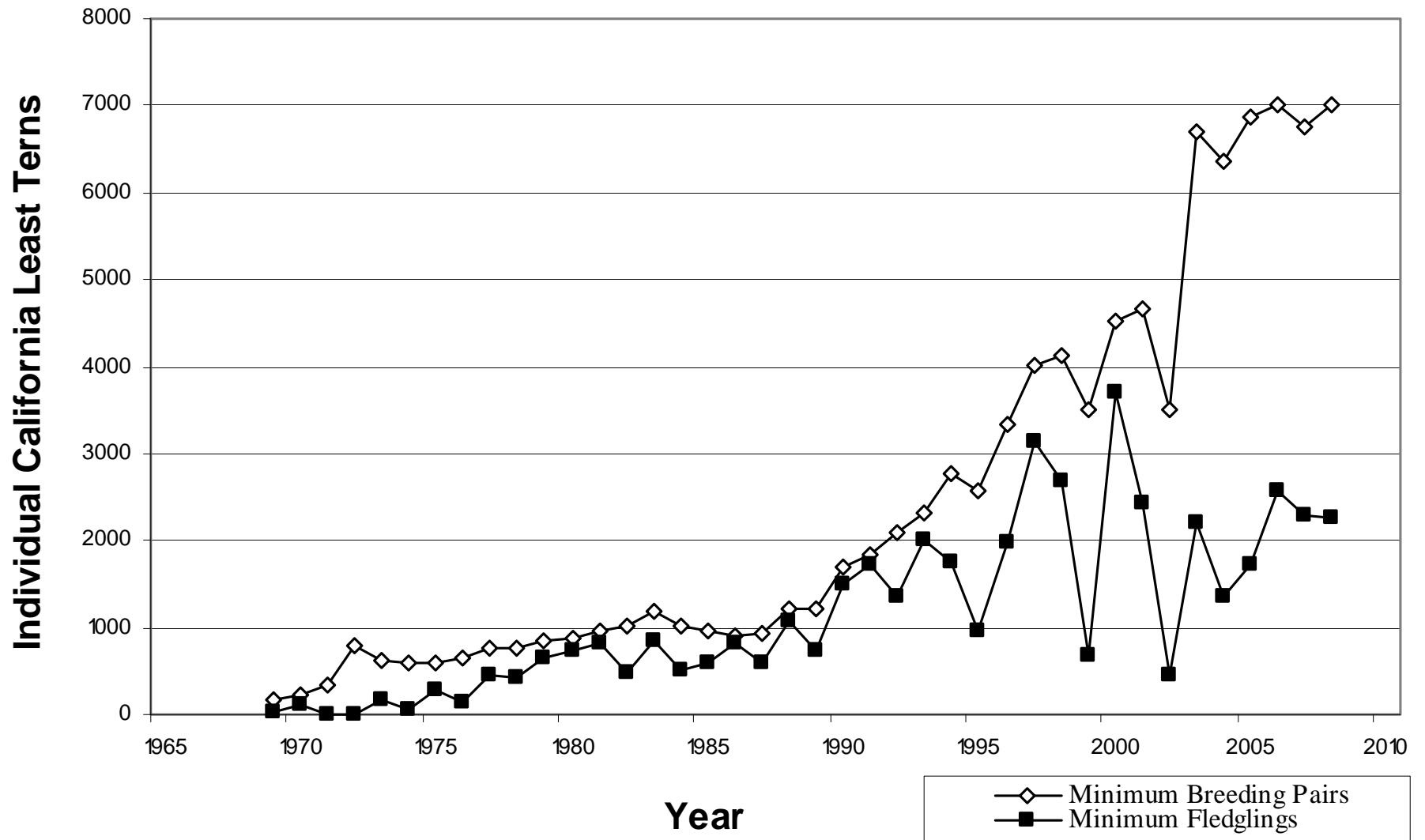


Figure 2. Number of documented California least tern breeding pairs and fledglings in California during annual surveys, 1969-2008. (Data from: Craig 1971; Bender 1974a, 1974b; Massey 1975, 1988, 1989b; Atwood *et al.* 1977; Jurek 1977; Atwood *et al.* 1979; Collins 1984, 1986, 1987; Gustafson 1986; Johnston and Obst 1992; Obst and Johnston 1992; Caffrey 1993, 1994, 1995b, 1997, 1998; Keane 1998, 2000, 2001; Patton 2002, 2004 unpubl. Table; Marschalek 2005, 2006, 2007, 2008).

Table 3. Regional productivity comparison, 2008.

| Region | Breeding Pairs** | Proportion of Total | Fledglings** | Proportion of Total | Fledgling:Pair* |
|--|------------------|---------------------|--------------|---------------------|-----------------|
| San Francisco Bay Area (w/Bufferlands) | 444 | 0.063 | 442 | 0.196 | 0.995 |
| San Luis Obispo/Santa Barbara Counties | 74 | 0.011 | 89 | 0.039 | 1.203 |
| Ventura County | 572 | 0.082 | 214 | 0.095 | 0.374 |
| Los Angeles/Orange County | 1693 | 0.242 | 939 | 0.417 | 0.555 |
| San Diego County | 4215 | 0.602 | 570 | 0.253 | 0.135 |
| Total | 6998 | 1.000 | 2254 | 1.000 | 0.322 |

* This is not the minimum fledgling-to-breeding pair ratio since the maximum number of pairs is not used.

** Breeding pair and fledgling numbers represent the minimum number recorded if a site reported a range of abundance.

As in the past, the number of breeding pairs generally corresponds more closely to the number of nests, eggs, and chicks than the number of fledglings (Table 4). Camp Pendleton, Naval Base Coronado, Batiquitos Lagoon Ecological Reserve, and Venice Beach had the highest number of breeding pairs, nests, eggs, and chicks in the state in 2008. There was more variation in the rankings than previous years. The five sites with the most fledglings produced differed due to different survival rates at each site. Hayward (1.18), Hollywood Beach (1.17), Alameda Point (1.10) and Vandenburg AFB (1.06) are the only four sites that had a minimum fledgling-to-pair ratio greater than one.

Table 4. Top five nesting sites with highest observed number of breeding pairs, nests, eggs, chicks and fledglings (actual number observed in parenthesis).

| Breeding Pairs | Nests | Eggs | Chicks | Fledglings |
|----------------------------|----------------------------|---------------------------------|----------------------------|---------------------------|
| Camp Pendleton (1604) | Camp Pendleton (1665) | Camp Pendleton (2907) | Camp Pendleton (2188) | Alameda Point (357) |
| Naval Base Coronado (1335) | Naval Base Coronado (1524) | Naval Base Coronado (2643) | Naval Base Coronado (2137) | Venice Beach (296) |
| Batiquitos (598) | Venice Beach (928) | Venice Beach (1236) | Batiquitos (924) | Huntington Beach (267) |
| LA Harbor (486) | Batiquitos (610) | Batiquitos (1086) | Alameda Point (543) | LA Harbor (210) |
| Venice Beach (460) | LA Harbor (529) | Pt. Mugu & LA Harbor (891 each) | Venice Beach (476) | Naval Base Coronado (130) |

A few sites constituted the majority of breeding activity for the state in 2008, which is a trend observed in the past (Caffrey 1994, 1995b, 1997, 1998; Marschalek 2005, 2006, 2007, 2008). Five sites (Camp Pendleton, Naval Base Coronado, Batiquitos Lagoon Ecological

Reserve, Los Angeles Harbor, and Venice Beach) had over 400 minimum breeding pairs, which represented 64% of the state total. Eggs and nests tend to show a linear relationship with number of breeding pairs, resulting in an uneven distribution of eggs and nests as well. Fledgling numbers were also unevenly distributed as the four sites with over 200 fledglings each (Alameda Point, Venice Beach, Huntington Beach, and LA Harbor) contributed 50% of the state's production, similar to 52% in 2007 although two of the four sites are different.

Mortality and Predation

The 2008 chick mortality rate of 14% represented the first increase since 2004 but the actual rate was less than those of 2004 (32%) and 2005 (28%) (Marschalek 2005, 2006, 2007, 2008) (Table 5). The larger nesting colonies continued to experience rates greater than the average. At Camp Pendleton, Venice Beach, LA Harbor, Seal Beach, and Batiquitos Lagoon Ecological Reserve 31, 27, 26, 20, and 18% of chicks were found dead, respectively. These five sites represented 87% of the total reported chick deaths, but only 45% of the total chicks hatched in California. Least tern mortality due to non-predation factors was greater than mortality due to predation in 2008.

Table 5. Cause of mortality of least terns with associated counts for each life stage. Complete and site specific mortality data is located in Appendix B-5 (non-predation) and B-6 (predation).

| | Eggs | Nests | Chicks | Fledglings | Adults |
|----------------------|-----------|-----------|----------|------------|--------|
| Non-predation | 2348 | 1400 | 1329 | 314 | 31 |
| Predation | 1686-1693 | 1100-1107 | 308-443+ | 73-100 | 28 |

Abandonment prior to the expected hatching date was the second highest death rate from non-predation events, leading to the loss of 1088 eggs (46%). Abandonment post-term or failure to hatch is often difficult to distinguish from pre-term abandonment and contributed a slightly lower rate (27%) to the non-predation mortality.

It was very difficult to accurately determine the predator species involved in a tern predation event. These events were not typically observed and often little or no evidence remained at the site. The uncertainty of the exact predator species responsible for a depredation event often resulted in reporting a range of least terns lost to a particular species rather than an exact number. Uncertainty is also reflected in a predation event reported as either suspected or documented in some cases, 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 two different calculations: (1) only documented species, and (2) suspected and documented species.

Forty-five species were reported as possible, suspected, or documented predators of least terns (Table 6). The most commonly documented predators were common ravens (*Corvus corax*), peregrine falcons (*Falco peregrinus*), American crows (*Corvus brachyrhynchos*), gulls

(*Larus* sp.), great blue herons (*Ardea herodias*), and American kestrels (*Falco sparverius*). As in past years, most reported predators were avian species.

Table 6. Reported species documented or thought to have depredated least terns. Number of sub-colonies each species was reported from in parenthesis.

| Species | Species | Species |
|--------------------------------|--------------------------|--------------------------------|
| Great blue heron (20) | Peregrine falcon (22) | Black-tailed jackrabbit (3) |
| Great egret (4) | Black-bellied plover (1) | Opossum (11) |
| Black-crowned night heron (11) | Barn owl (9) | River otter (1) |
| California gull (2) | Great-horned owl (6) | Raccoon (8) |
| Western gull (5) | Burrowing owl (3) | Skunk (6) |
| Gulls (21) | Owls (10) | Gray fox (3) |
| Caspian tern (4) | Rock pigeon (1) | Red fox (2) |
| Elegant tern (1) | American crow (22) | Coyote (14) |
| Gull-billed tern (11) | Common raven (25) | Domestic dog (8) |
| Black skimmer (3) | Corvids (3) | Domestic cat (10) |
| Northern harrier (14) | Loggerhead shrike (2) | California ground squirrel (8) |
| White-tailed kite (4) | European starling (3) | Rats (6) |
| Cooper's hawk (7) | Western meadowlark (4) | Rodents (8) |
| Red-tailed hawk (14) | Red-winged blackbird (1) | Unknown mammal (2) |
| Golden eagle (1) | Brewer's blackbird (1) | Snakes (4) |
| Osprey (5) | Unknown avian (13) | Ants (9) |
| Crested caracara (1) | Long-tailed weasel (3) | Unknown (10) |
| American kestrel (20) | | |

Predation led to the loss of 1686-1693 eggs, 308-443 chicks, 73-100 fledglings, and 28 adults (Table 5). The number of depredated eggs was about two times greater in 2008 than 2007, but 760 eggs (45%) were solely from Venice Beach. It is believed that most of the Venice Beach terns re-nested, ultimately producing 296 fledglings. In past years, a predation event(s) of this magnitude would typically result in complete reproductive failure from that particular site. Monitors reported about half the number of chicks, equal number of fledglings, and three-quarters the number of adults depredated in 2008 compared to 2007. A total of 2034 least tern individuals (including eggs) were reported with a documented or suspected predator species.

Most depredated least terns were lost to American crows (802 total individuals, 38%) in 2008 (Table 7). Excluding the large predation event at Venice Beach, American crow predation would have been lower than in past years (3% in 2008 compared to 7% or higher in 2004-2007) (Marschalek 2008). Gull-billed terns, common ravens, and coyotes represented 8-10% of the depredation, with all other species responsible for less than 5% of depredated least terns. The “unknown predators” category is different than reported in 2007. The 2007 category included only those least terns that were actually reported as depredated by “unknown predators,” while the 2008 category represents the difference between the total number reported depredated minus the number associated with suspected or documented predator species. 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 located in Appendix B-5 (non-predation) and B-6 (predation).

Table 7. Species responsible for greatest proportion of depredated least tern eggs, chicks, fledglings or adults.

| Species | Proportion of Least Tern Individuals Depredated (Documented and Suspected Predators)* |
|------------------|---|
| American crow | 0.3776 |
| Gull-billed tern | 0.1031 |
| Common raven | 0.0833 |
| Coyote | 0.0791 |
| Peregrine Falcon | 0.0485 |
| American kestrel | 0.0414 |
| Unknown | 0.0414 |
| Burrowing owl | 0.0381 |
| Black skimmer | 0.0254 |
| Unknown avian | 0.0217 |
| Northern harrier | 0.0202 |

*Based on average of the range reported for least terns depredated by each species.

Predation data reported by the site monitors appears to be the most detailed since 2004 or earlier. As in 2007, most predation was a result of only a couple species in 2008. American crows, gull-billed terns, common ravens, and coyotes comprised about 64% of the predator mortality. The expanded foraging area of gull-billed terns observed in 2007 (Marschalek 2008) was again observed in 2008, with similar predation rates. Predator species varied in importance among each least tern age class. American crows had the largest depredation rate of eggs, while gull-billed terns, avian species, and peregrine falcons depredated the most chicks, fledglings, and adults, respectively (Table 8). In addition, fledgling and adult predation was almost exclusively restricted to avian predators.

Table 8. The five species responsible for greatest proportion of depredated least tern for each age class. Total least terns of each age class depredated in parentheses.

| Eggs | | Chicks | | Fledglings | | Adults | |
|-----------------------|-------------|------------------------|-------------|----------------------|-------------|----------------------------|-------------|
| Predator | Proportion* | Predator | Proportion* | Predator | Proportion* | Predator | Proportion* |
| American crow (795) | 0.5318 | Gull-billed tern (148) | 0.2716 | Unknown avian (15) | 0.2542 | Peregrine Falcon (13) | 0.3250 |
| Coyote (160) | 0.1070 | American kestrel (87) | 0.1596 | Unknown (13) | 0.2203 | Unknown avian (12) | 0.3000 |
| Common raven (153) | 0.1023 | Peregrine falcon (84) | 0.1541 | Great blue heron (8) | 0.1356 | Owl species (9) | 0.2250 |
| Gull-billed tern (71) | 0.0475 | Burrowing owl (81) | 0.1486 | Peregrine falcon (6) | 0.1017 | Unknown (2) | 0.0500 |
| Unknown (63) | 0.0421 | Great blue heron (27) | 0.0495 | Owl species (5) | 0.0847 | Four different species (1) | 0.0250 |

*This value represents the proportion of least terns within the particular age class depredated by the particular predator species.

Summary by Site

Management and monitoring of California 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. This section includes detailed site-specific information that is of particular importance for management, but is not meant to be all inclusive. Site-specific reports produced by the site biologist may be referred to if additional details are desired.

Sacramento Area

Bufferlands

One pair established a nest on a gravel road situated between two treatment ponds associated with the Sacramento Regional Wastewater Treatment Plant. This appears to be the first recorded nesting of least terns in Sacramento County. When the nest was detected, the road was closed; however the pair was unsuccessful in producing fledglings.

San Francisco Bay Area

Green Island (Napa Plant)

This was the second year least tern nesting was documented at Green Island. In 2008, 16-18 pairs established 16-18 nests and produced 1-2 fledglings. This represents the first confirmation of successful nesting at this site.

Montezuma Wetlands

This was the third year least tern nesting was documented at Montezuma Wetlands, with 35 pairs establishing 35 nests and producing 11-18 fledglings. Red foxes were reported near the site.

Pittsburg Power Plant

Ten least tern pairs were present early in the year, although only one nest was observed. These terns left the site and the nest was unsuccessful.

Alameda Point

At the Alameda Point site, 323-324 breeding pairs established 336 nests and produced 357-507 fledglings. The number of pairs and nests were lower in 2008 than 2007, but fledgling production was about double the 2007 total. Nesting started about a week later than 2007. Many predator species were observed at the nesting site, resulting in the removal of barn owls, common ravens, American crows, skunks and feral cats removed from refuge area.

Hayward Regional Shoreline

Hayward Regional Shoreline experienced the fourth consecutive year of least tern nesting activity and the third production of fledglings. In 2008, 57-62 breeding pairs established 62 nests and produced 73 fledglings. This represents the highest total of pairs, nests and fledglings for this site, as well as one of the state's highest fledgling per breeding pair ratio again.

Predation was low, but the few events resulted from aerial predators (California gull, American crow and Peregrine falcon). Volunteers contributed to this reduced predation rate by deterring predator species in the area or reporting these to Wildlife Services. There was the first western snowy plover nest at this site in 2008 as well. This site has been constructed with a combination of volunteer efforts and support from a variety of grant funds and donations (Riensch 2007).

Eden Landing

This was the second year that least terns nested at Eden Landing, with two pairs established two nests. Both nests were unsuccessful due to suspected predation by California gulls.

San Luis Obispo/Santa Barbara Counties

Oceano Dunes SVRA

The Oceano Dunes State Vehicular Recreational Area (SVRA) site had 55 breeding pairs, 56 nests, and produced 70 fledglings. These numbers are similar to 2007, which represented a doubling in reproductive success from 2006. All nesting occurred within the large seasonally fenced area provided for nesting least terns and snowy plovers. Least terns continue to use the site as a night roost.

Guadalupe-Mussel Rock

There was no least tern nesting at Guadalupe-Mussel Rock in 2008. Only one pair has attempted nesting in the last three years.

Vandenberg AFB

At Vandenberg AFB, 18 breeding pairs established 18 nests and produced 19 fledglings. Pair and nest counts are identical to those in 2007, but three more fledglings were produced. Two-egg clutches were more common in 2008 than 2007 when about half of the nests were only one-egg clutches.

Coal Oil Point Reserve

For the second consecutive year, least tern nesting was unsuccessful at Coal Oil Point Reserve due to predation by skunks. A predator control program is now in place and 2009 plans include attracting least tern nesting using audio devices.

Ventura County

Santa Clara River/McGrath State Beach

The Santa Clara River site had 89-97 breeding pairs establish 97 nests and produce 77 fledglings. This represents the highest recorded number of pairs, nests and fledglings from this site.

Hollywood Beach

At Hollywood Beach, 24 breeding pairs established 24 nests and produced 28 fledglings. This is only the fourth year of least tern nesting at this site.

Ormond Beach

At Ormond Beach, 79-81 breeding pairs established 81 nests and produced 30 fledglings.

NAS Point Mugu

Point Mugu had a total of 380-456 breeding pairs, 506 nests, and 79 fledglings. As in the last two years, Ormond Beach East had the highest number of pairs, nests and fledglings of the sub-colonies. Coyote predation was the main reason for documented mortality, although 148 eggs had unknown outcomes.

Los Angeles/Orange Counties

Venice Beach

Venice Beach had 460-698 breeding pairs, 928 nests, and 296 fledglings. Predation due to American crows was extremely high and resulted in 100% failure of the first nesting attempt. In total, 760 eggs from 553 nests were depredated by crows. A second nesting wave was able to produce the second most fledglings of any site in 2008.

Los Angeles Harbor

The Los Angeles Harbor site had 486-515 breeding pairs, 529 nests, and 210 fledglings. Despite fewer pairs and nests, more fledglings were produced compared to 2007. Burrowing owls, American kestrel, and peregrine falcons are suspected to be responsible for depredation of 150 least tern chicks. Predator presence may have also led to some nest abandonment. When chicks were present, it was noted that prey may have been limited, another possible reason for abandonment.

Seal Beach NWR

At Seal Beach NWR, 166-200 breeding pairs established 206 nests and produced 44 fledglings. Great blue heron predation may have led to high levels of mortality, but exact totals are unknown due to a weekly survey schedule.

Bolsa Chica Ecological Reserve

At Bolsa Chica Ecological Reserve, 211-217 breeding pairs established 242 nests and produced 100-150 fledglings. This represents the second highest breeding pair count ever recorded from this site, and the highest since 1990.

Huntington State Beach

At Huntington State Beach, 344-411 breeding pairs established 454 nests and produced 267 fledglings.

Burris Sand Pit (Burris Basin)

At Burris Sand Pit, four breeding pairs established at least 10 nests and produced two fledglings. The four pairs resulted from the maximum number observed at any one time. Predation was likely high, resulting in the low reproduction success. Burris Basin is another name being used for this location.

Upper Newport Bay Ecological Reserve

At Upper Newport Bay Ecological Reserve, 22-26 breeding pairs established at least 25 nests and produced 20 fledglings. This was a Type 2 site so specific reproductive data are not available.

San Diego County

MCB Camp Pendleton

At Camp Pendleton, a total of 1604 breeding pairs established 1665 nests and produced 107-139 fledglings, the highest number of breeding pairs and nests of any site within the state for 2008. As in the last three years, the Santa Margarita River North Beach sites (North and South) had the majority of the least tern nesting and production, representing 88% of the pairs and 95% of the fledglings at Camp Pendleton.

Batiquitos Lagoon Ecological Reserve

At Batiquitos Lagoon Ecological Reserve, 598 breeding pairs established 610 nests and produced 123-176 fledglings. Documented predation was relatively low.

San Elijo Lagoon Ecological Reserve

There was no nesting activity at San Elijo Lagoon Ecological Reserve in 2008. Currently, a restoration project is underway that may provide additional least tern nesting habitat in the future.

Mission Bay - FAA Island

There were no nests at FAA Island in 2008. Scrapes were present earlier in the season so the terns expressed some interest in nesting.

- North Fiesta Island

The North Fiesta Island site had 10 breeding pairs establish at least 10 nests. All nesting attempts failed due to predation by snakes, gulls, American crows or common ravens.

- Mariner's Point

At Mariner's Point, 12-13 breeding pairs established 14 nests. All nesting attempts failed due to predation by gulls, American crows, common ravens or rats.

- Stony Point

No nesting was detected at Stony Point in 2008, but a suspected least tern egg was observed being carried away by an American crow.

- San Diego River Mouth (S)

The San Diego River Mouth (S) site had one breeding pair establish one nest. The nest was depredated by an American crow or common raven.

San Diego Bay

- Lindbergh Field

At Lindbergh Field, 122 breeding pairs established 139 nests and produced 115-128 fledglings, including a four-egg clutch nest. Pair and nest numbers are nearly identical to those of 2007; however fledgling production was about four times greater.

- NAS North Island

At North Island, 139 breeding pairs established 146 nests and produced 25 fledglings.

-Naval Base Coronado

Naval Base Coronado had 1347-1525 breeding pairs, 1525 nests, and 130 fledglings, with most of the production at the Naval Amphibious Base Ocean sub-colony. South Delta Beach had the fewest numbers of the three sub-colonies for the third consecutive year.

- D Street Fill/Sweetwater Marsh NWR

At D Street, 135 breeding pairs established 148 nests and produced 17-24 fledglings.

- Chula Vista Wildlife Reserve

Chula Vista NWR had 28 breeding pairs establish 33 nests and produced two fledglings. Evidence of nest abandonment and documented predation were minimal.

- South San Diego Bay Unit, SDNWR - Saltworks

At Saltworks NWR, 79 breeding pairs established 102 nests and produced six fledglings. Predation and non-predation mortality were at similar levels.

Tijuana Estuary NERR

At Tijuana Estuary, 177 breeding pairs established 201 nests and produced 45-50 fledglings. Flooding resulted in the loss of 27 eggs, while 36 eggs were abandoned and 62 lost to predation.

Biologists recorded the second highest total of California least tern breeding pairs in 2008. After an increase in the breeding population through the 1990s, it appears the population is stabilizing around 6900 breeding pairs based on counts of 2005-2008. Chick mortality continues to be a factor at specific sites, possibly a result of limited or inappropriate food sources. Many of the same predator species, such as American crows and coyotes, continued to be an issue in 2008. However, it appears that predation by “protected” species or species of special concern, such as gull-billed terns and burrowing owls, is increasing and will be an important topic that will have to be addressed.

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Appendix A

Data Sheets

General Data Sheet

Page 1

| Location: | | | | Date: | | Job: | | Observer(s): | | | |
|------------------|-----------|-------------|------------|---------------|----------|----------------|--------|-----------------|----------|------------------|--------|
| Time start: | | | | Time stop: | | | | On site: | | | |
| Est/Measured | Time: | | Temp: | Wind Spd/Dir: | | Cloud cvr (%): | | Precip. (Y/N): | | Tide: H L In Out | |
| ADULTS | Total: | | | NESTS | Total: | | | New: | | | |
| CHICKS | Observed: | | | Est max: | | New Chicks: | | Fledglings Obs: | | Est max: | |
| Mortality (Y/N): | Adult: | | Fledgling: | | Chick: | | Egg: | | Nest: | | |
| Predation (Y/N): | Adult: | | Fledgling: | | Chick: | | Egg: | | Nest: | | |
| Take (Y/N): | Adult: | | Fledgling: | | Chick: | | Egg: | | Nest: | | |
| Col Live (Y/N): | Adult: | | Fledgling: | | Chick: | | Egg: | | Other: | | |
| Col Dead (Y/N): | Adult: | | Fledgling: | | Chick: | | Egg: | | Fish: | | Other: |
| Nest No. | Grid No. | New/ Incub. | Status | Nest No. | Grid No. | New/ Incub. | Status | Nest No. | Grid No. | New/ Incub. | Status |
| 1 | | | | 31 | | | | 61 | | | |
| 2 | | | | 32 | | | | 62 | | | |
| 3 | | | | 33 | | | | 63 | | | |
| 4 | | | | 34 | | | | 64 | | | |
| 5 | | | | 35 | | | | 65 | | | |
| 6 | | | | 36 | | | | 66 | | | |
| 7 | | | | 37 | | | | 67 | | | |
| 8 | | | | 38 | | | | 68 | | | |
| 9 | | | | 39 | | | | 69 | | | |
| 10 | | | | 40 | | | | 70 | | | |
| 11 | | | | 41 | | | | 71 | | | |
| 12 | | | | 42 | | | | 72 | | | |
| 13 | | | | 43 | | | | 73 | | | |
| 14 | | | | 44 | | | | 74 | | | |
| 15 | | | | 45 | | | | 75 | | | |
| 16 | | | | 46 | | | | 76 | | | |
| 17 | | | | 47 | | | | 77 | | | |
| 18 | | | | 48 | | | | 78 | | | |
| 19 | | | | 49 | | | | 79 | | | |
| 20 | | | | 50 | | | | 80 | | | |
| 21 | | | | 51 | | | | 81 | | | |
| 22 | | | | 52 | | | | 82 | | | |
| 23 | | | | 53 | | | | 83 | | | |
| 24 | | | | 54 | | | | 84 | | | |
| 25 | | | | 55 | | | | 85 | | | |
| 26 | | | | 56 | | | | 86 | | | |
| 27 | | | | 57 | | | | 87 | | | |
| 28 | | | | 58 | | | | 88 | | | |
| 29 | | | | 59 | | | | 89 | | | |
| 30 | | | | 60 | | | | 90 | | | |

Egg/Nest Codes: E=egg, CH=chick, NC=New Chick, H=hatched and no longer present, PH=probable hatch, FH=failed to hatch, A=abandoned
 P=Preyed on, DAM=damaged, F=flooded, B=buried, Col=collected, M=moved, Unk=unkown. Circle Nest Number if new or if status has changed.

Multi-visit Form

| Species: | | | | LOCATION | | | | | | | |
|-----------------|-------|------------|-------|-----------------|--------|--------|------------|--------|--------|--------|-------------|
| Date 1 | | Date 2 | | Date 3 | | | Date 4 | | | | |
| Observers: | | Observers: | | Observers: | | | Observers: | | | | |
| Date 5 | | Date 6 | | Date 7 | | | Date 8 | | | | |
| Observers: | | Observers: | | Observers: | | | Observers: | | | | |
| Date 9 | | Date 10 | | Date 11 | | | | | | | |
| Observers: | | Observers: | | Observers: | | | | | | | |
| Nest | Found | Grid | Prior | Date 1 | Date 2 | Date 3 | Date 4 | Date 5 | Date 6 | Date 7 | Band Number |
| 1 | | | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| 11 | | | | | | | | | | | |
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| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 21 | | | | | | | | | | | |
| 22 | | | | | | | | | | | |
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| 26 | | | | | | | | | | | |
| 27 | | | | | | | | | | | |
| 28 | | | | | | | | | | | |
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| 31 | | | | | | | | | | | |
| 32 | | | | | | | | | | | |
| 33 | | | | | | | | | | | |
| 34 | | | | | | | | | | | |
| 35 | | | | | | | | | | | |
| 36 | | | | | | | | | | | |
| 37 | | | | | | | | | | | |
| 38 | | | | | | | | | | | |
| 39 | | | | | | | | | | | |
| 40 | | | | | | | | | | | |
| 41 | | | | | | | | | | | |
| Nest | Found | Grid | Prior | Date 1 | Date 2 | Date 3 | Date 4 | Date 5 | Date 6 | Date 7 | Band Number |

Appendix B
Site Specific Data

Appendix B-1: Site Preparation (continued).

| Site name: | Sub-colony names (if any): | Name of primary monitor: | Names of other monitors: | Fence type: | Interpretive signs at site: | Chick shelters: | Decoys: | Grid system: | Vegetation management: | Other site preparation: | By whom: |
|---|----------------------------|--------------------------|------------------------------------|-------------|-----------------------------|-----------------|---------|--------------|------------------------|--|--|
| San Diego County | | | | | | | | | | | |
| MCB Camp Pendleton- Totals | | | | | | | | | | | |
| Red Beach | | Brian Foster | | | | | | | | | |
| White Beach | | Brian Foster | | | | | | | | | |
| Cockleburrr Beach | | Brian Foster | | | | | | | | | |
| Santa Margarita River - North Beach North | | Brian Foster | | | | | | | | | |
| Santa Margarita River - North Beach South | | Brian Foster | | | | | | | | | |
| Santa Margarita River - Saltflats | | Brian Foster | | | | | | | | | |
| Santa Margarita River - Saltflats Island | | Brian Foster | | | | | | | | | |
| Batiqitos Lagoon Ecological Reserve- Totals | | | | | | | | | | | |
| W1 | BAT-W1 | S. Wolf | L. Squires, A. Copper, L. Hofsteen | 3 | Yes | Yes | No | Yes | Yes | | |
| W2 | BAT-W2 | S. Wolf | L. Squires, A. Copper, L. Hofsteen | 3 | Yes | Yes | No | Yes | Yes | | |
| E1 | BAT-E1 | S. Wolf | L. Squires, A. Copper, L. Hofsteen | 3 | Yes | Yes | No | Yes | Yes | | |
| E2 | BAT-E2 | S. Wolf | L. Squires, A. Copper, L. Hofsteen | 3 | Yes | Yes | No | Yes | Yes | | |
| E3 | BAT-E3 | S. Wolf | L. Squires, A. Copper, L. Hofsteen | 4 | Yes | Yes | No | Yes | Yes | | |
| San Elijo Lagoon Ecological Reserve | | R. Patton | M. Bache, S. Welker | 3 | Yes | No | No | No | 6 | Flood control dike gate valve | County of SD Parks Dept |
| Mission Bay | | | | | | | | | | | |
| FAA Island | | | | | | | | | | | |
| North Fiesta Island | | Ginger Johnson | | 1 | Yes | Yes- 50 | Yes- 35 | Yes | 4 | Improved grid and installed chick fence | San Diego City Parks Dept |
| Mariner's Point | | Ginger Johnson | | 1 | Yes | Yes- 30 | No | Yes | 4 | Repairs of chick fence | San Diego Audubon Society, San Diego City Parks Dept |
| Stony Point | | Ginger Johnson | | 1 | Yes | Yes | No | Yes | 4 | Improved grid, new chain link fence, chick shelters provided | San Diego City Parks Dept |
| San Diego River Mouth | | Ginger Johnson | | 1 | Yes | No | No | No | 7 | Temporary plastic fence with chick fence at bottom | San Diego City Parks Dept |

Appendix B-1: Site Preparation (continued).

| Site name: | Sub-colony names (if any): | Name of primary monitor: | Names of other monitors: | Fence type: | Interpretive signs at site: | Chick shelters: | Decoys: | Grid system: | Vegetation management: | Other site preparation: | By whom: |
|--|----------------------------------|--------------------------|--|-------------|-----------------------------|-----------------------------|----------|--------------|------------------------|-------------------------|-------------|
| San Diego Bay | | | | | | | | | | | |
| Lindbergh Field & Former Naval Training Center | | R. Patton | E. Copper, B. Foster, J. Barth, M. Garcia | 3 | Yes | No | No | Yes | 4 | | |
| USN- Totals | | | | | | | | | | | |
| NI MAT | | E. Copper | Dennis Parker, Mark Billings, Laura Hoffsteen | 1 | Yes | Yes- 200 wood tent shelters | Yes- 60 | Yes | 4 | | Ernie Clemm |
| Delta Beach North | | | Marit Evans-Layng, Mark Billings, Lea Squires, Matt Sadowski, Laura Hofsteen | 1 | No | Yes- 200 wood tent shelters | Yes- 60 | Yes | 1 | | Ernie Clemm |
| Delta Beach South | | | Marit Evans-Layng, Mark Billings, Lea Squires, Matt Sadowski, Laura Hofsteen | 1 | Yes | Yes- 200 wood tent shelters | Yes- 80 | Yes | 1 | | Ernie Clemm |
| NAB Ocean | yellow2/red, green, blue, orange | | Tom Myers, Mark Billings, Matt Sadowski, Joe Barth, Laura Hofsteen, | 3, 4 | Yes | No | No | Yes | 7 | | |
| D Street Fill/Sweetwater Marsh NWR | | R. Patton | B. Collins, J. Jackson, J. Barth | 3 | Yes | Yes- 180 | Yes- 100 | Yes | 4 | | |
| Chula Vista Wildlife Reserve | | R. Patton | J. Jackson, J. Barth | 3 | Yes | Yes- 40 | Yes- 100 | Yes | 4 | | |
| South San Diego Bay Unit, SDNWR - Saltworks | | R. Patton | B. Collins | 3 | No | Yes- 20 | No | No | 7 | | |
| Tijuana Estuary NERR | | R. Patton | B. Collins, J.Barth,R.Burg,P.Roulard | 3 | Yes | Yes- 100 | No | Yes | 7 | | |

Legend

Fence Type:

- 1- Fully enclosed site deterring most predators.
- 2- Fully enclosed site and 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 in 2008
- 7- None Needed

Appendix B-2: Monitoring.

| Site name: | Site type: | Date of first monitoring visit: | Date of last monitoring visit: | Total number of monitoring visits: | Nest marking: | Egg marking: | Banding: | If color-banding, what color(s) were used: |
|---|------------|---------------------------------|--------------------------------|---|---|--------------|-------------|---|
| Sacramento Area | | | | | | | | |
| Bufferlands | | | | | | | | |
| San Francisco Bay Area | | | | | | | | |
| Green Island | | | | | | | | |
| Montezuma Wetlands | 2 | 6-May-08 | 29-Jul-08 | 13 | No | No | No | N/A |
| Pittsburg Power Plant | 2 | 22-Apr-08 | 25-Jun-08 | 7 | N/A | N/A | N/A | N/A |
| Alameda Point | 3 | 28-Apr-08 | 11-Aug-08 | 80 | Yes | No | No | N/A |
| Hayward Regional Shoreline | 3 | 25-Apr-08 | 17-Aug-08 | 232 | Yes | No | No | N/A |
| Eden Landing | | | | | | | | |
| San Luis Obispo/Santa Barbara Counties | | | | | | | | |
| | | | | Site received some degree of monitoring on a daily basis. | Yes- with naturally occurring materials present | No | Yes- chicks | Green over yellow on left, right with USFWS band and tape for unique combo. |
| Oceano Dunes SVRA | 1 | 1-Mar-08 | 30-Sep-08 | | | No | | |
| Guadalupe-Mussel Rock | | 5-Mar-08 | 12-Sep-08 | 64 | No | No | No | N/A |
| Vandenberg AFB | 3 | 15-Apr-08 | 7-Sep-08 | 105 | Yes | No | No | N/A |
| Coal Oil Point Reserve | | | | | | | | |
| Ventura County | | | | | | | | |
| Santa Clara River/McGrath State Beach | 1 | 29-May-08 | 10-Sep-08 | 20 | Yes | No | No | |
| Ormond Beach | 1 | 30-Apr-08 | 3-Sep-08 | 18 | Yes | No | No | |
| Hollywood Beach | 1 | 20-May-08 | 31-Aug-08 | 16 | Yes | No | No | |
| Pt Mugu- Totals | 1 and 3 | 5-May-08 | 26-Aug-08 | 25 | Yes | No | No | |
| Ormond Beach East | 1 | 5-May-08 | 7-Aug-08 | 23 | Yes | No | No | |
| Holiday Beach | 1 | 5-May-08 | 11-Aug-08 | 17 | Yes | No | No | |
| Holiday Beach Salt Panne | 1 | 5-May-08 | 28-Jul-08 | 23 | Yes | No | No | |
| Eastern Arm | 3 | 5-May-08 | 26-Aug-08 | 25 | Yes | No | No | |
| Los Angeles/Orange Counties | | | | | | | | |
| Venice Beach | 1 | 22-Apr-08 | 3-Sep-08 | 25 | Yes | No | Yes- chicks | N/A |
| LA Harbor | 1 | 29-Apr-08 | 18-Aug-08 | 50 | Yes | No | No | N/A |
| | | | | | | | | Black/yellow split plastic on left leg, FWS on right |
| Seal Beach NWR - Anahiem Bay | 1 | 8-May-08 | 21-Jul-08 | 14 | Yes | no | Yes- chicks | |
| Bolsa Chica Ecological Reserve | 1 | 15-May-08 | 26-Jun-08 | 21 | Yes | no | No | N/A |
| Huntington State Beach | 1 | 16-May-08 | 5-Aug-08 | 22 | Yes | No | No | N/A |
| Burris Sand Pit/Burris Basin | 2 | | | | No | No | No | N/A |
| Upper Newport Bay Ecological Reserve | 2 | | | | | | | |

Appendix B-2: Monitoring (continued).

| Site name: | Site type: | Date of first monitoring visit: | Date of last monitoring visit: | Total number of monitoring visits: | Nest marking: | Egg marking: | Banding: | If color-banding, what color(s) were used: |
|--|------------|---------------------------------|--------------------------------|------------------------------------|---------------|--------------|-------------|--|
| San Diego County | | | | | | | | |
| MCB Camp Pendleton- Totals | 1 | | | | | | Yes | black/mauve |
| Red Beach | 1 | | | | | | Yes | N/A |
| White Beach | 1 | | | | | | Yes | black/mauve |
| Cockleburrr Beach | 1 | | | | | | Yes | N/A |
| Santa Margarita River - North Beach North | 1 | | | | | | Yes | black/mauve |
| Santa Margarita River - North Beach South | 1 | | | | | | Yes | black/mauve |
| Santa Margarita River - Saltflats | 1 | | | | | | Yes | black/mauve |
| Santa Margarita River - Saltflats Island | 1 | | | | | | Yes | black/mauve |
| Batiquitos Lagoon Ecological Reserve- Totals | 1 | | | | | | Yes | black/mauve |
| W1 | 1 | 3-Jan-08 | 30-Sep-08 | | Yes | | Yes | white/red |
| W2 | 1 | 3-Jan-08 | 30-Sep-08 | | Yes | | Yes | red/white |
| E1 | 1 | 10-Jan-08 | 30-Sep-08 | | Yes | | Yes | red/white |
| E2 | 1 | 14-Jan-08 | 25-Sep-08 | | Yes | | Yes | red/white |
| E3 | 1 | 19-Feb-08 | 25-Sep-08 | | Yes | | Yes | red/white |
| San Elijo Lagoon Ecological Reserve | 3 | 14-Apr-08 | 8-Sep-08 | 30 | Yes | No | Yes- chicks | N/A |
| Mission Bay | | | | | | | | |
| FAA Island | 1 | | | | | | | |
| North Fiesta Island | 1 | 23-Apr-08 | 5-Aug-08 | 17 | Yes | Yes | No | N/A |
| Mariner's Point | 1 | 17-Apr-08 | 5-Aug-08 | 22 | Yes | Yes | No | N/A |
| Stony Point | 1 | 25-Apr-08 | 5-Aug-08 | 16 | No | No | No | N/A |
| San Diego River Mouth | 1 | 16-Apr-08 | 6-Aug-08 | 18 | Yes | Yes | No | N/A |

Appendix B-2: Monitoring (continued).

| Site name: | Site type: | Date of first monitoring visit: | Date of last monitoring visit: | Total number of monitoring visits: | Nest marking: | Egg marking: | Banding: | If color-banding, what color(s) were used: |
|--|------------|---------------------------------|--------------------------------|------------------------------------|---------------|--------------|------------------------|---|
| San Diego Bay | | | | | | | | |
| Lindbergh Field & Former Naval Training Center | 1 | 3-Apr-08 | 2-Sep-08 | 57 | Yes | No | Yes- chicks and adults | adult: W/G |
| USN- Totals | 1 | 4-Jan-08 | 31-Dec-08 | | Yes | Yes | Yes- chicks and adults | |
| NI MAT | 1 | 26-Mar-08 | 27-Aug-08 | 112 | Yes | Yes | Yes- chicks and adults | S-O/A chicks; A-A/OS or A/OS-A adults |
| Delta Beach North | 1 | 4-Jan-08 | 31-Dec-08 | 133 | Yes | Yes | Yes- chicks and adults | S-R/Y chicks; A-Y/RS or Y/RS-A adults |
| Delta Beach South | 1 | 4-Jan-08 | 31-Dec-08 | 146 | Yes | Yes | Yes- chicks and adults | S-W/K chicks; W/KS-A, K/WS-A, X-W/KS adults |
| NAB Ocean | 1 | 4-Jan-08 | 31-Dec-08 | 169 | Yes | Yes | Yes- chicks and adults | S-B/F chicks; A-F/BS or F/BS-A adults |
| D Street Fill/Sweetwater Marsh NWR | 1 | 1-Apr-08 | 5-Sep-08 | 52 | Yes | No | Yes- chicks and adults | adult: W/M |
| Chula Vista Wildlife Reserve | 1 | 1-Apr-08 | 29-Aug-08 | 59 | Yes | No | Yes- chicks and adults | adult: Y/K |
| South San Diego Bay Unit, SDNWR - Saltworks | 1 | 1-Apr-08 | 30-Sep-08 | 33 | Yes | No | Yes- chicks and adults | adult: L/M |
| Tijuana Estuary NERR | 1 | 2-Apr-08 | 30-Sep-08 | 44 | Yes | No | Yes- chicks and adults | adult: G/R |

Appendix B-2: Monitoring (continued).

Color combinations of current and past California least tern banding studies conducted at breeding areas in California.

| Site Name | Color Combination | Abbreviation |
|--------------------------------------|----------------------------|---------------------|
| Oceano Dunes SVRA | Green/Yellow, Yellow/Green | G/Y, Y/G |
| MCB Camp Pendleton | Mauve (Violet)/Black | M/K |
| Batiquitos Lagoon Ecological Reserve | Red/White | R/W |
| Mariner's Point | Blue/Green | B/G |
| NIMAT | Aqua (light blue)/Orange | A/O |
| NI 1-1 | Black/Aqua (Light Blue) | K/A |
| Naval Amphibious Base Ocean | Blue/Pink, Red/Blue | B/P, R/B |
| Delta Beach North | Yellow/Red | Y/R |
| Delta Beach South | White/Black | W/K |
| 2005 Captive* | Anodized Red | - |
| 2004 Captive* | Anodized Red | - |
| 2003 Captive* | Anodized Green | - |
| 2002 Captive* | Anodized Blue | - |

* "Captive" refers to rehabilitated birds (Project Wildlife) released to the wild (no releases in 2006-2008)

Appendix B-3: Pair Estimation (Method I).

| Site name: | Date terns first observed: | Date terns last observed: | Date of first nest: | Date of last nest initiation: | Total nests prior to 15 June: | Total nests 15 June & later: | Total pairs: |
|---|----------------------------|---------------------------|---------------------|-------------------------------|-------------------------------|------------------------------|----------------------------------|
| Sacramento Area | | | | | | | |
| Bufferlands | | | | | | | |
| San Francisco Bay Area | | | | | | | |
| Green Island | | | | | | | |
| Montezuma Wetlands | 6-May-08 | 29-Jul-08 | 3-Jun-08 | Unknown | Unknown | Unknown | 35 (high count on weekly visits) |
| Pittsburg Power Plant | 22-May-08 | 25-Jun-08 | | | | | |
| Alameda Point | 25-Apr-08 | 8-Aug-08 | 14-May-08 | 11-Jul-08 | 310 | 26 | 323 |
| Hayward Regional Shoreline | 25-Apr-08 | 17-Aug-08 | 15-May-08 | 17-Jul-08 | 51 | 11 | 56.5 |
| Eden Landing | | | | | | | |
| San Luis Obispo/Santa Barbara Counties | | | | | | | |
| Oceano Dunes SVRA | 10-May-08 | 22-Aug-08 | 3-Jun-08 | 27-Jun-08 | 23 | 33 | 39.5 |
| Guadalupe-Mussel Rock | 19-May-08 | 8-Jun-08 | N/A | N/A | 0 | 0 | 0 |
| Vandenberg AFB | 12-May-08 | 15-Aug-08 | 17-Jun-08 | 22-Jul-08 | 18 | 0 | 18 |
| Coal Oil Point Reserve | | | | | | | |
| Ventura County | | | | | | | |
| Santa Clara River/McGrath State Beach | 29-May-08 | 2-Sep-08 | 3-Jun-08 | 10-Jul-08 | 97 | | 97 |
| Ormond Beach | 7-May-08 | 27-Aug-08 | 24-May-08 | 13-Jul-08 | 81 | | 81 |
| Hollywood Beach | 26-May-08 | 24-Aug-08 | 26-May-08 | 20-Jul-08 | 24 | | 24 |
| Pt Mugu- Totals | 5-May-08 | 27-Aug-08 | 19-May-08 | 14-Jul-08 | 406 | 100 | 456 |
| Ormond Beach East | | 4-Aug-08 | 23-May-08 | 1-Jul-08 | 58 | 16 | 66 |
| Holiday Beach | | 27-Aug-08 | 23-May-08 | 3-Jul-08 | 9 | 8 | 13 |
| Holiday Beach Salt Panne | | 4-Aug-08 | 22-May-08 | 14-Jul-08 | 28 | 25 | 40.5 |
| Eastern Arm | | 4-Aug-08 | 19-May-08 | 9-Jul-08 | 311 | 51 | 336.5 |
| Los Angeles/Orange Counties | | | | | | | |
| Venice Beach | 22-Apr-08 | 27-Aug-08 | 13-May-08 | 23-Jul-08 | 468 | 460 | 698 |
| LA Harbor | 29-Apr-08 | 15-Aug-08 | 19-May-08 | 9-Jul-08 | 500 | 29 | 514.5 |
| Seal Beach NWR - Anahiem Bay | 21-Apr-08 | unknown | 8-May-08 | 30-Jun-08 | 193 | 13 | 199.5 |
| Bolsa Chica Ecological Reserve | 14-Apr-08 | 19-Aug-08 | 4-May-08 | 2-Jul-08 | 191 | 51 | 216.5 |
| Huntington State Beach | 2-May-08 | 5-Aug-08 | 16-May-08 | 27-Jun-08 | 367 | 87 | 411 |
| Burris Sand Pit/Burris Basin | | | 29-May-08 | | | | 4 |
| Upper Newport Bay Ecological Reserve | | | | | | | |

Appendix B-3: Pair Estimation (Method I) (continued).

| Site name: | Date terns first observed: | Date terns last observed: | Date of first nest: | Date of last nest initiation: | Total nests prior to 15 June: | Total nests 15 June & later: | Total pairs: |
|--|----------------------------|---------------------------|---------------------|-------------------------------|-------------------------------|------------------------------|--------------|
| San Diego County | | | | | | | |
| MCB Camp Pendleton- Totals | 22-Apr-08 | 30-Aug-08 | 10-May-08 | 17-Jul-08 | | | 1604 |
| Red Beach | 29-Apr-08 | 8-Jul-08 | 15-May-08 | 31-May-08 | | | 5 |
| White Beach | 29-Apr-08 | 14-Aug-08 | 13-May-08 | 26-Jun-08 | | | 114 |
| Cockleburrr Beach | 19-Jun-08 | 12-Aug-08 | 19-Jun-08 | 19-Jun-08 | | | 1 |
| Santa Margarita River - North Beach North | 29-Apr-08 | 12-Aug-08 | 11-May-08 | 10-Jul-08 | | | 432 |
| Santa Margarita River - North Beach South | 22-Apr-08 | 30-Aug-08 | 10-May-08 | 17-Jul-08 | | | 987 |
| Santa Margarita River - Saltflats | 29-Apr-08 | 27-Jul-08 | 17-May-08 | 1-Jul-08 | | | 44 |
| Santa Margarita River - Saltflats Island | 29-Apr-08 | 27-Jul-08 | 17-May-08 | 24-Jun-08 | | | 21 |
| Batiquitos Lagoon Ecological Reserve- Totals | 23-Apr-08 | 26-Aug-08 | 13-May-08 | 24-May-08 | | | 593 |
| W1 | 26-Apr-08 | 14-Aug-08 | 15-May-08 | 12-Jun-08 | 34 | 1 | 34.5 |
| W2 | 24-Apr-08 | 26-Aug-08 | 13-May-08 | 21-Jun-08 | 385 | 19 | 394.5 |
| E1 | 23-Apr-08 | 14-Aug-08 | 13-May-08 | 24-Jun-08 | 156 | 14 | 163 |
| E2 | 24-Apr-08 | 12-Jul-08 | N/A | N/A | 0 | 0 | 0 |
| E3 | 24-Apr-08 | 12-Jul-08 | 24-May-08 | 24-May-08 | 1 | 0 | 1 |
| San Elijo Lagoon Ecological Reserve | 26-Apr-08 | 11-Aug-08 | N/A | N/A | 0 | 0 | 0 |
| Mission Bay | | | | | | | |
| FAA Island | | | | | 0 | 0 | 0 |
| North Fiesta Island | 13-May-08 | 12-Jun-08 | 21-May-08 | 21-May-08 | 10 | 0 | 10 |
| Mariner's Point | 3-May-08 | 16-Jul-08 | 14-May-08 | 20-Jun-08 | 11 | 3 | 12.5 |
| Stony Point | 7-May-08 | 7-Jun-08 | | | | | 0 |
| San Diego River Mouth | 20-May-08 | 16-Jul-08 | 9-Jun-08 | 9-Jun-08 | 1 | 0 | 1 |
| San Diego Bay | | | | | | | |
| Lindbergh Field & Former Naval Training Center | 22-Apr-08 | 15-Aug-08 | 16-May-08 | 18-Jul-08 | | | 122-124 |
| USN- Totals | 14-Apr-08 | 29-Aug-08 | 5-May-08 | 1-Aug-08 | 1305 | 366 | 1488 |
| NI MAT | 25-Apr-08 | 3-Aug-08 | 7-May-08 | 23-Jun-08 | 134 | 12 | 140 |
| Delta Beach North | 22-Apr-08 | 12-Aug-08 | 5-May-08 | 4-Jul-08 | 250 | 45 | 272.5 |
| Delta Beach South | 22-Apr-08 | 27-Aug-08 | 10-May-08 | 7-Jul-08 | 153 | 21 | 163.5 |
| NAB Ocean | 14-Apr-08 | 29-Aug-08 | 5-May-08 | 1-Aug-08 | 768 | 288 | 912 |
| D Street Fill/Sweetwater Marsh NWR | 22-Apr-08 | 13-Aug-08 | 10-May-08 | 16-Jul-08 | | | 133-135 |
| Chula Vista Wildlife Reserve | 9-Apr-08 | 29-Aug-08 | 16-May-08 | 8-Jul-08 | | | 28 |
| South San Diego Bay Unit, SDNWR - Saltworks | 26-Apr-08 | 17-Sep-08 | 14-May-08 | 23-Jul-08 | | | 79-80 |
| Tijuana Estuary NERR | 26-Apr-08 | 18-Sep-08 | 15-May-08 | 19-Jul-08 | | | 177-178 |

Appendix B-4: Productivity (continued).

| Site name: | Total nests: | Total eggs: | No. of eggs hatched: | Hatching Success: | Date of first chick: | Date of last hatch: | Date of first fledgling: | Fledgling estimate method: | Total fledglings: |
|--|--------------|-------------|----------------------|-------------------|----------------------|---------------------|--------------------------|--|-------------------|
| San Diego County | | | | | | | | | |
| MCB Camp Pendleton- Totals | 1665 | 2907 | 2188 | 0.7527 | 31-May-08 | 17-Jul-08 | | | 107-139 |
| Red Beach | 5 | 8 | 0 | 0 | N/A | N/A | | | 0 |
| White Beach | 119 | 209 | 146 | 0.6986 | 5-Jun-08 | 29-Jun-08 | | | 2-3 |
| Cocklebur Beach | 1 | 2 | 0 | 0 | N/A | N/A | | | 0 |
| Santa Margarita River - North Beach North | 458 | 773 | 565 | 0.7309 | 1-Jun-08 | 15-Jul-08 | | | 17 |
| Santa Margarita River - North Beach South | 1012 | 1796 | 1391 | 0.7745 | 31-May-08 | 17-Jul-08 | | | 85-116 |
| Santa Margarita River - Saltflats | 48 | 82 | 55 | 0.6707 | 8-Jun-08 | 15-Jul-08 | | | 3 |
| Santa Margarita River - Saltflats Island | 22 | 37 | 31 | 0.8378 | 5-Jun-08 | 15-Jul-08 | | | 0 |
| Batiquitos Lagoon Ecological Reserve- Totals | 610 | 1086 | 924 | 0.8508 | 3-Jun-08 | 14-Jun-08 | 8-Jul-08 | | 123-176 |
| W1 | 35 | 64 | 54 | 0.8438 | 5-Jun-08 | 3-Jul-08 | 26-Jun-08 | recap | 24-32 |
| W2 | 404 | 706 | 594 | 0.8414 | 3-Jun-08 | 15-Jul-08 | 24-Jun-08 | recap | 73-98 |
| E1 | 170 | 314 | 274 | 0.8726 | 5-Jun-08 | 15-Jul-08 | 26-Jun-08 | 2W obs | 25-45 |
| E2 | 0 | 0 | 0 | 0 | N/A | N/A | N/A | N/A | 0 |
| E3 | 1 | 2 | 2 | 1 | 14-Jun-08 | 14-Jun-08 | 8-Jul-08 | 2W obs | 1 |
| San Elijo Lagoon Ecological Reserve | 0 | 0 | 0 | N/A | N/A | N/A | N/A | N/A | 0 |
| Mission Bay | | | | | | | | | |
| FAA Island | 0 | 0 | 0 | N/A | N/A | N/A | N/A | N/A | 0 |
| North Fiesta Island | 10 | 18 | 0 | 0 | N/A | N/A | N/A | N/A | 0 |
| Mariner's Point | 14 | 17 | 0 | 0 | N/A | N/A | N/A | N/A | 0 |
| Stony Point | 0 | 0 | 0 | N/A | N/A | N/A | N/A | N/A | 0 |
| San Diego River Mouth | 1 | 1 | 0 | 0 | N/A | N/A | N/A | N/A | 0 |
| San Diego Bay | | | | | | | | | |
| Lindbergh Field & Former Naval Training Center | 139 | 238 | 193 | 0.8109 | 6-Jun-08 | 21-Jul-08 | 30-Jun-08 | R, 2WD | 115-128 |
| USN- Totals | 1670 | 2890 | 2286 | 0.7910 | 28-May-08 | 14-Jul-08 | 18-Jun-08 | Combination of survey and fledgling data | 155 |
| NI MAT | 146 | 247 | 149 | 0.6032 | 3-Jun-08 | 14-Jul-08 | 24-Jun-08 | Combination of survey and fledgling data | 25 |
| Delta Beach North | 295 | 519 | 407 | 0.7842 | 30-May-08 | 25-Jul-08 | 18-Jun-08 | Combination of survey and fledgling data | 30 |
| Delta Beach South | 174 | 308 | 276 | 0.8961 | 31-May-08 | 25-Jul-08 | 23-Jun-08 | Combination of survey and fledgling data | 35 |
| NAB Ocean | 1055 | 1816 | 1454 | 0.8007 | 28-May-08 | 28-Jul-08 | 24-Jun-08 | Combination of survey and fledgling data | 65 |
| D Street Fill/Sweetwater Marsh NWR | 148 | 262 | 223 | 0.8511 | 3-Jun-08 | 22-Jul-08 | 24-Jun-08 | R, 2WD | 17-24 |
| Chula Vista Wildlife Reserve | 33 | 60 | 32 | 0.5333 | 6-Jun-08 | 26-Jul-08 | 15-Aug-08 | R, 2WD | 2 |
| South San Diego Bay Unit, SDNWR - Saltworks | 102 | 191 | 81 | 0.4241 | 7-Jun-08 | 30-Jul-08 | 25-Jun-08 | R, 2WD | 6 |
| Tijuana Estuary NERR | 201 | 371 | 191 | 0.5148 | 5-Jun-08 | 10-Jul-08 | 26-Jun-08 | R, 2WD | 45-51 |

Appendix B-4: Productivity, clutch sizes 2008.

| Site name: | Nest total | Egg total | Number of nests | | | |
|---|------------|-----------|-----------------|--------------|--------------|--------------|
| | | | 1 egg clutch | 2 egg clutch | 3 egg clutch | 4 egg clutch |
| Sacramento Area | | | | | | |
| Bufferlands | 1 | 1 | 1 | 0 | 0 | 0 |
| San Francisco Bay Area | | | | | | |
| Green Island | 16-18 | | | | | |
| Montezuma Wetlands | 35+ | | | | | |
| Pittsburg Power Plant | 1 | | | | | |
| Alameda Point | 336 | 633 | 43 | 289 | 4 | 0 |
| Hayward Regional Shoreline | 62 | 114 | 10 | 51 | 1 | 0 |
| Eden Landing | 2 | 2 | | | | |
| San Luis Obispo/Santa Barbara Counties | | | | | | |
| Oceano Dunes SVRA | 56 | 115 | | | | |
| Guadalupe-Mussel Rock | | | | | | |
| Vandenberg AFB | 18 | 35 | 1 | 17 | 0 | 0 |
| Coal Oil Point Reserve | 1 | 2 | | | | |
| Ventura County | | | | | | |
| Santa Clara River/McGrath State Beach | 97 | 158 | 38 | 57 | 2 | 0 |
| Ormond Beach | 81 | 153 | 10 | 70 | 1 | 0 |
| Hollywood Beach | 24 | 46 | 5 | 16 | 3 | 0 |
| Pt Mugu- Totals | 492 | 891 | 101 | 371 | 16 | 0 |
| Ormond Beach East | 73 | 140 | 9 | 61 | 3 | 0 |
| Holiday Beach | 17 | 31 | 4 | 12 | 1 | 0 |
| Holiday Beach Salt Panne | 53 | 100 | 12 | 35 | 6 | 0 |
| Eastern Arm | 345 | 620 | 76 | 263 | 6 | 0 |
| Los Angeles/Orange Counties | | | | | | |
| Venice Beach | 928 | 1276 | | | | |
| LA Harbor | 529 | 891 | 167 | 362 | 0 | 0 |
| Seal Beach NWR - Anahiem Bay | 206 | 359 | 56 | 147 | 3 | 0 |
| Bolsa Chica Ecological Reserve | 242 | 434 | 55 | 182 | 5 | 0 |
| Huntington State Beach | 454 | 739 | 170 | 283 | 1 | 0 |
| Burris Sand Pit/Burris Basin | | | | | | |
| Upper Newport Bay Ecological Reserve | | | | | | |
| San Diego County | | | | | | |
| MCB Camp Pendleton- Totals | 1665 | 2907 | 431 | 1226 | 9 | 0 |
| Red Beach | 5 | 8 | 2 | 3 | 0 | 0 |
| White Beach | 119 | 209 | 29 | 90 | 1 | 0 |
| Cockleburr Beach | 1 | 2 | 0 | 1 | 0 | 0 |
| Santa Margarita River - North Beach North | 458 | 773 | 144 | 313 | 1 | 0 |
| Santa Margarita River - North Beach South | 1012 | 1796 | 235 | 770 | 7 | 0 |
| Santa Margarita River - Saltflats | 48 | 82 | 14 | 34 | 0 | 0 |
| Santa Margarita River - Saltflats Island | 22 | 37 | 7 | 15 | 0 | 0 |
| Batiquitos Lagoon Ecological Reserve- Totals | 610 | 1086 | 143 | 460 | 7 | 0 |
| W1 | 35 | 64 | 6 | 29 | 0 | 0 |
| W2 | 404 | 706 | 106 | 296 | 2 | 0 |
| E1 | 170 | 314 | 31 | 134 | 5 | 0 |
| E2 | 0 | 0 | 0 | 0 | 0 | 0 |
| E3 | 1 | 2 | 0 | 1 | 0 | 0 |
| San Elijo Lagoon Ecological Reserve | 0 | 0 | 0 | 0 | 0 | 0 |

Appendix B-4: Productivity, clutch sizes 2008 (continued)

| Site name: | Nest total | Egg total | Number of nests | | | |
|--|------------|-----------|-----------------|--------------|--------------|--------------|
| | | | 1 egg clutch | 2 egg clutch | 3 egg clutch | 4 egg clutch |
| Mission Bay | | | | | | |
| FAA Island | 0 | 0 | 0 | 0 | 0 | 0 |
| North Fiesta Island | 10 | 18 | 2 | 8 | 0 | 0 |
| Mariner's Point | 14 | 17 | 11 | 3 | 0 | 0 |
| Stony Point | 0 | 0 | 0 | 0 | 0 | 0 |
| San Diego River Mouth | 1 | 1 | 1 | 0 | 0 | 0 |
| San Diego Bay | | | | | | |
| Lindbergh Field & Former Naval Training Center | 139 | 238 | 43 | 94 | 1 | 1 |
| USN (Total) | 1671 | 2891 | 454 | 1212 | 4 | 0 |
| NI MAT | 146 | 247 | 45 | 101 | 0 | 0 |
| Delta Beach North | 295 | 519 | 73 | 220 | 2 | 0 |
| Delta Beach South | 174 | 308 | 40 | 134 | 0 | 0 |
| NAB Ocean | 1056 | 1817 | 296 | 757 | 2 | 0 |
| D Street Fill/Sweetwater Marsh NWR | 148 | 262 | 34 | 114 | 0 | 0 |
| Chula Vista Wildlife Reserve | 33 | 60 | 7 | 25 | 1 | 0 |
| South San Diego Bay Unit, SDNWR - Saltworks | 102 | 191 | 15 | 86 | 0 | 0 |
| Tijuana Estuary NERR | 201 | 371 | 34 | 164 | 3 | 0 |

Appendix B-4: Productivity, clutch sizes 2007.

| Site name: | Nest total | Egg total | Number of nests | | | |
|---|------------|-----------|-----------------|--------------|--------------|--------------|
| | | | 1 egg clutch | 2 egg clutch | 3 egg clutch | 4 egg clutch |
| San Francisco Bay Area | | | | | | |
| Pittsburg Power Plant | | | | | | |
| Alameda Point | 394 | 678 | 114 | 276 | 4 | 0 |
| Hayward Regional Shoreline | 35 | 67 | 5 | 30 | 0 | 0 |
| San Luis Obispo/Santa Barbara Counties | | | | | | |
| Oceano Dunes SVRA | | | | | | |
| Rancho Guadalupe Dunes Preserve | | | | | | |
| Vandenberg AFB- Purisima Pt | 18 | 29 | 7 | 11 | 0 | 0 |
| Coal Oil Point | | | | | | |
| Ventura County | | | | | | |
| Santa Clara River/McGrath State Beach | | | | | | |
| Ormond Beach | 52 | 92 | 13 | 38 | 1 | 0 |
| Hollywood Beach | 1 | 2 | | 1 | | |
| NBVC Pt. Mugu (Total) | 431 | 743 | 117 | 309 | 5 | 0 |
| Ormond East | 351 | 596 | 101 | 247 | 3 | 0 |
| Holiday Beach | 65 | 124 | 9 | 54 | 2 | 0 |
| Holiday Beach Salt Panne | 6 | 9 | 3 | 3 | 0 | 0 |
| Eastern Arm | 9 | 14 | 4 | 5 | 0 | 0 |
| Los Angeles/Orange Counties | | | | | | |
| Venice Beach | 546 | 775 | 319 | 225 | 2 | 0 |
| LA HARBOR Pier 400 | | | | | | |
| Seal Beach NWR/Anaheim Bay | 166 | 292 | 42 | 122 | 3 | 0 |
| Bolsa Chica Ecological Reserve | 266 | 392 | 60 | 166 | 0 | 0 |
| Huntington State Beach | 485 | 772 | 198 | 287 | 0 | 0 |
| Burris Sand Pit | | | | | | |
| Upper Newport Bay ER | | | | | | |
| San Diego County | | | | | | |
| Camp Pendleton (Total) | | | | | | |
| Red Beach | 14 | 24 | 4 | 10 | 0 | 0 |
| White Beach | 117 | 194 | 40 | 77 | 0 | 0 |
| Santa Margarita River - North Beach North | 288 | 420 | 156 | 132 | 0 | 0 |
| Santa Margarita River - North Beach South | 984 | 1416 | 554 | 428 | 2 | 0 |
| Santa Margarita River - Saltflats | 85 | 125 | 45 | 40 | 0 | 0 |
| Santa Margarita River - Saltflats Island | 42 | 56 | 28 | 14 | 0 | 0 |
| Batiquitos Lagoon Ecological Reserve (Total) | | | | | | |
| W1 | 40 | 62 | 18 | 22 | 0 | 0 |
| W2 | 379 | 600 | 158 | 221 | 0 | 0 |
| E1 | 170 | 269 | 71 | 99 | 0 | 0 |
| E2 | 0 | 0 | 0 | 0 | 0 | 0 |
| E3 | 5 | 8 | 2 | 3 | 0 | 0 |
| San Elijo Lagoon Ecological Reserve | | | | | | |

Appendix B-4: Productivity, clutch sizes 2007 (continued).

| Site name: | Nest total | Egg total | Number of nests | | | |
|--|------------|-----------|-----------------|--------------|--------------|--------------|
| | | | 1 egg clutch | 2 egg clutch | 3 egg clutch | 4 egg clutch |
| Mission Bay | | | | | | |
| FAA | 28 | 48 | 9 | 18 | 1 | 0 |
| North Fiesta Island | 39 | 64 | 16 | 22 | 0 | 1 |
| Mariner's Point | 105 | 180 | 30 | 75 | 0 | 0 |
| Stony Point | 45 | 78 | 12 | 33 | 0 | 0 |
| San Diego River Mouth | 30 | 54 | 7 | 22 | 1 | 0 |
| San Diego Bay | | | | | | |
| Lindbergh Field & Former Naval Training Center | 135 | 238 | 33 | 101 | 1 | 0 |
| USN (Total) | 1285 | 2205 | 365 | 920 | 0 | 0 |
| NI MAT | 123 | 200 | 46 | 77 | 0 | 0 |
| Delta Beach North | 224 | 393 | 55 | 169 | 0 | 0 |
| Delta Beach South | 156 | 264 | 48 | 108 | 0 | 0 |
| NAB Ocean | 782 | 1348 | 216 | 566 | 0 | 0 |
| D Street Fill/Sweetwater Marsh NWR | 130 | 214 | 47 | 82 | 1 | 0 |
| Chula Vista Wildlife Reserve | 46 | 81 | 11 | 35 | 0 | 0 |
| South San Diego Bay Unit, SDNWR - Saltworks | 97 | 166 | 28 | 69 | 0 | 0 |
| Tijuana Estuary NERR | 291 | 511 | 72 | 218 | 1 | 0 |

Appendix B-4: Productivity, clutch sizes 2006.

| Site name: | Nest total | Egg total | Number of nests | | |
|---|------------|-----------|-----------------|--------------|--------------|
| | | | 1 egg clutch | 2 egg clutch | 3 egg clutch |
| San Francisco Bay Area | | | | | |
| Pittsburg Power Plant | | | | | |
| Alameda Point | 441 | 754 | 132 | 305 | 4 |
| Hayward Regional Shoreline | 15 | 13 + | unknown | unknown | unknown |
| San Luis Obispo/Santa Barbara Counties | | | | | |
| Oceano Dunes SVRA | | | | | |
| Guadalupe-Mussel Rock | | | | | |
| Vandenberg AFB (Total) | | | | | |
| Purisima Point | 2 | 4 | 0 | 2 | 0 |
| Beach 2 | 0 | 0 | 0 | 0 | 0 |
| Ventura County | | | | | |
| Santa Clara River/McGrath State Beach | | | | | |
| Ormond Beach | 53 | 100 | 10 | 41 | 2 |
| NAWS Pt Mugu (Total) | 469 | 838 | 100 | 363 | 6 |
| Ormond East | 194 | 686 | 90 | 295 | 4 |
| Holiday Beach | 21 | 87 | 4 | 40 | 1 |
| Eastern Arm | 16 | 64 | 6 | 28 | 1 |
| Los Angeles/Orange Counties | | | | | |
| Venice Beach, Marina del Rey, California | 384 | 597 | 172 | 211 | 1 |
| LA HARBOR Pier 400 | | | | | |
| Seal Beach NWR/Anaheim Bay | 186 | 298 | 77 | 106 | 3 |
| Bolsa Chica Ecological Reserve | 222 | 363 | 83 | 137 | 2 |
| Huntington State Beach | | | | | |
| Upper Newport Bay ER | 36 | 61 | 11 | 25 | 0 |
| San Diego County | | | | | |
| Camp Pendleton (Total) | | | | | |
| Red Beach | 27 | 43 | 11 | 16 | 0 |
| White Beach | 147 | 246 | 50 | 95 | 2 |
| Santa Margarita River - North Beach North | 301 | 455 | 147 | 154 | 0 |
| Santa Margarita River - North Beach South | 951 | 1499 | 403 | 548 | 0 |
| Santa Margarita River - Saltflats | 66 | 113 | 19 | 47 | 0 |
| Santa Margarita River - Saltflats Island | 48 | 79 | 17 | 31 | 0 |
| Batiquitos Lagoon Ecological Reserve (Total) | | | | | |
| W1 | 36 | 59 | 13 | 23 | 0 |
| W2 | 409 | 669 | 149 | 260 | 0 |
| E1 | 160 | 262 | 58 | 102 | 0 |
| E2 | 0 | 0 | 0 | 0 | 0 |
| E3 | 22 | 35 | 9 | 13 | 0 |
| San Elijo Lagoon Ecological Reserve | | | | | |

Appendix B-4: Productivity, clutch sizes 2006 (continued)

| Site name: | Nest total | Egg total | Number of nests | | |
|--|------------|-----------|-----------------|--------------|--------------|
| | | | 1 egg clutch | 2 egg clutch | 3 egg clutch |
| Mission Bay | | | | | |
| FAA | 104 | 145 | 63 | 41 | 0 |
| North Fiesta Island | 30 | 52 | 8 | 22 | 0 |
| Mariner's Point | 120 | 169 | 72 | 47 | 1 |
| Stony Point | 136 | 236 | 36 | 100 | 0 |
| San Diego River Mouth | 14 | 17 | 11 | 3 | 0 |
| San Diego Bay | | | | | |
| Lindbergh Field & Former Naval Training Center | | | | | |
| USN (Total) | | | | | |
| NI MAT | 180 | 272 | 88 | 92 | 0 |
| Delta Beach North | 223 | 327 | 120 | 102 | 1 |
| Delta Beach South | 155 | 242 | 68 | 87 | 0 |
| NAB Ocean | 1047 | 1632 | 462 | 585 | 0 |
| D Street Fill/Sweetwater Marsh NWR | | | | | |
| Chula Vista Wildlife Reserve | | | | | |
| South San Diego Bay Unit, SDNWR - Saltworks | 82 | 138 | 26 | 56 | 0 |
| Tijuana Estuary NERR | 371 | 606 | 136 | 235 | 0 |

Appendix B-4: Productivity, clutch sizes 2005

| Site name: | Nest total | Egg total | Number of nests | | |
|---|------------|-----------|-----------------|--------------|--------------|
| | | | 1 egg clutch | 2 egg clutch | 3 egg clutch |
| San Francisco Bay Area | | | | | |
| Pittsburg Power Plant | | | | | |
| Alameda Point | 550 | 913 | 192 | 353 | 5 |
| Hayward Regional Shoreline | 8 | | | | |
| San Luis Obispo/Santa Barbara Counties | | | | | |
| Oceano Dunes SVRA | | | | | |
| Guadalupe-Mussel Rock | | | | | |
| Vandenberg AFB | | | | | |
| Purisima Pt | 74 | 14 | 30 | 0 | |
| Beach 2 | 0 | 0 | 0 | 0 | |
| Ventura County | | | | | |
| Santa Clara River/McGrath State Beach | 9 | 17 | 1 | 8 | 0 |
| Ormond Beach | 27 | 46 | 8 | 19 | 0 |
| Pt Mugu- Totals | 608 | 1105 | 100 | 480 | 15 |
| Eastern Arm | 24 | 45 | 5 | 17 | 2 |
| Holiday Beach | 108 | 202 | 20 | 82 | 6 |
| Ormond Beach East | 476 | 858 | 75 | 381 | 7 |
| Los Angeles/Orange Counties | | | | | |
| Venice Beach | | | | | |
| LA Harbor - Pier 400 | | | | | |
| Seal Beach NWR - Anahiem Bay | 142 | 259 | 34 | 108 | 3 |
| Bolsa Chica Ecological Reserve | 135 | 243 | 36 | 97 | 2 |
| Huntington State Beach | 339 | 554 | 124 | 215 | 0 |
| Upper Newport Bay Ecological Reserve | 28 | 57 | 16 | 12 | 0 |
| San Diego County | | | | | |
| MCB Camp Pendleton | 1664 | 2683 | 648 | 1240 | 5 |
| Red Beach | 3 | 4 | 2 | 1 | 0 |
| White Beach | 136 | 226 | 46 | 89 | 1 |
| Santa Margarita River - North Beach N | 375 | 610 | 140 | 464 | 2 |
| Santa Margarita River - North Beach S | 1034 | 1658 | 412 | 618 | 2 |
| Santa Margarita River - Saltflats | 59 | 95 | 24 | 35 | 0 |
| Santa Margarita River - Saltflats Island | 57 | 90 | 24 | 33 | 0 |
| Batiquitos Lagoon Ecological Reserve | 595 | 944 | 253 | 335 | 7 |
| W1 | 46 | 71 | 22 | 23 | 1 |
| W2 | 354 | 583 | 149 | 211 | 4 |
| E1 | 157 | 249 | 68 | 86 | 3 |
| E2 | 0 | 0 | 0 | 0 | 0 |
| E3 | 30 | 47 | 14 | 15 | 1 |
| San Elijo Lagoon Ecological Reserve | 1 | 2 | 0 | 1 | 0 |

Appendix B-4: Productivity, clutch sizes 2005 (continued)

| Site name: | Nest total | Egg total | Number of nests | | |
|--|------------|-----------|-----------------|--------------|--------------|
| | | | 1 egg clutch | 2 egg clutch | 3 egg clutch |
| Mission Bay | | | | | |
| FAA Island | | | | | |
| North Fiesta Island | | | | | |
| Mariner's Point | 281 | 483 | 79 | 202 | 0 |
| San Diego River Mouth | 118 | 198 | 38 | 80 | 0 |
| San Diego Bay | | | | | |
| Lindbergh Field & Former Naval Training Center | 157 | 278 | 39 | 115 | 3 |
| USN (Total) | 1269 | 2073 | 461 | 808 | 1 |
| NI MAT | 134 | 229 | 39 | 95 | 0 |
| Delta Beach North | 351 | 578 | 125 | 226 | 1 |
| Delta Beach South | 215 | 338 | 89 | 126 | 0 |
| NAB Ocean | 569 | 928 | 208 | 361 | 0 |
| D Street Fill/Sweetwater Marsh NWR | 101 | 161 | 42 | 58 | 1 |
| Chula Vista Wildlife Reserve | 57 | 101 | 13 | 44 | 0 |
| South San Diego Bay Unit, SDNWR - Saltworks | 34 | 60 | 8 | 26 | 0 |
| Tijuana Estuary NERR | 458 | 803 | 119 | 333 | 6 |

Appendix B-4: Productivity, clutch sizes 2004

| Site name: | Nest total | Egg total | Number of nests | | | |
|---|------------|-----------|-----------------|--------------|--------------|--------------|
| | | | 1 egg clutch | 2 egg clutch | 3 egg clutch | 4 egg clutch |
| San Francisco Bay Area | | | | | | |
| Pittsburg Power Plant | 15 | 24 min | 0 | 9 min | 0 | 0 |
| Albany Central Ave. Mitigation Island | 0 | 0 | 0 | 0 | 0 | 0 |
| Alameda Point | 440 | 755 | 148 | 281 | 10 | 1 |
| San Luis Obispo/Santa Barbara Counties | | | | | | |
| Oceano Dunes SVRA | | | | | | |
| Guadalupe-Mussel Rock | 8 | 18 | 0 | 4 | 3 | 0 |
| Vandenberg AFB | 1 | 1 | 1 | 0 | 0 | 0 |
| Purissima Pt | 1 | 1 | 1 | 0 | 0 | 0 |
| Beach 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coal Oil Point Reserve | | | | | | |
| Ventura County | | | | | | |
| Santa Clara River/McGrath State Beach | 83 | 143 | 20 | 60 | 1 | 0 |
| Hollywood Beach | 48 | 82 | 18 | 32 | | 0 |
| Ormond Beach | 29 | 43 | 12 | 14 | 1 | 0 |
| Pt Mugu- Totals | 617 | 1048 | 190 | 420 | 6 | 0 |
| Holiday Beach | 12 | 23 | 1 | 11 | 0 | 0 |
| Ormond Beach East | 453 | 755 | 149 | 303 | 0 | 0 |
| Nesting Islands | 25 | 49 | 3 | 20 | 2 | 0 |
| Eastern Arm | 127 | 221 | 37 | 86 | 4 | 0 |
| Los Angeles/Orange Counties | | | | | | |
| Venice Beach | 17 | 19 | 16 | 0 | 1 | 0 |
| LA Harbor - Pier 400 | 1071 | 1748 | 396 | 673 | 2 | 0 |
| Seal Beach NWR - Anahiem Bay | 206 | 335 | 79 | 125 | 2 | 0 |
| Bolsa Chica Ecological Reserve | 229 | 334 | 124 | 105 | 0 | 0 |
| Huntington State Beach | 323 | 444 | 202 | 121 | 0 | 0 |
| Upper Newport Bay Ecological Reserve | | | | | | |
| San Diego County | | | | | | |
| MCB Camp Pendleton | 1430 | 2558 | 312 | 1087 | 5 | 0 |
| Red Beach | 1 | 2 | 0 | 1 | 0 | 0 |
| White Beach | 102 | 175 | 29 | 73 | 0 | 0 |
| Santa Margarita River - North Beach N | 450 | 797 | 103 | 344 | 2 | 0 |
| Santa Margarita River - North Beach S | 801 | 1444 | 167 | 634 | 3 | 0 |
| Santa Margarita River - Saltflats | 39 | 101 | 8 | 31 | 0 | 0 |
| Santa Margarita River - Saltflats Island | 37 | 69 | 5 | 32 | 0 | 0 |
| Batiquitos Lagoon Ecological Reserve | 592 | 1032 | 160 | 424 | 8 | 0 |
| San Elijo Lagoon Ecological Reserve | | | | | | |

Appendix B-4: Productivity, clutch sizes 2004 (continued)

| Site name: | Nest total | Egg total | Number of nests | | | |
|--|------------|-----------|-----------------|--------------|--------------|--------------|
| | | | 1 egg clutch | 2 egg clutch | 3 egg clutch | 4 egg clutch |
| Mission Bay | | | | | | |
| FAA Island | 315 | 423 | 208 | 212 | 1 | 0 |
| North Fiesta Island | 17 | 20 | 14 | 3 | 0 | 0 |
| Mariner's Point | 299 | 455 | 145 | 152 | 2 | 0 |
| Dog Beach | 42 | 58 | 32 | 26 | 0 | 0 |
| San Diego Bay | | | | | | |
| Lindbergh Field & Former Naval Training Center | 76 | 126 | 27 | 48 | 1 | 0 |
| USN (Total) | 1207 | 1861 | 555 | 650 | 2 | 0 |
| NI MAT | 172 | 283 | 61 | 111 | 0 | 0 |
| Delta Beach North | 263 | 410 | 117 | 145 | 1 | 0 |
| Delta Beach South | 195 | 289 | 101 | 94 | 0 | 0 |
| NAB Ocean | 577 | 879 | 276 | 300 | 1 | 0 |
| D Street Fill/Sweetwater Marsh NWR | 111 | 163 | 59 | 52 | 0 | 0 |
| Chula Vista Wildlife Reserve | 66 | 103 | 30 | 35 | 1 | 0 |
| South San Diego Bay Unit, SDNWR - Saltworks | 49 | 78 | 20 | 29 | 0 | 0 |
| Silver Strand State Beach | 1 | 2 | 0 | 1 | 0 | 0 |
| Tijuana Estuary NERR | 520 | 804 | 236 | 284 | 0 | 0 |

Appendix B-5: Non Predation Mortality.

| Site name: | No. of eggs | | | | | No. of nests | | | | | No. of dead | | | Comments on cause(s) of non-predation mortality: |
|---|----------------|-------------------|--------------------|-------------------------------|------------------|---------------|------------------|--------------------|-------------------------------|-----------------|-------------|------------|--------|---|
| | human damaged: | lost to flooding: | abandoned pre-term | abandoned post-term/nonviable | outcome unknown: | human damaged | lost to flooding | abandoned pre-term | abandoned post-term/nonviable | outcome unknown | chicks | fledglings | adults | |
| Sacramento Area | | | | | | | | | | | | | | |
| Bufferlands | | | | | | | | | | | | | | |
| San Francisco Bay Area | | | | | | | | | | | | | | |
| Green Island | | | | | | | | | | | | | | |
| Montezuma Wetlands | | | | | | | | | | | | | | With weekly visits, there was no way to know the fate of any nest. |
| Pittsburg Power Plant | | | | | | | | | | | | | | |
| Alameda Point | | | 17 | 37 | 21 | 0 | 0 | 12 | 30 | 17 | 22 | 0 | 0 | Unknown. |
| Hayward Regional Shoreline | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 5 | 0 | 3 | 0 | 0 | |
| Eden Landing | | | | | | | | | | | | | | |
| San Luis Obispo/Santa Barbara Counties | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Oceano Dunes SVRA | 0 | 0 | 6 | 3 | 0 | 0 | 0 | 3 | 2 | 0 | 7 | 1 | 1 | One juvenile, seven chicks, and one adult found on-site dead from unknown causes. Necropsy of a large chick (20 days old) showed atrophy of pectoral muscles and showed the presence of Aeromonas sp. bacteria in the liver and lungs. Necropsy of a second chick (8 days old) also showed Aeromonas sp. bacteria in the liver and lungs. Both necropsies are inconclusive on cause of death. (One additional juvenile was seen to drown off-site at a artificial lake 3.2 miles away from breeding area. This lake is used by adult and juvenile ODSVRA terns (bands seen) and it is highly likely this was an ODSVRA juvenile.) |
| Guadalupe-Mussel Rock | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| Vandenberg AFB | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 4 | 0 | Likely food shortage at end of breeding season. |
| Coal Oil Point Reserve | | | | | | | | | | | | | | |
| Ventura County | | | | | | | | | | | | | | |
| Santa Clara River/McGrath State Beach | 1 | | 4 | | 6 | 1 | | 4 | | 4 | 2 | | | |
| Ormond Beach | 2 | | 8 | | 9 | 1 | | 5 | | 5 | 2 | | | |
| Hollywood Beach | 1 | | | 2 | | 1 | | | 1 | | | | | |
| Pt Mugu- Totals | 0 | 93 | 55 | 9 | 148 | 0 | 47 | 33 | 9 | 77 | 0 | 0 | 0 | |
| Ormond Beach East | 0 | 25 | 7 | 3 | 10 | 0 | 13 | 4 | 3 | 6 | 0 | 0 | 0 | |
| Holiday Beach | 0 | 15 | 0 | 0 | 2 | 0 | 7 | 0 | 0 | 2 | 0 | 0 | 0 | |
| Holiday Beach Salt Panne | 0 | 53 | 1 | 1 | 2 | 0 | 27 | 1 | 1 | 1 | 0 | 0 | 0 | |
| Eastern Arm | 0 | 0 | 47 | 5 | 134 | 0 | 0 | 28 | 5 | 68 | 4 | 1 | 0 | |

Appendix B-5: Non Predation Mortality (continued).

| Site name: | No. of eggs | | | | | No. of nests | | | | | No. of dead | | | Comments on cause(s) of non-predation mortality: |
|--|----------------|-------------------|--------------------|-------------------------------|------------------|---------------|------------------|--------------------|-------------------------------|-----------------|-------------|------------|--------|--|
| | human damaged: | lost to flooding: | abandoned pre-term | abandoned post-term/nonviable | outcome unknown: | human damaged | lost to flooding | abandoned pre-term | abandoned post-term/nonviable | outcome unknown | chicks | fledglings | adults | |
| Mission Bay | | | | | | | | | | | | | | |
| FAA Island | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| North Fiesta Island | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Mariner's Point | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Stony Point | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| San Diego River Mouth | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| San Diego Bay | | | | | | | | | | | | | | |
| Lindbergh Field & Former Naval Training Center | 0 | 0 | 9 | 20 | 0 | 0 | 0 | 8 | 16 | 0 | 19 | 5 | 0 | |
| USN- Totals | 27 | 8 | 183 | 124 | 104 | 17 | 3 | 148 | 51 | 46 | 51 | 8 | 3 | |
| NI MAT | 0 | 0 | 24 | 22 | 1 | 0 | 0 | 17 | 20 | 0 | 5 | 0 | 0 | Predator caused abandonment. |
| Delta Beach North | 0 | 4 | 36 | 34 | 24 | 0 | 2 | 28 | 18 | 13 | 12 | 2 | 0 | Human disturbance and predator caused abandonment. |
| Delta Beach South | 0 | 0 | 11 | 10 | 6 | 0 | 0 | 11 | 4 | 3 | 8 | 0 | 1 | Human disturbance and predator caused abandonment. |
| NAB Ocean | 27 | 4 | 112 | 58 | 73 | 17 | 1 | 92 | 9 | 30 | 26 | 6 | 2 | Human disturbance and predator caused abandonment. |
| D Street Fill/Sweetwater Marsh NWR | 0 | 0 | 20 | 9 | 0 | 0 | 0 | 16 | 6 | 0 | 12 | 0 | 0 | |
| Chula Vista Wildlife Reserve | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | |
| South San Diego Bay Unit, SDNWR - Saltworks | 0 | 0 | 23 | 8 | 0 | 0 | 0 | 15 | 6 | 0 | 0 | 0 | 0 | |
| Tijuana Estuary NERR | 1 | 27 | 25 | 11 | 0 | 1 | 14 | 21 | 10 | 0 | 3 | 2 | 1 | |

Appendix B-6: Predation.

| Predator Species | Predation | | |
|----------------------------|-----------|-----------|------------|
| | Possible | Suspected | Documented |
| ants (spp.) | X | X | X |
| snakes (spp.) | X | | |
| great blue heron | X | | X |
| great egret | X | | |
| black-crowned night heron | X | | X |
| California gull | | | X |
| western gull | | X | X |
| gulls (spp.) | X | X | X |
| Caspian tern | X | | |
| elegant tern | | | X |
| gull-billed tern | X | X | X |
| black skimmer | X | X | X |
| northern harrier | X | X | X |
| white-tailed kite | X | | |
| Cooper's hawk | X | X | X |
| red-tailed hawk | X | X | X |
| golden eagle | X | | |
| osprey | X | | |
| crested caracara | X | | |
| American kestrel | X | X | X |
| peregrine falcon | X | X | X |
| black-bellied plover | X | | |
| barn owl | X | X | X |
| great-horned owl | X | X | X |
| burrowing owl | X | | X |
| owls (spp.) | X | X | X |
| rock pigeon | X | | |
| American crow | X | X | X |
| common raven | X | X | X |
| corvids | | | X |
| loggerhead shrike | X | | X |
| European starling | X | | X |
| western meadowlark | X | | |
| red-winged blackbird | X | | |
| Brewer's blackbird | X | | |
| unknown avian spp. | | X | X |
| unknown mammal spp. | X | | |
| opossum | X | | X |
| river otter | X | | |
| long-tailed weasel | X | | X |
| black-tailed jackrabbit | X | | |
| California ground squirrel | X | X | X |
| rats (spp.) | X | X | |
| rodents | X | X | X |
| domestic dog | X | | |
| coyote | X | X | X |
| gray fox | X | | |
| red fox | X | | |
| raccoon | X | | |
| striped skunk | X | | X |
| domestic cat | X | X | |

Appendix B-6: Predation (continued).

| Site name | Predation | | | Number of | | | | | Total number documented | | | | |
|-------------------------------|---|-----------------------------------|--|-----------------------------|------------------|------------------------------------|--------------------|-------------------------------------|-------------------------|-------|--------|------------|--------|
| | Possible | Suspected | Documented | Eggs | Nests | Chicks | Fledglings | Adults | Eggs | Nests | Chicks | Fledglings | Adults |
| Sacramento Area | | | | | | | | | | | | | |
| Bufferlands | | | | | | | | | | | | | |
| San Francisco Bay Area | | | | | | | | | | | | | |
| Green Island | | | | | | | | | 0 | 0 | 0 | 0 | 0 |
| Montezuma Wetlands | GTBH, gull, CATE, NOHA, RTHA, GOEA, AMKE, BUOW, AMCR, WEME, RWBL, otter, btj rabbit, rfox, rac, cat | | | | | | | | 0 | 0 | 0 | 0 | 0 |
| Pittsburg Power Plant | GTBH, GREG, AMKE, NOHA, mammal | | | | | | | | 0 | 0 | 0 | 0 | 0 |
| Alameda Point | gull, BAOW | NOHA, RTHA, AMKE, PEFA, BAOW, owl | ant, NOHA, RTHA, PEFA, BAOW, AMCR, CORA, LOSH, avian | ant 1D, corvid 5S, avian 6S | | ant 1D, NOHA 1D, RTHA 1D, avian 1D | NOHA 1D, avian 11S | PEFA 1S, BAOW 1S, LOSH 1D, avian 6D | 12 | | 4 | 12 | 9 |
| Hayward Regional Shoreline | NOHA, RTHA, CORA, rfox, rac, cat | | CAGU, PEFA, AMCR | CAGU 2D, AMCR 2D | CAGU 2D, AMCR 2D | CAGU 3D | PEFA 1D | | 4 | 4 | 4 | 1 | 0 |
| Eden Landing | | CAGU | | CAGU 2S | CAGU 2S | | | | 2 | 2 | 0 | 0 | 0 |

Appendix B-6: Predation (continued).

| Site name | Predation | | | Number of | | | | | Total number documented | | | | | |
|---|---|-----------|------------|-----------|----------|--|------------|---------|-------------------------|-------|--------|------------|--------|---|
| | Possible | Suspected | Documented | Eggs | Nests | Chicks | Fledglings | Adults | Eggs | Nests | Chicks | Fledglings | Adults | |
| San Luis Obispo/Santa Barbara Counties | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | GTBH, gull, NOHA, RTHA, AMKE, PEFA, GHOW, owl, AMCR, CORA, BRBL, op, dog, coyote, rac, skunk | | gull | gull 1D | gull 1D | GTBH 0- 22P, gull 0- 22P, NOHA 0-22P, RTHA 0- 22P, AMKE 0-22P, PEFA 0- 22P, GHOW 0-22P, owl 0- 22P, AMCR 0-22P, CORA 0- 22P, BRBL 0-22P, op 0- 22P, dog 0- 22P, coyote 0-22P, rac 0- 22P, skunk 0-22P | | | | 1 | 1 | 0 | 0 | 0 |
| Oceano Dunes SVRA | | | | | | | | | 0 | 0 | 0 | 0 | 0 | |
| Guadalupe-Mussel Rock | | | | | | | | | | | | | | |
| Vandenberg AFB | | | GHOW | | | | GHOW 1D | GHOW 1D | 0 | 0 | 0 | 1 | 1 | |
| Coal Oil Point Reserve | | | skunk | skunk 2D | skunk 1D | | | | 2 | 1 | 0 | 0 | 0 | |

Appendix B-6: Predation (continued).

| Site name | Predation | | | Number of | | | | | Total number documented | | | | |
|---------------------------------------|--|---------------------|---------------------------|---|--|-----------|------------|----------|-------------------------|-------|--------|------------|--------|
| | Possible | Suspected | Documented | Eggs | Nests | Chicks | Fledglings | Adults | Eggs | Nests | Chicks | Fledglings | Adults |
| Ventura County | | | | | | | | | | | | | |
| Santa Clara River/McGrath State Beach | GTBH, WTKI, RTHA, PEFA, CORA | | AMCR, op, gs, coyote | AMCR 2D, op 1D, gs 3D, coyote 3D | | | | | 9 | | 0 | 0 | 0 |
| Ormond Beach | | | op, rodent, coyote | op 2D, rodent 1D, coyote 1D | op 1D, rodent 1D, coyote 1D | | | | 4 | 3 | 0 | 0 | 0 |
| Hollywood Beach | mammal | | AMCR, avian | AMCR 3D | AMCR 2D | | | avian 1D | 14 | 11 | 2 | 1 | 2 |
| Pt Mugu- Totals | snake, GTBH, BCNH, gull, WTKI, NOHA, RTHA, AMKE, PEFA, BAOW, GHOW, owl, AMCR, LOSH, WEME, avian, rats, dog, It weasel, cat | gs, rodents, coyote | CORA, op, rodents, coyote | CORA 2D, op 4D, rodent 33D, coyote 136D | CORA 1D, op 2D, rodent 20D, coyote 77D | coyote 8D | | | 229 | 131 | 8 | 0 | 0 |
| Ormond Beach East | gull | | op, rodent, coyote | op 4D, rodent 20D, coyote 101D | op 2D, rodent 12D, coyote 59D | coyote 8D | | | 151 | 88 | 8 | 0 | 0 |
| Holiday Beach | | | CORA, rodent, coyote | CORA 2D, rodent 13D, coyote 8D | CORA 1D, rodent 8D, coyote 4D | | | | 46 | 26 | 0 | 0 | 0 |
| Holiday Beach Salt Panne | | | | | | | | | | | | | |
| Eastern Arm | | | coyote | coyote 27D | coyote 14D | | | | 32 | 17 | 0 | 0 | 0 |

Appendix B-6: Predation (continued).

| Site name | Predation | | | Number of | | | | | Total number documented | | | | |
|--------------------------------------|---|------------|------------------------------|-------------------|-------------------|---|------------|------------------|-------------------------|-------|--------|------------|--------|
| | Possible | Suspected | Documented | Eggs | Nests | Chicks | Fledglings | Adults | Eggs | Nests | Chicks | Fledglings | Adults |
| Los Angeles/Orange Counties | | | | | | | | | | | | | |
| Venice Beach | GTBH, BCNH, AMKE | | gull, PEFA, AMCR | AMCR 760D | AMCR 553D | | | gull 1D, PEFA 3D | 760 | 553 | 0 | 1 | 3 |
| LA Harbor | rats, cat | CORA | gull, AMKE, PEFA, BUOW, CORA | gull 1D, CORA 32D | gull 1D, CORA 28D | AMKE 1D 0-150S, PEFA 8D 0-150S, BUOW 6D 0-150 | PEFA 3D | | 33 | 29 | 15-150 | 3-30 | 0 |
| Seal Beach NWR - Anaheim Bay | BCNH, AMCR, CORA | NOHA, PEFA | GTBH, PEFA, GHOW | GTBH ? | GTBH ? | GTBH 20+D, NOHA 10S, GHOW 4D | | | ? | ? | 34+ | 0 | 0 |
| Bolsa Chica Ecological Reserve | GTBH, BCNH, gull, CATE, GBTE, BLSK, WTKI, RTHA, AMKE, PEFA, AMCR, CORA, gs, coyote, rac | BLSK, RTHA | ant, BLSK, RTHA | BLSK 34D | BLSK 19D | ant 2D, RTHA 1D | | | 34 | 19 | 3 | 0 | 0 |
| Huntington State Beach | BCNH, gull, CATE, GBTE, OSPR, COHA, AMKE, PEFA, ROPI, AMCR, CORA, gs, dog | | AMKE, AMCR | AMCR 1D | | AMKE 6D, AMCR 1D | AMCR 1D | | 100 | 71 | 7 | 1 | 0 |
| Burris Sand Pit/Burris Basin | GTBH, GREG, WEGU, COHA, AMKE, PEFA | RTHA | | | | | | | 0-7 | 0-7 | 0 | 0 | 0 |
| Upper Newport Bay Ecological Reserve | | | | | | | | | 0 | 0 | 0 | 0 | 0 |

Appendix B-6: Predation (continued).

| Site name | Predation | | | Number of | | | | | Total number documented | | | | |
|--|-----------|-----------|------------|--|---|---|--|--------------------------|-------------------------|-------|--------|------------|--------|
| | Possible | Suspected | Documented | Eggs | Nests | Chicks | Fledglings | Adults | Eggs | Nests | Chicks | Fledglings | Adults |
| San Diego County | | | | | | | | | | | | | |
| MCB Camp Pendleton- Totals | | | | | | | | | 169 | 133 | 32 | 22 | 2 |
| Red Beach | | | | AMCR 4D, CORA 2D | AMCR 3D, CORA 1D | | | | 6 | 4 | 0 | 0 | 0 |
| White Beach | | | | BAOW 4D, CORA 25D, It weasel 3D, coyote 4D, unknown 1D | BAOW 2D, CORA 17D, It weasel 2D, coyote 2D, unknown 1D | CORA 8D, owl 4D, op 4D | CORA 1D, owl 3D | owl 5D, avian 1D | 37 | 24 | 4 | 0 | 0 |
| Cocklebur Beach | | | | | | | | | 0 | 0 | 0 | 0 | 0 |
| Santa Margarita River - North Beach North | | | | BLSK 3D, CORA 21D, gull 3D, op 2D, unknown 8D | BLSK 2D, CORA 15D, gull 3D, op 1D, unknown 7D | CORA 15D, BCNH 2D, WEGU 1D,owl 5D, unknown 4D | NOHA 1D | owl 2D | 37 | 28 | 19 | 14 | 1 |
| Santa Margarita River - North Beach South | | | | BCNH 1D, BLSK 17D, corvid 1D, ELTE 1D, gull 3D, avian 7D, skunk 9D, unknown 38D | | BCNH 1D, GBTE 1D, WEGU 3D, RTHA 1D, owl 2D, unknown 2D | PEFA 1D, owl 2D, It weasel 2D, gs 1D, unknown 2D | owl 1D, unknown 1D | 80 | 69 | 9 | 8 | 1 |
| Santa Margarita River - Saltflats | | | | avian 1D, skunk 6D, unknown 1D | | | | | 8 | 7 | 0 | 0 | 0 |
| Santa Margarita River - Saltflats Island | | | | unknown 1D | | | | | 1 | 1 | 0 | 0 | 0 |

Appendix B-6: Predation (continued).

| Site name | Predation | | | Number of | | | | | Total number documented | | | | |
|---|--|---------------------------------------|--|--|----------------------------------|--|-------------------------------------|---------------------|-------------------------|-------|--------|------------|--------|
| | Possible | Suspected | Documented | Eggs | Nests | Chicks | Fledglings | Adults | Eggs | Nests | Chicks | Fledglings | Adults |
| San Diego County | | | | | | | | | | | | | |
| Batiquitos Lagoon Ecological Reserve-Totals | | | | gull 11S, AMCR 2D, CORA 2D, avian 1 D | AMCR 1D, CORA 1D, avian 2D | GTBH 7D, WEGU 2D, COHA 3D, owl 2S, avian 1D, unknown 2D | GTBH 8D, avian 3D, unknown 8D | owl 1S, avian 2D | 6 | 4 | 16 | 20 | 2 |
| W1 | | owl | GTBH, COHA, AMCR, avian | AMCR 2D, avian 1D | AMCR 1D, avian 1D | COHA 2D, owl 1S, avian 1D | GTBH 1D, avian 1D | | 3 | 2 | 3 | 2 | 0 |
| W2 | | WEGU, gull, owl, avian, unknown | GTBH, WEGU, COHA | gull 11S | | GTBH 7D, COHA 1D, WEGU 2D | GTBH 7D, avian 1D, unknown 1D | owl 1S, avian 2D | 0 | 0 | 10 | 9 | 2 |
| E1 | | COHA, owl | COHA, GHOW, CORA, avian, unknown | CORA 2D, avian 1D | CORA 1D, avian 1D | COHA 1S 1D, owl 1S, unknown 2D | GHOW 1D, avian 1D, unknown 7D | | 3 | 2 | 3 | 9 | 0 |
| E2 | | | | | | | | | 0 | 0 | 0 | 0 | 0 |
| E3 | rac | | | | | | | | 0 | 0 | 0 | 0 | 0 |
| San Elijo Lagoon Ecological Reserve | snake, RTHA, AMKE, AMCR, CORA, op, dog, coyote, rac | | | | | | | | 0 | 0 | 0 | 0 | 0 |

Appendix B-6: Predation (continued).

| Site name | Predation | | | Number of | | | | | Total number documented | | | | |
|-----------------------|-------------|-----------------------|------------|---|---|--------|------------|--------|-------------------------|-------|--------|------------|--------|
| | Possible | Suspected | Documented | Eggs | Nests | Chicks | Fledglings | Adults | Eggs | Nests | Chicks | Fledglings | Adults |
| Mission Bay | | | | | | | | | | | | | |
| FAA Island | | | | | | | | | 0 | 0 | 0 | 0 | 0 |
| North Fiesta Island | snake, gull | AMCR, CORA | | snake 0-18P, gull 0-18P, AMCR 0-18S, CORA 0-18S | snake 0-10P, gull 0-10P, AMCR 0-10S, CORA 0-10S | | | | 18 | 10 | 0 | 0 | 0 |
| Mariner's Point | | gull, AMCR, CORA, rat | | gull 0-17D, AMCR 0-17D, CORA 0-17D, rat 0-17D | gull 0-14D, AMCR 0-14D, CORA 0-14D, rat 0-14D | | | | 17 | 14 | 0 | 0 | 0 |
| Stony Point | AMCR | | | AMCR 1P | AMCR 1P | | | | 0 | 0 | 0 | 0 | 0 |
| San Diego River Mouth | | AMCR, CORA | | AMCR 0-1S, CORA 0-1S | AMCR 0-1S, CORA 0-1S | | | | 1 | 1 | 0 | 0 | 0 |

Appendix B-6: Predation (continued).

| Site name | Predation | | | Number of | | | | | Total number documented | | | | |
|--|--|------------------|------------------------|---|---------------------|---------------------------------|-------------------------------|-------------------------------|-------------------------|-------|--------|------------|--------|
| | Possible | Suspected | Documented | Eggs | Nests | Chicks | Fledglings | Adults | Eggs | Nests | Chicks | Fledglings | Adults |
| San Diego Bay | | | | | | | | | | | | | |
| Lindbergh Field & Former Naval Training Center | ant, GTBH, BCNH, gull, COHA, AMKE, PEFA, BAOW, AMCR, CORA, EUST, rat, rodent, gfox, rac, cat | AMKE, PEFA, CORA | gull, PEFA, CORA, EUST | gull 1D, CORA 9D 2S | gull 1D, CORA 7D 2S | ant 1D, AMKE S, PEFA 1D, CORA S | PEFA 1D | PEFA 2D | 14 | 11 | 2 | 1 | 2 |
| USN- Totals | | | | | | | | | 155 | 67 | 159 | 9 | 7 |
| NI MAT | GTBH, gull, RTHA, BAOW, GHOW, BUOW, btj rabbit, rat, rodent, cat | AMKE | ant, PEFA, AMCR, CORA | AMCR 2D, CORA 38D, corvid 5D, unknown 2D | | AMCR 2D, avian 1D, unkown 2D | AMCR 3D, avian 1D | PEFA 2D, avian 1D | 47 | 28 | 5 | 4 | 2 |
| Delta Beach North | GTBH, gull, RTHA, BAOW, CORA, dog, coyote | ant, AMKE | GBTE, NOHA, PEFA | GBTE 9S or D | | NOHA 1S or D, GBTE 36S or D | AMKE 1S or D, unknown 3S or D | PEFA 2D, avian 1D, unknown 1D | 9 | 4 | 37 | 4 | 4 |
| Delta Beach South | ant, GTBH, gull, CORA, dog | NOHA | GBTE, AMKE, PEFA | CORA 2S or D, GBTE 4S or D, unknown 3S or D | | GBTE 22S or D | avian 1S or D | PEFA 1S or D | 9 | 4 | 22 | 1 | 1 |
| NAB Ocean | GTBH, dog, coyote | AMKE, PEFA, CORA | GBTE, op | GBTE 58S or D, op 23S or D, unknown 9S or D | | GBTE 95S or D | | | 90 | 31 | 95 | 0 | 0 |

Appendix B-6: Predation (continued).

| Site name | Predation | | | Number of | | | | | Total number documented | | | | |
|---|--|--|--------------------|---------------------------------|--------------------------------|---|------------|--------|-------------------------|-------|--------|------------|--------|
| | Possible | Suspected | Documented | Eggs | Nests | Chicks | Fledglings | Adults | Eggs | Nests | Chicks | Fledglings | Adults |
| San Diego Bay | | | | | | | | | | | | | |
| D Street Fill/Sweetwater Marsh NWR | ant, snakes, GTBH, GREG, BCNH, gull, OSPR, NOHA, COHA, RTHA, AMKE, PEFA, BAOW, AMCR, CORA, EUST, WEME, op, gs | ant, GBTE, NOHA, COHA, AMKE, PEFA, BAOW, gs, cat | GBTE, AMKE | GBTE S, avian D | GBTE S, avian D | ant S, GBTE 5D S, NOHA S, AMKE 5D S | | | 2 | 2 | 11 | 0 | 0 |
| Chula Vista Wildlife Reserve | ant, GTBH, GREG, BCNH, gull, CATE, GBTE, OSPR, NOHA, AMKE, PEFA, BAOW, CORA, gs, rat, gfox, skunk, cat | GBTE, NOHA, PEFA, rat | GBTE | GBTE S, NOHA S, rat S | GBTE S, NOHA S, rat S | GBTE 2D S, NOHA S, PEFA S, rat S | PEFA S | | 6 | 4 | 2 | 1 | 0 |
| South San Diego Bay Unit, SDNWR - Saltworks | GTBH, gull, GBTE, OSPR, NOHA, RTHA, AMKE, PEFA, AMCR, CORA, op, rodent, coyote, rac, skunk, cat | gull, GBTE, NOHA, PEFA, coyote | gull, GBTE, coyote | gull 7D S, GBTE S, coyote 16D S | gull 6D S, GBTE S, coyote 9D S | gull S, GBTE 7D S, NOHA S, PEFA S, coyote S | | | 32 | 19 | 7 | 0 | 0 |
| Tijuana Estuary NERR | ant, snakes, GTBH, BCNH, gull, GBTE, OSPR, WTKI, NOHA, RTHA, CRCA, AMKE, PEFA, BBPL, owl, AMCR, CORA, WEME, op, btj rabbit, gs, rodent, dog, coyote, gfox, cat | GBTE, NOHA, AMKE | GBTE, NOHA | GBTE S, NOHA 29D S, rodent S | GBTE S, NOHA 17D S, rodent S | GBTE 2D S, NOHA S, AMKE S | | | 62 | 10 | 2 | 0 | 0 |

Appendix B-6: Predation (continued).

| Legend: | P: Possible | S: Suspected | D: Documented | |
|---------------------------------|--------------------|----------------------------|----------------------------|-------------------------------------|
| GTBH: Great blue heron | | WTKI: White-tailed kite | GHOW: Great-horned owl | avian: Unknown avian species |
| GREG: Great Egret | | COHA: Cooper's hawk | BUOW: Burrowing owl | op: Opossum |
| BCNH: Black-crowned night-heron | | RTHA: Red-tailed hawk | ROPI: Rock pigeon | btj rabbit: Black-tailed jackrabbit |
| CAGU: California gull | | GOEA: Golden eagle | AMCR: American crow | gs: California ground squirrel |
| WEGU: Western gull | | OSPR: Osprey | CORA: Common raven | lt weasel: long-tailed weasel |
| CATE: Caspian tern | | CRCA: Created caracara | LOSH: Loggerhead shrike | gfox: Gray fox |
| ELTE: Elegant tern | | AMKE: American kestrel | EUST: European starling | rac: Raccoon |
| GBTE: Gull-billed tern | | PEFA: Peregrine falcon | WEME: Western meadowlark | mammal: Unknown mammal species |
| BLSK: Black Skimmer | | BBPL: Black-bellied plover | RWBL: Red-winged blackbird | |
| NOHA: Northern harrier | | BAOW: Barn owl | BRBL: Brewer's blackbird | |