State of California
Natural Resources Agency
Department of Fish and Wildlife
Wildlife Branch

California Least Tern Breeding Survey

2012 Season

by
Nancy Frost

Nongame Wildlife Program, 2013-01

Final Report

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ABSTRACT

Monitoring to document breeding success of California least terns (*Sternula antillarum browni*) continued in 2012, with observers at 41 nesting sites providing data. An estimated 4293-6421 California least tern breeding pairs established 6636 nests and produced 557-628 fledglings at 49 documented locations. The fledgling to breeding pair ratio was 0.09 to 0.15. Statewide, 11,036 eggs were reported, with a Site Mean clutch size of 1.66 eggs per nest (St Dev = 0.134) and a Statewide clutch size of 1.65 eggs (St Dev = 0.492) for Type 1 sites. Numbers of nesting least terns were not uniformly distributed across all sites. Naval Base Coronado, Point Mugu, Batiquitos Lagoon Ecological Reserve, Camp Pendleton, Huntington State Beach, and Alameda Point represented 74% of the breeding pairs. Fledgling numbers were also unevenly distributed as the two sites with at least 90 fledglings each (Hayward and Huntington State Beach) contributed 38% of the state's production, and the five sites with greater than 35 fledglings each (Hayward, Huntington State Beach, Oceano Dunes, Seal Beach, and Lindbergh Field) contributed 59% of the state's production. The 2012 chick mortality rate was 49%, continuing the upward trend observed in the previous four years. With the exception of Batiquitos Lagoon and Camp Pendleton, the larger nesting colonies experienced chick mortality rates less than the average, which is opposite that documented in 2011. The most commonly-reported possible, suspected, or documented predators were common ravens (*Corvus corax*), American crows (*Corvus brachyrhynchos*), peregrine falcon (*Falco sparverius*), great-blue herons (*Ardea herodias*), American kestrels (*Falco sparverius*), and red-tailed hawks (*Buteo jamaicensis*). The predators known to be responsible for the greatest number of depredated least terns in 2012 were American kestrel, coyote (*Canis latrans*), common raven, American crow, unknown avian species, unknown gull species, gull-billed tern (*Gelochelidon nilotica*), red-tailed hawk, peregrine falcon, and northern harrier (*Circus cyaneus*). The monitoring effort of 2012 is scheduled to continue in 2013.

[1] Frost, N. 2013. California least tern breeding survey, 2012 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2013-01. Sacramento, CA. 19 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 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 to increase breeding success. These techniques included banding to study local movements (Jurek 1977), use of chick shelters (Jurek 1977), identifying key feeding areas (Atwood et al. 1977), and extensive use of decoys (Atwood et al. 1979). The first documented records of fledglings appeared in the 1977 annual survey report (Atwood et al. 1977). Massey (1989a) later conducted an analysis of fledgling survey techniques to determine a method that minimized sampling problems associated with the tendency of young to quickly leave the nesting area. Based on that analysis, she recommended that evening fledgling counts be taken every three weeks, starting approximately 8-9 weeks after the first egg is laid.

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 2012 breeding season in California.

METHODS

Monitors for each site that had least tern nesting in 2011 or who planned monitoring activities for 2012 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. Appendix B includes the full dataset reported by biologists. Blank cells or rows in the appendices indicate that no data were reported. General updates from each site were compiled monthly during the breeding season and distributed to California Department of Fish and Wildlife (CDFW) and U.S. Fish and Wildlife Service (USFWS) representatives so that any potential problems could be addressed.

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.

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

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

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

Method III is much more subjective, relying on the monitor to estimate of the number of renesting pairs in the first and second wave. This calculation subtracts the estimated number of

renesting pairs for each wave from the total nests during each wave. The totals for waves one and two are then added to estimate the total number of breeding pairs. Adult banding can reduce the subjectivity of Method III by allowing the monitor to observe renesting pairs.

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

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

Total Pairs = pairs first wave + pairs second wave

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

Productivity

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

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. Reported fledgling counts are based on the total number of fledglings produced at each site, including those that were later found dead.

Mortality and Predation

Identifying causes of mortality was of particular importance since it has been identified as the main cause of low reproductive success for this species (Collins 1984). 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 only documented predation and 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 slightly over half of the sites used chick shelters, few used decoys. Site specific and complete site preparation data are provided in Appendix B-1.

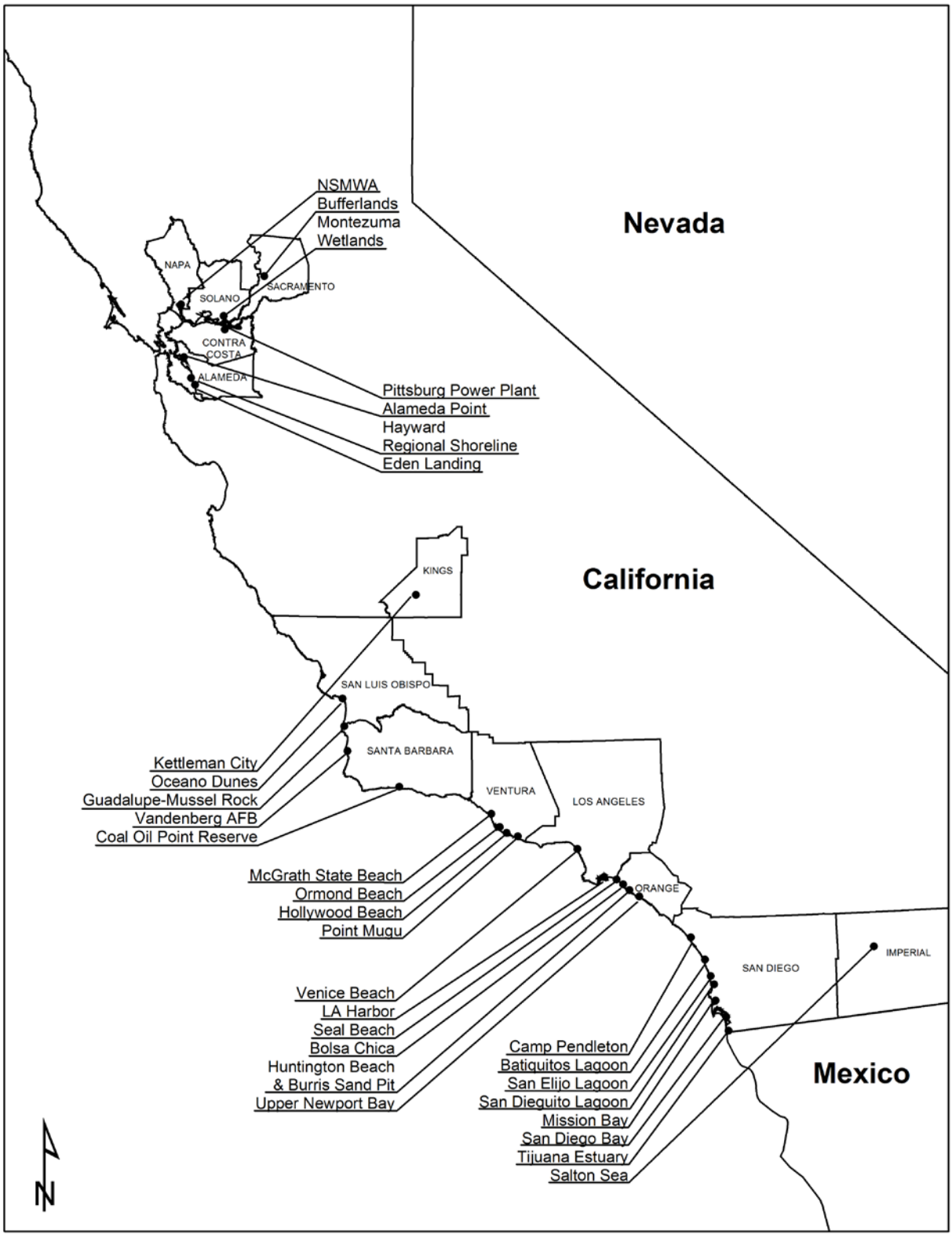

Figure 1. California sites monitored for California least tern nesting in 2012. Some listed areas include multiple sites, sites with nesting at more than one location, or both.

Monitoring

Twenty-seven of 41 sites monitored in 2012 were Type I sites, the majority monitored at least one or two times per week. A grid system to assist in locating nests was used at 21 sites and nest marking was used at 28 sites. Site-specific and complete monitoring data are located in Appendix B-2.

Productivity

At least partial data were received and analyzed for all monitored least tern nesting areas in California for 2012. An estimated 4293-6421 California least tern breeding pairs established 6636 nests and produced 557-628 fledglings at 49 documented locations, including sub-sites (Table 1, Appendix B-3). The fledgling to breeding pair ratio was 0.09 to 0.15, less than that in 2011 (0.17 to 0.25 fledglings per pair). Statewide, 11,036 eggs were reported, with a Site Mean clutch size of 1.66 eggs per nest (St Dev = 0.134) and a Statewide clutch size of 1.65 eggs (St Dev = 0.492).
Pair estimation and total nest calculations included eggs that were laid and likely abandoned shortly thereafter, as the eggs were not observed to be incubated or attended by an adult (e.g., 26 eggs at Hayward and 1 egg at Hollywood Beach).

The 2012 California least tern nesting season lasted five months. The first recorded least terns at a nesting site were observed on 12 April at Chula Vista Wildlife Reserve and D Street Fill/Sweetwater Marsh NWR, and the last observed on 13 September at Chula Vista Wildlife Reserve and Saltworks. The first nest was detected on 28 April at NAB Ocean, the first chick at Naval Base Coronado-Delta Beach North on 18 May, and first fledgling at Delta Beach North on 13 June.

There were four locations used in 2011 (Coal Oil Point: 1 nest; Salton Sea: 3 nests; Point Mugu-Eastern Arm: 1 nest; Camp Pendleton-Delta Beach: 4 nests) at which least terns did not nest in 2012. Conversely, they nested at two locations (Pittsburg Power Plant: 3 nests; Hollywood Beach: 1 nest) not used in 2011. Site-specific and complete productivity data are located in Appendix B-3 (breeding pair estimation) and B-4 (productivity).

The 4293 recorded minimum breeding pairs in 2012 was about 11% lower than the 4826 recorded in 2011 (Marschalek 2012), which represented the lowest count recorded since 2002 (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, 2009, 2010, 2011, 2012). Likewise, the minimum number of fledglings in 2012 (557) represented the lowest count recorded since 2002 and was 46% lower than the 2011 count (1038; Marschalek 2012), which was half of the 2010 count (Marschalek 2011).

The majority of breeding pairs nested in San Diego County (2230 pairs, 52%) and the fewest in the central coast area; San Luis Obispo, Santa Barbara, and Kings counties combined (58 pairs, 1.4%) (Table 3). Breeding pairs were not a predictor for fledgling numbers, however. The fledgling-to-pair ratio ranged from a low of 0.04 in Ventura County to a high of 0.9 in San Luis Obispo, Santa Barbara, and King Counties.

Table 1. California least tern colony productivity in 2012.

2012-Final	Estimated Number of Breeding Pairs		Number of Nests	Estimated Number of Fledglings		Fledgling per Pair Ratio	
Site	Minimum	Maximum		Minimum	Maximum	Minimum	Maximum
Sacramento Area							
Bufferlands	1	1	2	0	0	0	0
San Francisco Bay Area							
Napa Sonoma Marsh Wildlife Area- Totals	16	28	35	4	30	0.14	1.88
Montezuma Wetlands	18	18	30	15	18	0.83	1.00
Pittsburg Power Plant	5	5	3	0	0	0.00	0.00
Alameda Point	306	347	382	17	17	0.05	0.06
Hayward Regional Shoreline	143	210	215	121	146	0.00	0.00
Eden Landing	0	0	0	0	0	0.00	0.00
Kings County							
Kettleman City Evaporation Ponds	0	1	0	0	0	0	0
San Luis Obispo/Santa Barbara Counties							
Oceano Dunes SVRA	42	45	46	42	42	0.93	1.00
Guadalupe-Mussel Rock	0	0	0	0	0	0.00	0.00
Vandenberg AFB	16	18	18	10	10	0.56	0.63
Coal Oil Point Reserve	0	0	0	0	0	0	0
Ventura County							
Santa Clara River/McGrath State Beach	38	39	42	8	8	0.21	0.21
Ormond Beach	6	6	6	0	0	0.00	0.00
Hollywood Beach	0	1	1	0	0	0.00	0.00
Pt Mugu- Totals	608	844	844	15	15	0.02	0.02
Los Angeles/Orange Counties							
Venice Beach	0	14	14	0	0	0.00	0.00
LA Harbor	144	207	211	35	35	0.17	0.24
Seal Beach NWR - Anaheim Bay	117	121	121	40	40	0.33	0.34
Bolsa Chica Ecological Reserve-Totals	154	305	305	16	16	0.05	0.10
Huntington State Beach	422	534	542	90	90	0.17	0.21
Burris Sand Pit/Burris Basin	11	11	11	7	7	0.64	0.64
Upper Newport Bay Ecological Reserve	16	21	20	4	4	0.19	0.25
San Diego County							
MCB Camp Pendleton- Totals	507	1231	1245	25	25	0.02	0.05
Batiquitos Lagoon Ecological Reserve- Totals	550	562	563	34	38	0.06	0.07
San Elijo Lagoon Ecological Reserve	0	0	0	0	0	0.00	0.00
San Dieguito Lagoon Ecological Reserve	0	0	0	0	0	0.00	0.00
Fairbanks Ranch	0	0	0	0	0	0.00	0.00
Mission Bay							
FAA Island	8	46	49	0	0	0.00	0.00
North Fiesta Island	1	1	1	0	0	0.00	0.00
Mariner's Point	14	135	142	0	2	0.00	0.14
Stony Point	13	13	17	0	0	0.00	0.00
San Diego River Mouth	0	12	12	0	0	0.00	0.00
San Diego Bay							
Lindbergh Field/Former Naval Training Center	102	124	130	36	36	0.29	0.35
NIMAT	0	10	10	0	0	0.00	0.00
Naval Base Coronado- Totals	803	1023	1068	10	19	0.01	0.02
D Street Fill/Sweetwater Marsh NWR	37	110	114	9	9	0.08	0.24
Chula Vista Wildlife Reserve	37	51	64	18	20	0.35	0.54
South San Diego Bay Unit, SDNWR-Saltworks	49	69	90	1	1	0.01	0.02
Tijuana Estuary NERR	109	259	283	0	0	0.00	0.00
Imperial County							
Salton Sea	0	0	0	0	0	0.00	0.00
Totals:	4293	6421	6636	557	628	0.09	0.15

Table 2. California least tern sub-colony productivity in 2012.

Colony	Sub-colony	Breeding Pairs		Nests	Fledglings		Fledgling per Pair Ratio	
		Min	Max		Min	Max	Min	Max
Napa Sonoma Marsh	Green Island Unit	1	12	12	0	0	0.00	0.00
	Huichica Unit	15	16	23	4	30	0.25	2.00
Point Mugu	Ormond Beach E	561	781	781	11	11	0.01	0.02
	Holiday Beach	44	60	60	4	4	0.07	0.09
	Holiday Beach Salt Panne	3	3	3	0	0	0	0
	Eastern Arm	0	0	0	0	0	0	0
Bolsa Chica ER	Nest Site 1	45	176	176	1	1	0.01	0.02
	Nest Site 2	36	46	46	0	0	0	0
	Nest Site 3	19	27	27	0	0	0	0
	S Tern Island	54	56	56	15	15	0.27	0.28
Camp Pendleton	Red Beach	0	0	0	0	0	0	0
	White Beach	36	118	123	5	5	0.04	0.14
	Delta Beach	0	0	0	0	0	0	0
	Santa Margarita River-N Beach N	141	278	278	6	6	0.02	0.04
	Santa Margarita River-N Beach S	304	796	802	13	13	0.02	0.04
	Santa Margarita River-Saltflats	10	21	22	0	0	0	0
	Santa Margarita River-Saltflats Island	17	20	20	1	1	0.05	0.06
Batiquitos Lagoon ER	W1	17	18	18	2	2	0.11	0.12
	W2	445	453	454	31	35	0.07	0.08
	E1	57	60	60	1	1	0.02	0.02
	E2	0	0	0	0	0	0	0
	E3	31	31	31	0	0	0	0
Naval Base Coronado	Delta Beach N	146	248	255	5	5	0.02	0.03
	Delta Beach S	97	138	144	2	2	0.01	0.02
	NAB Ocean	561	638	669	10	12	0.02	0.02

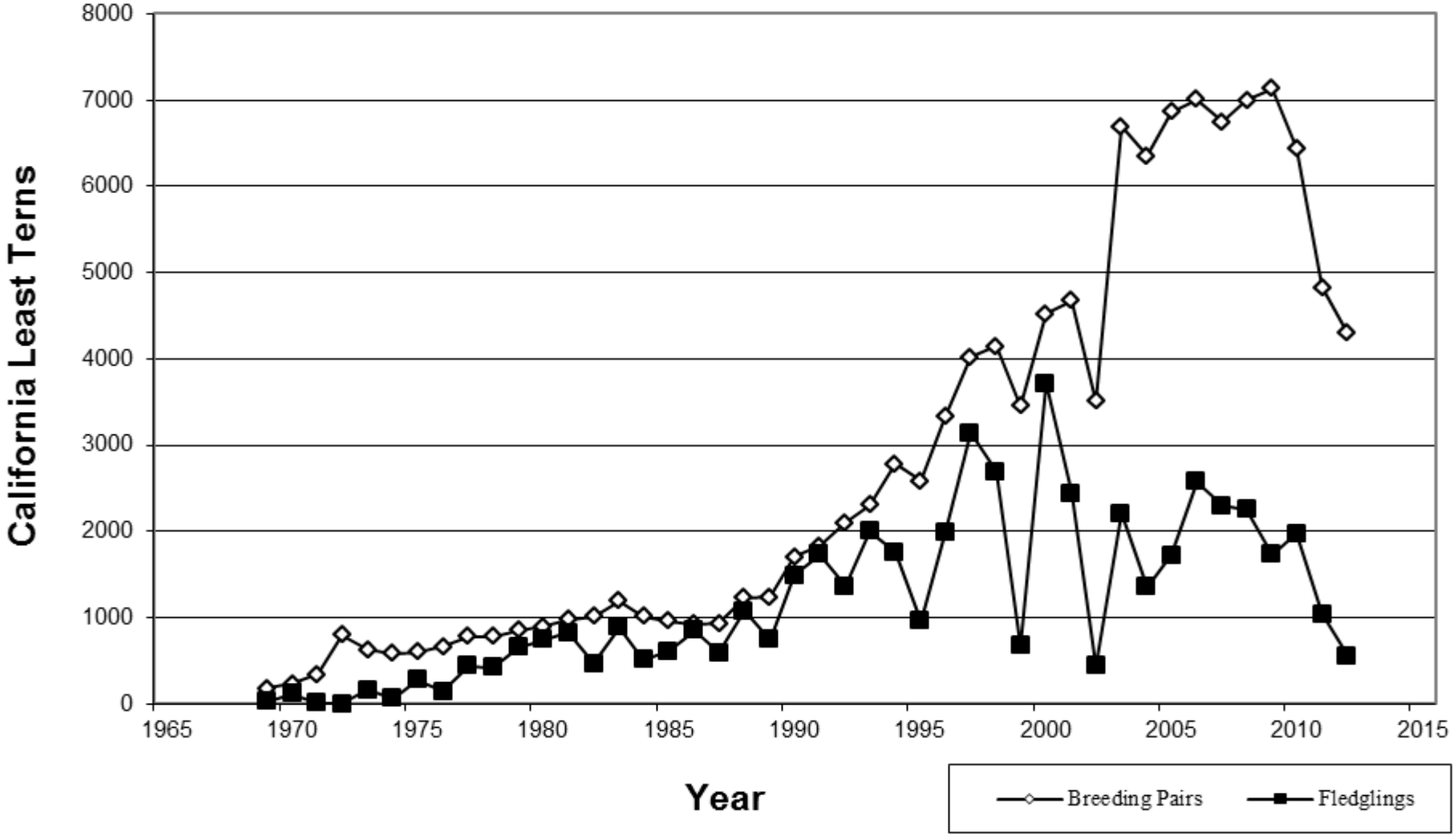

Figure 2. Minimum number of documented California least tern breeding pairs and fledglings in California during annual surveys, 1969-2012. (Data from: Craig 1971; Bender 1974a, 1974b; Massey 1975, 1988, 1989b; Atwood *et al*. 1977; Jurek 1977; Atwood *et al*. 1979; Collins 1984, 1986, 1987; Gustafson 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, 2009, 2010, 2011, 2012).

Table 3. Regional productivity comparison, 2012.

Region	Breeding Pairs**	Proportion of Total	Fledglings**	Proportion of Total	Fledgling:Pair*
San Francisco Bay Area (w/Bufferlands)	489	0.114	157	0.282	0.321
San Luis Obispo/Santa Barbara/King Counties	58	0.014	52	0.093	0.897
Ventura County	652	0.152	23	0.041	0.035
Los Angeles/Orange Counties	864	0.201	192	0.345	0.222
San Diego/Imperial Counties	2230	0.520	133	0.239	0.060
Total	4293	1.000	557	1.000	

* 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). As was the case in 2011, Naval Base Coronado, Point Mugu, Batiquitos Lagoon Ecological Reserve, Camp Pendleton, and Huntington Beach had the highest number of breeding pairs, nests, eggs, and chicks in the state in 2012. With the exception of Huntington Beach, the sites with the most fledglings produced differed from those with the highest number of breeding pairs due to different survival rates at each site. None of the sites 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 parentheses).

Breeding Pairs	Nests	Eggs	Chicks	Fledglings
Naval Base Coronado (803)	Camp Pendleton (1245)	Camp Pendleton (2152)	Camp Pendleton (1328)	Hayward (121)
Point Mugu (608)	Naval Base Coronado (1068)	Naval Base Coronado (1608)	Naval Base Coronado (813)	Huntington Beach (90)
Batiquitos (550)	Pt. Mugu (844)	Pt. Mugu (1463)	Huntington Beach (805)	Oceano Dunes (42)
Camp Pendleton (507)	Batiquitos (563)	Batiquitos (992)	Batiquitos (740)	Seal Beach (40)
Huntington Beach (422)	Huntington Beach (542)	Huntington Beach (947)	Pt. Mugu (467)	Lindbergh Field (36)

A few sites constituted the majority of breeding activity for the state in 2012, which is a trend observed in the past (Marschalek 2012). Six sites (Naval Base Coronado, Point Mugu, Batiquitos Lagoon Ecological Reserve, Camp Pendleton, Huntington State Beach, and Alameda Point) had over 300 minimum breeding pairs, which represented 74% of the state total. Eggs and nests tend to show a linear relationship with number of breeding pairs. One four-egg clutch was observed in 2012 at Seal Beach NWR. Fledgling numbers were also unevenly distributed. The two sites with at least 90 fledglings each (Hayward and Huntington State Beach), contributed

38% of the state's production, and the five sites with greater than 35 fledglings each (Hayward, Huntington State Beach, Oceano Dunes, Seal Beach, and Lindbergh Field), contributed 59% of the state's production.

Mortality and Predation

In 2012, the statewide non-predation chick mortality rate was 49%, continuing the upward trend observed in the previous four years (20% in 2011, 18% in 2010, 15% in 2009 and 14% in 2008; Marschalek 2009, 2010, 2011, 2012) (Table 5). Unlike 2011, most of the larger nesting colonies experienced non-predation chick mortality rates less than the average. The exceptions were Batiquitos Lagoon and Camp Pendleton, with non-predation chick mortality rates of 54% and 51%, respectively. At LA Harbor, Point Mugu, Huntington Beach, Alameda Point, and Naval Base Coronado, 31%, 24%, 19%, 9%, and 6% of chicks were found dead, respectively. These five sites represented 46% of the total chicks hatched, but only 15% of the total reported non-predation chick deaths.

Least tern mortality due to non-predation factors was greater than mortality due to predation in 2012. Of non-predation egg mortality events, the highest death rate (55%) was attributed to abandonment prior to the expected hatching date, leading to the loss of 2038 eggs. While often difficult to distinguish from pre-term abandonment, abandonment post-term or failure to hatch was estimated to constitute 26% of non-predation mortality.

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	**Chicks**	**Fledglings**	**Adults**	**Total**
Non-predation	3706	1677	24	15	5422
Predation	1175-1215	647-655	32	114	1968-2016

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 both suspected and documented species. Previous calculations show similar trends when using only documented predator species (Marschalek 2008).

Fifty-two species as well as 15 other taxa (e.g., avian spp., ant spp.) were reported as possible, suspected, or documented predators of least terns (Table 6). The most commonly reported predators were common ravens (*Corvus corax*), American crows (*Corvus brachyrhynchos*), peregrine falcons (*Falco peregrinus*), great-blue herons (*Ardea herodias*), American kestrels (*Falco sparverius*), and red-tailed hawks (*Buteo jamaicensis*). In addition to the usual predatory

species, three least terns were observed preying upon their own species. As in past years, most reported predators were avian species.

Table 6. Reported species documented, suspected, or possibly thought to have depredated least terns.

Number of Sub-Colonies Reporting Each Predator Species	Predator Species
35	Common Raven, American Crow
32	Peregrine Falcon, Great-blue Heron
31	American Kestrel
27	Red-tailed Hawk
24	Northern Harrier
23	Cooper's Hawk
22	Coyote
21	Western Gull
20	Great Egret
18	California Gull
16	Great-horned Owl
14	California Ground Squirrel
13	Barn Owl, Black-crowned Night Heron, European Starling, Raccoon, Gull spp.
12	Gull-billed Tern, Domestic Cat
11	Opossum, Avian spp., Ant spp.
10	Horned Lark, Domestic Dog
9	White-tailed Kite, Striped Skunk, Unknown spp.
8	Caspian Tern, Corvid spp., Mouse spp.
7	Osprey, Long-tailed Weasel, Rat spp., Mammal spp.
6	Black Skimmer, Owl spp.
4	Elegant Tern, Black-bellied Plover, Western Meadowlark, Ring-billed Gull, Red-winged Blackbird, Merlin, Black-tailed Jackrabbit
3	Least Tern, Burrowing Owl, Loggerhead Shrike, Long-billed Curlew, Canid spp.
2	Bobcat, Pocket Gopher, Snake spp., Rodent spp., Rattlesnake spp., Crab spp.
1	Turkey Vulture, Swainson's Hawk, Great-tailed Grackle, Rock Pigeon, River Otter, Red Fox, Grey Fox, Gopher snake, Black-widow Spider, Trap-door Spider, Raptor spp.

Predation was reported as the cause of loss of 1175-1215 eggs, 647-655 chicks, 32 fledglings, and 114 adults (Table 5). A total of 1992 least tern individuals (including eggs) were reported with a documented or suspected predator species, and about 1% of depredated least terns were due to unknown species.

Of those least terns lost to suspected or documented predator species, American kestrel, coyote (*Canis latrans*), common raven, American crow, unknown avian spp., unknown gull spp., gull-billed tern (*Gelochelidon nilotica*), red-tailed hawk, peregrine falcon, and northern harrier (*Circus cyaneus*) (Table 7) depredated the most least terns. All other species not listed in Table 7 each represented less than 3.5% of the depredation. 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 known depredated least tern eggs, chicks, fledglings, or adults.

Species	Proportion of Least Tern Individuals Depredated by Documented and Suspected Predators* (Number of Least Terns Depredated in Parentheses)
American kestrel	0.1817 (362)
Coyote	0.1501 (299)
Common raven	0.1104 (220)
American crow	0.0896 (178.5)
Avian spp.	0.0592 (118)
Gull spp.	0.0462 (92)
Gull-billed tern	0.0437 (87)
Red-tailed hawk	0.0427 (85)
Peregrine falcon	0.0402 (80)
Northern harrier	0.0361 (72)

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

Historically, predation due to American crows, gull-billed terns, common ravens, and coyotes tended to be higher (Marschalek 2010). The foraging area of gull-billed terns appears to be expanding since 2007; however the number of least terns suspected or documented to be depredated by gull-billed terns has decreased over the last three years with 813 individuals depredated in 2009, 222 in 2010, 149 in 2011, and 87 in 2012. Predator species varied in importance among each least tern age class. Coyotes, common ravens, and American crows had the largest depredation rate of eggs, while American kestrels depredated the most chicks. Peregrine falcons, northern harriers, and unknown avian species depredated the most fledglings, and unknown avian species, peregrine falcons, and great-horned owls depredated the most adults (Table 8).

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***
Coyote (293)	0.2454	American Kestrel (358)	0.4535	Peregrine Falcon (9)	0.2903	Avian spp. (47)	0.4196
Common Raven (220)	0.1843	Gull spp. (78)	0.0988	Northern Harrier (6)	0.1935	Peregrine Falcon (29)	0.2589
American Crow (176)	0.1470	Red-tailed Hawk (76)	0.0963	Avian spp. (6)	0.1935	Great-horned Owl (18)	0.1607
Unknown spp. (139)	0.1164	Great-blue Heron (65)	0.0823	Raptor spp. (3)	0.0968	Barn Owl (4)	0.0357
						Owl spp. (4)	0.0357
Avian spp. (62)	0.0519	Gull-billed Tern (62)	0.0779	American Kestrel (3)	0.0968	River Otter (4)	0.0357

*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. Appendix B-7 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.

Conclusion

In 2012, biologists recorded a minimum number of breeding pairs that was less than that recorded in 2011, which represented the lowest count recorded since 2002. Moreover, the fledgling to breeding pair ratio in 2012 was approximately half that in 2011. Since 1977, this ratio has been less than 0.50 for only 13 years, which includes the last 11 years. Continuing the upward trend observed in the previous four years, chick mortality in 2012 continued to be a factor at specific sites, possibly due to limited or inappropriate food sources. In addition to avian predators, which were responsible for the highest predation rates over the last several years, coyotes also contributed to the highest predation rates documented in 2012.

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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			
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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.

Predators Observed (Time, Species, Location, Activity):

Ants Y / N **Grid Location(s):**

Documented Predation/Mortality:

Human Disturbance/Take:

Comment:

Band Prefix	Band Number	Comb. L - R	Age	Wing	Weight	Cond.	Nest No.	Egg #	Grid	Comment	Recap. (Y/N)
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		-									
Band Prefix	Band Number	Comb. L - R	Age	Wing	Weight	Cond.	Nest No.	Egg #	Grid	Comment	Recap. (Y/N)

Predators Observed (Time, Species, Location, Activity):

Ants Y / N **Grid Location(s):**

Documented Predation/Mortality:

Human Disturbance/Take:

Comment:

Band Prefix	Band Number	Comb. L - R	Age	Wing	Weight	Cond.	Nest No.	Egg #	Grid	Comment	Recap. (Y/N)
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		-									
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		-									
		-									

Master Nest List Form

Least Tern Master Nest List				Location:					
Date of 1st Nest:				1st Chick:			1st Fledge:		
Nest No.	Grid No.	Egg No.	Date Found	Hatch Date	Other Outcome	Date	Band Number	Move Y/N	Comments
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Master Band List

Version #1

Species **Year** **Observer(s)**

Band Prefix	Band No.	Date	Band Comb.	Wing	Weight	Cond.	Nest No.	Egg No.	Loc.	Grid	Age	NOTES
Band Prefix	Band No.	Date	Band Comb.	Wing	Weight	Cond.	Nest No.	Egg No.	Loc.	Grid	Age	NOTES

Version #2

Species Year Observer(s)

Band Prefix	Band No.	Date	Band Comb.	Wing	Weight	Cond.	Nest No.	Egg No.	Loc.	Age
Band Prefix	Band No.	Date	Band Comb.	Wing	Weight	Cond.	Nest No.	Egg No.	Loc.	Age

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
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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 in 2012.

Site name	Name of primary monitor	Names of other monitors	Fence type	Interpretive signs at site	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
San Francisco Bay Area											
Napa Sonoma Marsh Wildlife Area -Green Island Unit	K Taylor	H Thompson	4	No	Ceramic roof tiles and PVC pipe cut in half	Yes, approx. 20	No	6	Yes/No, removed some tree stumps on the islands that were being used as perches	No	DFG
Napa Sonoma Marsh Wildlife Area -Huichica Creek Unit	K Taylor	H Thompson	4	No	No	No	No	6	No	No	DFG
Montezuma	Anne Wallace		4	No	No	No	No	7	No		
Pittsburg Power Plant	D Riggs		1-chain link	Yes	Yes-20	No	No	4	Yes	addition of gravel and crushed shell substrate	WRA
Alameda Point	Susan Euing	Meredith Elliott; Benjamin Spence	1	Yes	Yes; 250 wooden A Frames, 70 terracotta tile cylinders, 100 terracotta half-cylinders,oyster shells	No	Yes	4	Yes	Yes; maintain/repair chick fencing, check that gravel around inside perimeter seals any holes at base of fence. Addition of sand when necessary and feasible.	USFWS staff, FAWR and other vols.

Site name	Name of primary monitor	Names of other monitors	Fence type	Interpretive signs at site	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Hayward Regional Shoreline	David Riensche, Amanda Dwyer, Janelle Dorcy	Patrick Alvarez, Juan Benjumea, Neysa Budzinski, Lavinia Canales, Gustavo Canales, Carla Canales, Maggie Clark, Norman Chu, Lien-Thi DeLa Pena, Emily DeLa Pena, Arthur Garibaldi, Carin High, Howard High, Kate High, Sam High, Richard Kaufmann, John Mena, Marty Marrow, Brian Pinomaki, Mary Riensche, Sarah Riensche, Daniel Riensche, Nathan Riensche, Rebekah Riensche, Mark Schynert, Petra Shawen, Nicholas Smith, Linda Valle, Steve Wiley, and David Wiley.	4	yes	Yes – 10 roofing tile shelters, and 16 small wooden A-frame shelters.	Yes – 12 pairs.	Yes - The small wooden A-frame chick shelters were added to the site to form 10m (32.8 ft) grid cells to improve nest mapping	2 and 3; 4 – a combination of herbicide (a solution of Dimension Ultra 40 WSP and Millestone produced by Dow Agroscience was applied by a qualified District applicator) and manual removal.	yes	David Riensche, Amanda Dwyer, Janelle Dorcy	Patrick Alvarez, Juan Benjumea, Neysa Budzinski, Lavinia Canales, Gustavo Canales, Carla Canales, Maggie Clark, Norman Chu, Lien-Thi DeLa Pena, Emily DeLa Pena, Arthur Garibaldi, Carin High, Howard High, Kate High, Sam High, Richard Kaufmann, John Mena, Marty Marrow, Brian Pinomaki, Mary Riensche, Sarah Riensche, Daniel Riensche, Nathan Riensche, Rebekah Riensche, Mark Schynert, Petra Shawen, Nicholas Smith, Linda Valle, Steve Wiley, and David Wiley.

Site name	Name of primary monitor	Names of other monitors	Fence type	Interpretive signs at site	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
San Luis Obispo/Santa Barbara Counties											
Oceano Dunes SVRA	D George, A Clark, M Pryzbylski, D Costello, E Krygsman, C Lish, J Iwanicha	R Slack, K Surgalski, S Flores, K Barry, A Rudduck, C Rose, A Branske, E Hildebrand	1	Yes	Yes, 223, plywood: A-shape shelter (typically 6" high by 12" long by 11" wide), L-shape shelter (typically 7" high by 19" long by 14" wide), or T-shape shelter (12" by 12" flat roof with a center support partially buried in sand)	No	No	5 Least tern breeding site open to off-road vehicle use October to February and this prevents or removes vegetation. Efforts are made to encourage some vegetation for chick cover.	Yes	Limited amounts of driftwood, woodchips, seed, and plants were put out for nest and chick cover.	California Department of Parks and Recreation (Oceano Dunes State Vehicular Recreation Area)
Guadalupe-Mussel Rock	Tom Applegate										
Vandenberg AFB-Purisima Pt.	D Robinette	L Hargett	2 (electric)	Yes	Yes	No	No	7	Yes	Electric fence maintenance	Past chick shelters used at the colony were made of wood slats placed in the shape of a teepee around a central post that was pounded into the sand. See Jenks-Jay. 1982. J. Field Ornithol. 53(1): 58-60. All existing shelters were left in place. However, broken shelters were not maintained due to concerns about possible unexploded ordinance at the colony. Broken shelters were replaced with wooden shelters similar in shape and size to Spanish roof tiles. We placed 46 new style shelters on the colony

Site name	Name of primary monitor	Names of other monitors	Fence type	Interpretive signs at site	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Coal Oil Point Reserve	April Price	Cristina Sandoval									
Ventura County											
Santa Clara River/ McGrath State Beach	A Frangis	D Glenn, B Sheridan, A Maingot	3	Yes	No	No	No	4	No		
Ormond Beach	N Fox-Fernandez	J Hidalgo, C Sulzman, J Turner, M Jacinto, C Kahler, A Cleveland, R Sweet	3	Yes	No	No	No	7	No		
Hollywood Beach	Cynthia Hartley										
Pt Mugu - Holiday Beach	M Ruane	F Ferrara, R Kelley, S Murphy, J More, L Mercer, B Holt	4	Yes	Yes- 25 shelters	No	No	7	Yes	No	
Pt Mugu - Holiday Beach Salt Panne	M Ruane	F Ferrara, R Kelley, S Murphy, J More, L Mercer, B Holt	4	Yes	No	No	No	7	Yes	No	
Pt Mugu - Eastern Arm	M Ruane	F Ferrara, R Kelley, S Murphy, J More, L Mercer, B Holt	4	Yes	No	No	No	7	Yes	No	
Pt Mugu - Ormond Beach East	M Ruane	F Ferrara, R Kelley, S Murphy, J More, L Mercer, B Holt, F Rivas, R Dolinar, E Brogren, K Barry	4	Yes	Yes- 50 shelters	No	No	7	Yes	No	

Site name	Name of primary monitor	Names of other monitors	Fence type	Interpretive signs at site	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Los Angeles/Orange Counties											
Venice Beach/Marina del Rey	T Ryan	S Vigallon	6 ft chain link	6 small signs on fence	No	Yes- 30	Yes	2	Yes	Sand clearing from fence, sea rocket removal, re-set grid, measured vegetation ht, % cover, dune ht & frequency, cleared grids for study.	T Ryan, S Vigallon, LA Audubon Volunteers, Community Volunteers, Dorsey High School Volunteers
LA Harbor- Pier 400	K Keane	N Mudry, W Ross, S Langdon, L Andersen, S Lopez, N Liberato, T Ryan, M Teutimez, M Amalong, B Schallmann	2	Yes	Yes, 50	Yes, 20	Yes	4	Yes		
Seal Beach NWR - Anaheim Bay	M Teutimez, S Lopez	K Gilligan, B Schallmann, J Fitch	1	Yes	Yes- roofing tiles	Yes- 17	Yes	3	Yes	Sand relocation at site, electric fence maintenance	USFWS
Bolsa Chica Ecological Reserve - Nest Site 1	P Knapp	K O'Reilly, G Keller, W Ross	2	Yes	Yes-, 40 roofing tiles	No	Yes	4	Yes		CDFG Staff
Bolsa Chica Ecological Reserve - Nest Site 2	P Knapp	K O'Reilly, G Keller, W Ross	4	No	Yes, 2 roofing tiles	No	Yes	4	Yes		CDFG Staff
Bolsa Chica Ecological Reserve - Nest Site 3	P Knapp	K O'Reilly, G Keller, W Ross	4	No	Yes- 4 roofing tiles	No	Yes	4	Yes		CDFG Staff
Bolsa Chica Ecological Reserve - South Tern Island	P Knapp	K O'Reilly, G Keller, W Ross	4	No	Yes- 55 roofing tiles	No	Yes	4	Yes		CDFG Staff
Huntington State Beach	M Aimar	T Barbee, C Kam, B Nash, G Arechavaleta, A Beckman, J Coumoutso, D McMichael	2	Yes	Yes- 64	No	Yes	3	Yes		CA State Parks

Site name	Name of primary monitor	Names of other monitors	Fence type	Interpretive signs at site	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Burris Sand Pit/Burris Basin	R Zembal	B Johnson, D McMichael, T Barbee, S Hoffman	4	Yes	Yes- 24	No	Yes	4	No	Sand-bagging for erosion control	OCWD and contractor
Upper Newport Bay Ecological Reserve – Tern Island	C Navarro	T Van Berkum, J Hartman	4	no	Yes, 30 roof tiles	no	Yes	4	No		DFG Staff
Upper Newport Bay Ecological Reserve – New Tern Island	C Navarro	T Van Berkum, J Hartman	4	no	no	Yes	No	4	No		DFG Staff
San Diego County											
MCB Camp Pendleton - Red Beach	J Fournier	K Turner, E Rice, J Symons, M Evans	4	No	No	No	No	7	no		
MCB Camp Pendleton - Delta Beach	J Fournier	K Turner, E Rice, J Symons, M Evans	4	No	No	No	No	7	Yes		
MCB Camp Pendleton - White Beach	J Fournier	K Turner, E Rice, J Symons, M Evans	3	Yes	No	No	Yes	4	Yes		
MCB Camp Pendleton - Santa Margarita River - North Beach	J Fournier	K Turner, E Rice, J Symons, M Evans	3	Yes	No	No	Yes	4	Yes		
MCB Camp Pendleton - Santa Margarita River - South Beach	J Fournier	K Turner, E Rice, J Symons, M Evans	3	Yes	No	No	Yes	4	Yes		
MCB Camp Pendleton - Santa Margarita River - Saltflats	J Fournier	K Turner, E Rice, J Symons, M Evans	3	No	No	No	Yes	7	Yes		
MCB Camp Pendleton - Santa Margarita River - Saltflats Island	J Fournier	K Turner, E Rice, J Symons, M Evans	3	No	No	No	Yes	7	Yes		

Site name	Name of primary monitor	Names of other monitors	Fence type	Interpretive signs at site	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
Batiquitos Lagoon Ecological Reserve - W1	B Foster	J Kelly	1 and 3	No	Yes	No	Yes	1	Yes		
Batiquitos Lagoon Ecological Reserve - W2	B Foster	J Kelly	1 and 3	No	Yes	No	Yes	unknown	Yes		
Batiquitos Lagoon Ecological Reserve - E1	B Foster	J Kelly	1 and 3	No	Yes	No	Yes	3 limited	Yes		
Batiquitos Lagoon Ecological Reserve - E2	B Foster	J Kelly	1 and 3	No	No	No	Yes	1	Yes		
Batiquitos Lagoon Ecological Reserve - E3	B Foster	J Kelly	4	No	No	No	Yes	unknown	Yes		
San Elijo Lagoon Ecological Reserve	R Patton	M Bache, S Wolf	3	Yes	No	No	No	7	No		
Fairbanks Ranch	R Patton										
San Dieguito Lagoon Ecological Reserve	R Patton										
Mission Bay											
FAA Island	J Jackson		chick fence	Yes	5 to 10	No	No	6, none	Yes	none	
North Fiesta Island	G Johnson		1	Yes	Yes- 70	Yes- 70	Yes	4	Yes	Vegetation study in designated plots	San Diego City Parks Dept and volunteers, San Diego Audubon Society
Mariner's Point	G Johnson		1	Yes	Yes- 50	Yes- 73	Yes	4	Yes	Vegetation study in designated plots	San Diego Audubon Society volunteers, San Diego City Parks Dept
Stony Point	G Johnson		1	Yes	Yes- 30	Yes- 74	Yes	4	Yes	Vegetation study in designated plots	San Diego City Parks Dept, San Diego Audubon Society volunteers
San Diego River Mouth	G Johnson		1	Yes	No	No	No	7	No	Temporary black plastic fence with chick fence at base installed 1 April and removed 15 Sept. Sand berm created to protect fence from flooding that would allow dogs to enter under fence.	San Diego City Parks Dept.

Site name	Name of primary monitor	Names of other monitors	Fence type	Interpretive signs at site	Chick shelters	Decoys	Grid system	Vegetation management	Predator management	Other site preparation	By whom
San Diego Bay											
Lindbergh Field & Former Naval Training Center	R Patton	E Copper, B Foster, M Garcia, M Sadowski, L Squires	3	Yes	No	No	Yes	4	Yes		
US Navy-NI MAT	J Fournier	D Zaldivar, C Beck	2	Yes	Yes	No	Yes	4	Yes		
Naval Base Coronado - Delta Beach North	J Fournier	E Rice, R Mendez, C Beck, D Zaldivar, D Parker, R Shultz	3	Yes	Yes	Yes- 54	Yes	4	Yes		
Naval Base Coronado - Delta Beach South	J Fournier	E Rice, R Mendez, C Beck, D Zaldivar, D Parker, R Shultz	3	Yes	Yes	Yes- 54	Yes	4	Yes		
Naval Base Coronado - NAB Ocean	J Fournier	E Rice, R Mendez, C Beck, D Zaldivar, D Parker, R Shultz	4	Yes	No	Yes- 54	Yes	7	Yes		
D Street Fill/Sweetwater Marsh NWR	R Patton	B Collins, B Foster, J Jackson, M Sadowski, L Squires	3	Yes	Yes	Yes, 100	Yes	4	Yes		
Chula Vista Wildlife Reserve	R Patton	B Foster, J Jackson, M Sadowski, L Squires	3	Yes	Yes	Yes, 80	Yes	4	Yes		
South San Diego Bay Unit, SDNWR - Saltworks	R Patton	B Collins, B Foster, K Goodenough, M Sadowski, L Squires	3	Yes	Yes	No	Yes	6	Yes		
Tijuana Estuary NERR	R Patton	B Collins, M Sadowski, L Squires	3	Yes	Yes	No	Yes	7	Yes		
Imperial County											
Salton Sea	G McCaskie										

Appendix B-1 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 2012; 7- None Needed.

Appendix B-2: Monitoring in 2012.

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 Francisco Bay Area								
Alameda Point	3	11-May-12	7-Aug-12	81	Yes	No	No	N/A
Napa Sonoma Marsh Wildlife Area -Green Island Unit	1	4-Jun-12	1-Aug-12	8	Yes. Black Sharpie on white oyster shells	No	No	N/A
Napa Sonoma Marsh Wildlife Area -Huichica Creek Unit	1	5-Apr-12	22-Aug-12	20	Yes. Black paint pen directly on salt	No	No	N/A
Montezuma	2	28-May-12	28-Aug-12	19	No	No	No	
Pittsburg Power Plant	2	20-Apr-12	20-Jul-12	13	No	No	No	N/A
Hayward Regional Shoreline	1	15-Apr-12	3-Aug-12	194	yes-5cm washers	no	no	
San Luis Obispo/Santa Barbara Counties								
Oceano Dunes SVRA	1	1-Mar-12	30-Sep-12	Site received some degree of monitoring on a daily basis.	Yes, usually naturally occurring materials present on the site.	no	yes, chick	size 1A blank aluminum band is covered with blue over white vinyl tape (to make a bicolored band) on right leg for all chicks. FWS band placed on left leg & tape in 1 to 2 colors placed on this band to create combos unique to each bird.
Vandenberg AFB-Purisima Pt.	3	16-Apr-12	13-Aug-12	84	yes, numbered tongue depressors placed 1m from nest.	no	no	
Ventura County								
Santa Clara River/McGrath State Beach	1	27-Apr-12	30-Aug-12	20	Yes, nat. driftwood	no	no	
Hollywood Beach	1	1-Apr-12	24-Aug-12	weekly				
Ormond Beach	1	6-Apr-12	11-Aug-12	19	Yes, tongue depressor	No	No	
Pt Mugu -	1 and 3	19-Apr-12	13-Jul-12	37	Yes, tongue depressors and arundo stick	no	no	
Holiday Beach	1	19-Apr-12	13-Jul-12	30	Yes, tongue depressors and arundo stick	no	no	
Holiday Beach Salt Panne	1	19-Apr-12	13-Jul-12	22	Yes, tongue depressors and arundo stick	no	no	
Eastern Arm	1	19-Apr-12	13-Jul-12	10	Yes, tongue depressors and arundo stick	no	no	
Ormond Beach East	3	19-Apr-12	13-Jul-12	37	Yes, tongue depressors and arundo stick	no	no	

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
Los Angeles/Orange Counties								
Venice Beach/Marina del Rey	1	16-Apr-12	14-Aug-12	20	No	No	No	N/A
LA Harbor- Pier 400	1	19-Mar-12	23-Jul-12	30	Yes, tongue depressors	No	No	
Seal Beach NWR - Anaheim Bay	1	2-May-12	22-Jul-12	13	Yes	No	Yes - chick	Single plastic split band - yellow/black
Bolsa Chica Ecological Reserve -	1				Yes, tongue depressors	no	No	
South Tern Island (STI)	1	8-May-12	3-Jul-12	9	Yes, tongue depressors	no	No	
Nest Site 1 (NS1)	1	8-May-12	19-Jun-12	7	Yes, tongue depressors	no	No	
Nest Site 2 (NS2)	1	17-May-12	3-Jul-12	8	Yes, tongue depressors	no	No	
Nest Site 3 (NS3)	1	17-May-12	21-Jun-12	6	Yes, tongue depressors	no	No	
Burris Sand Pit/Burris Basin	3	27-Apr-12	17-Jul-12	15	Yes, numbered rocks	no	no	
Huntington State Beach	1	10-May-12	20-Jul-12	16	Yes, tongue depressors	no	no	
Upper Newport Bay Ecological Reserve	3							
Tern Island	3	9-May-12	17-Aug-12	8	YES	NO	NO	N/A
New Tern Island	3	9-May-12	17-Aug-12	8	n/a	n/a	n/a	n/a
San Diego County								
MCB Camp Pendleton -	1	6-Mar-12	13-Sep-12					
Red Beach	1	20-Mar-12	13-Sep-12	40	n/a	n/a	n/a	n/a
Delta Beach	1	20-Mar-12	13-Sep-12	60	Yes	No	Yes (chick)	none
White Beach	1	20-Mar-12	13-Sep-12	76	Yes	No	Yes (chick)	none
Santa Margarita River - North Beach North	1	6-Mar-12	13-Sep-12	66	Yes	No	Yes (chick)	none
Santa Margarita River - North Beach South	1	6-Mar-12	13-Sep-12	80	Yes	No	Yes (chick)	none
Santa Margarita River - Saltflats	1	29-Mar-12	13-Sep-12	50	Yes	No	Yes (chick)	none
Santa Margarita River - Saltflats Island	1	29-Mar-12	13-Sep-12	50	Yes	No	Yes (chick)	none
Batiquitos Lagoon Ecological Reserve	1	2-May-12	6-Sep-12	39	yes, shim	no	yes, chick	none
San Elijo Lagoon Ecological Reserve	1	9-Apr-12	10-Sep-12	16	no	no	no	
Mission Bay								
FAA Island	1	18-Apr-12	25-Jun-12	21	Yes	Yes	Yes	No
North Fiesta Island	1	19-Apr-12	10-Sep-12	22	Yes, tongue depressors	Yes	No	
Mariner's Point	1	16-Apr-12	21-Aug-12	24	Yes, tongue depressors	Yes	No	
Stony Point	1	20-Apr-12	9-Aug-12	21	Yes	Yes	Yes chick	
San Diego River Mouth	1	21-Apr-12	24-Aug-12	19	Yes tongue depressor	Yes	No	

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-12	16-Aug-12	69	yes/spray paint on substrate	no	yes/chick/adult	chick X-S/adult W/G over S or F/K over S, F opposite S to indicate 2012 trapping
US Navy - NI MAT	1	5-Mar-12	15-Sep-12	40	Yes, stake w/ nest info	No	Yes- chicks	N/A
Naval Base Coronado -	1				Yes, stake w/ nest info	No	Yes- chicks	N/A
Delta Beach North	1	21-Mar-12	14-Sep-12	57	Yes, stake w/ nest info	No	Yes- chicks	N/A
Delta Beach South	1	21-Mar-12	8-Sep-12	57	Yes, stake w/ nest info	No	Yes- chicks	N/A
NAB Ocean	1	1-Mar-12	19-Sep-12	140	Yes, stake w/ nest info	No	Yes- chicks	N/A
D Street Fill/Sweetwater Marsh NWR	1	3-Apr-12	15-Sep-12	48	yes/tongue depressor	no	yes/chick/adult	chick X-S/adult W/M over S, F opposite S to indicate 2012 trapping
Chula Vista Wildlife Reserve	1	3-Apr-12	15-Sep-12	58	yes/tongue depressor	no	yes/chick/adult	chick X-S/adult Y/K over S, F opposite S to indicate 2012 trapping
South San Diego Bay Unit, SDNWR - Saltworks	1	4-Apr-12	17-Sep-12	57	yes/tongue depressor	no	yes/chick/adult	chick X-S/adult L/M over S, F opposite S to indicate 2012 trapping
Tijuana Estuary NERR	1	7-Apr-12	14-Sep-12	40	yes/tongue depressor	no	yes/chick/adult	chick X-S/adult G/R over S, F opposite S to indicate 2012 trapping
Imperial County								
Salton Sea								

Appendix B-2: Monitoring in 2012 (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, White/Blue, Various (left):Blue/White (right)	G/Y, Y/G, W/B, B/W
Seal Beach	Yellow/Black	Y/K
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 2006-2012)

Appendix B-3: Pair Estimation in 2012 (Method I).

Site name	Date terns first observed	Date terns last observed	Date of first nest	Date of last nest initiation	Total nests in first wave	Total nests in second wave	Total pairs	Total nests
Sacramento Area								
Bufferlands	21-May-12	8-Aug-12			1	1	1	2
San Francisco Bay Area								
Napa Sonoma Marsh Wildlife Area - Totals					18	17	26.5	35
NSMWA-Green Island Unit	22-May-12	11-Jul-12	4-Jun-12	19-Jun-12	12	0	12	12
NSMWA-Huichica Creek Unit	8-May-12	26-Jun-12	8-May-12	2-Jul-12	6	17	14.5	23
Montezuma Wetlands	28-May-12	24-Aug-12	28-May-12	mid-July	unknown	unknown	18	30
Pittsburg Power Plant	11-May-12	17-Jun-12	11-May-12	19-Jun-12	3	0	5	3
Alameda Point	17-Apr-12	14-Aug-12	9-May-12	24-Jul-12	312	70	347	382
Hayward Regional Shoreline	19-Apr-13	8-Aug-12	14-May-12	15-July-12	68	121	128.5	189
Eden Landing					0	0	0	0
Kings County								
Kettleman City Evaporation Ponds	7-Jun-12						0-1	
San Luis Obispo/Santa Barbara Counties								
Oceano Dunes SVRA	6-May-12	29-Aug-12	27-May-12	12-Jul-12	44	2	45	46
Guadalupe-Mussel Rock	8-May-12							
Vandenberg AFB-Purisima Pt.	8-May-12	9-Aug-12	30-May-12	17-Jul-12	18	0	18	18
Coal Oil Point Reserve							0	0
Ventura County								
Santa Clara River/McGrath State Beach	27-Apr-12	23-Aug-12	22-May-12	5-Jul-12	35	7	38.5	42
Hollywood Beach					1	0	1	1
Ormond Beach	27-Apr-12	11-Jul-12	18-May-12	13-Jun-12	6	0	6	6
Pt Mugu - Totals	19-Apr-12	30-Jul-12	7-May-12	26-Jun-12	844	0	844	844
Holiday Beach	19-Apr-12	30-Jul-12	10-May-12	26-Jun-12	60	0	60	60
Holiday Beach Salt Panne	19-Apr-12	30-Jul-12	21-May-12	22-Jun-12	3	0	3	3
Eastern Arm	19-Apr-12	30-Jul-12	n/a	n/a	0	0	0	0
Ormond Beach East	19-Apr-12	30-Jul-12	7-May-12	21-Jun-12	781	0	781	781
Los Angeles/Orange Counties								
Venice Beach/Marina del Rey	17-Apr-12	10-Aug-12	8-May-12	4-Jun-12	14	0	14	14
LA Harbor	18-Apr-12	23-Jul-12	12-May-12	28-Jun-12	202	9	206.5	211
Seal Beach NWR - Anaheim Bay	17-Apr-12	22-Jul-12	9-May-12	4-Jul-12	113	8	117	121
Bolsa Chica Ecological Reserve -Totals	15-Apr-12	25-Jul-12	no data		305	0	305	305
Nest Site 1 (NS1)			no data	5-Jun-12	176	0	176	176
Nest Site 2 (NS2)			no data	21-Jun-12	46	0	46	46
Nest Site 3 (NS3)			no data	14-Jun-12	27	0	27	27
South Tern Island (STI)			no data	26-Jun-12	56	0	56	56
Huntington State Beach	15-Apr-12	20-Jul-12	2-May-12	22-Jun-12	525	17	533.5	542
Burris Sand Pit/Burris Basin	29-Apr-12	17-Jul-12	24-May-12	11-Jun-12	11	0	11	11

Site name	Date terns first observed	Date terns last observed	Date of first nest	Date of last nest initiation	Total nests in first wave	Total nests in second wave	Total pairs	Total nests
Upper Newport Bay Ecological Reserve					16		16	16
Tern Island	9-May-12		9-May-12		16		16	16
New Tern Island	N/A		N/A		0	0	0	0
San Diego County								
MCB Camp Pendleton - Totals	16-Apr-12	4-Aug-12	30-Apr-12	24-Jul-12	1216	29	1230.5	1245
Red Beach	n/a	n/a	N/A	N/A			0	0
Delta Beach	n/a	n/a	N/A	N/A			0	0
White Beach	23-Apr-12	30-Jul-12	2-May-12	25-Jun-12	112	11	117.5	123
Santa Margarita River - North Beach North	16-Apr-12	30-Jul-12	30-Apr-12	18-Jun-12	277	1	277.5	278
Santa Margarita River - North Beach South	16-Apr-12	4-Aug-12	2-May-12	24-Jul-12	789	13	795.5	802
Santa Margarita River - Saltflats	21-Apr-12	24-Jul-12	8-May-12	16-Jun-12	19	3	20.5	22
Santa Margarita River - Saltflats Island	21-Apr-12	24-Jul-12	1-May-12	16-Jun-12	19	1	19.5	20
Batiquitos Lagoon Ecological Reserve - Totals					537	25	549.5	562
W1	unknown	9-Jul-12	2-May-12	24-May-12	16	2	17	18
W2	unknown	3-Aug-12	2-May-12	8-Jun-12	436	17	444.5	453
E1	unknown	15-Jun-12	2-May-12	1-Jun-12	54	6	57	60
E2	unknown	n/a	n/a	n/a	0	0	0	0
E3	unknown	6-Jun-12	8-May-12	8-Jun-12	31	0	31	31
San Elijo Lagoon Ecological Reserve	12-May-12	10-Jul-12			0	0	0	0
Fairbanks Ranch					0	0	0	0
San Dieguito Lagoon Ecological Reserve					0	0	0	0
Mission Bay								
FAA Island	23-Apr-12	14-Jun-12	2-May-12	14-Jun-12	43	6	46	49
North Fiesta Island	1-May-12	29-Jun-12	9-Jun-12	9-Jun-12	1	0	1	1
Mariner's Point	13-Apr-12	8-Jul-12	6-May-12	3-Aug-12	128	14	135	142
Stony Point	20-Apr-12	15-Jul-12	18-May-12	26-Jun-12	9	8	13	17
San Diego River Mouth	4-May-12	11-Jun-12	8-May-12	3-Jun-12	12	0	12	12
San Diego Bay								
Lindbergh Field & Former Naval Training Center	16-Apr-12	7-Aug-12	8-May-12	3-Jul-12	118	12	124	130
US Navy - NI MAT	20-Apr-12	20-Jun-12	9-May-12	18-May-12	10	0	10	10
Naval Base Coronado - Totals					978	90	1023	1068
Delta Beach North	18-Apr-12	21-Aug-12	30-Apr-12	30-Jul-12	240	15	247.5	255
Delta Beach South	16-Apr-12	8-Aug-12	30-Apr-12	1-Aug-12	131	13	137.5	144
NAB Ocean	16-Apr-12	24-Aug-12	28-Apr-12	6-Jul-12	607	62	638	669
D Street Fill/Sweetwater Marsh NWR	12-Apr-12	6-Aug-12	5-May-12	10-Jul-12	106	8	110	114
Chula Vista Wildlife Reserve	12-Apr-12	13-Sep-12	12-May-12	10-Jul-12	33	31	48.5	64
South San Diego Bay Unit, SDNWR - Saltworks	17-Apr-12	13-Sep-12	13-May-12	18-Jul-12	48	42	69	90
Tijuana Estuary NERR	17-Apr-12	30-Aug-12	10-May-12	12-Jul-12	234	49	258.5	283
Imperial County								
Salton Sea							0	0

Appendix B-3: Pair Estimation in 2012 (Method II and III).

	Pair Estimation II				Pair Estimation III							
Site name:	Total nests:	Number of unsuccessful nests before 20 June:	Estimated broods lost before 20 June:	Total pairs not renesting:	Date of second wave start (if any):	Total first wave nests:	Estimated renesters first wave:	Total Pairs first wave:	Total nests 2nd wave:	Estimated renesters 2nd wave:	Total Pairs 2nd wave:	Total Pairs:
Sacramento Area												
Bufferlands	2											
San Francisco Bay Area												
Napa Sonoma Marsh Wildlife Area - Totals	35	16	2	17								
NSMWA-Green Island Unit	12	11	0	1	n/a							
NSMWA-Huichica Creek Unit	23	5	2	16	1-Jul-12							
Montezuma	30	nr	nr	nr								
Pittsburg Power Plant								1				
Alameda Point	382	37	39	306	15-Jun-12	312	0	312	70	37	33	345
Hayward Regional Shoreline	189	4	1	184	15-Jun-12	68	4	64	121	22	99	163
Eden Landing												0
Kings County												
Kettleman City Evaporation Ponds												
San Luis Obispo/Santa Barbara Counties												
Oceano Dunes SVRA	46	2	0	44	4-Jul-12	44	4	40	2		2	42
Guadalupe-Mussel Rock												
Vandenberg AFB-Purisima Pt.	18	2	0	16	none	18	0	18	0	0	0	18
Coal Oil Point Reserve	1			0								0
Ventura County												
Santa Clara River/McGrath State Beach	42	4		38	5-Jul-12	35	4	31	7	0	7	38
Hollywood Beach	1	1	0	0		1	0	1	0	0	0	1
Ormond Beach	6	0	0	6								nr
Pt Mugu - Totals	844	230	6	608								
Holiday Beach	60	15	1	44				0	0		0	0
Holiday Beach Salt Panne	3	0	0	3				0	0		0	0
Eastern Arm	0	0	0	0				0	0		0	0
Ormond Beach East	781	215	5	561				0	0		0	0
Los Angeles/Orange Counties												
Venice Beach/Marina del Rey	14	14	0	0	N/A	14	0	14	0	0	0	14
LA Harbor	211	53	14	144		202	8	194	9	0	9	203
Seal Beach NWR - Anaheim Bay	121	0	1	120		113		113	8		8	121
Bolsa Chica Ecological Reserve - Totals	305	148	3	154	n/a	305		305				305
Nest Site 1 (NS1)	176	129	2	45	n/a	176		176				176
Nest Site 2 (NS2)	46	10	0	36	n/a	46		46				46
Nest Site 3 (NS3)	27	8	0	19	n/a	27		27				27
South Tern Island (STI)	56	1	1	54	n/a	56		56				56

	Pair Estimation II				Pair Estimation III							
Site name:	Total nests:	Number of unsuccessful nests before 20 June:	Estimated broods lost before 20 June:	Total pairs not renesting:	Date of second wave start (if any):	Total first wave nests:	Estimated renesters first wave:	Total Pairs first wave:	Total nests 2nd wave:	Estimated renesters 2nd wave:	Total Pairs 2nd wave:	Total Pairs:
Huntington State Beach	542	61	59	422	12-Jul-12	525	17	508	17	17	0	508
Burris Sand Pit/Burris Basin	11	0	0	11		11	0	11	0	0	0	11
Upper Newport Bay Ecological Reserve												
Tern Island	16	4		12	29-Jun-12	16		16	5		5	21
New Tern Island	0			0		0		0	0		0	0
San Diego County												
MCB Camp Pendleton - Totals	1245	406	332.5	506.5								
Red Beach	0			0								
Delta Beach	0			0								
White Beach	123	85	2	36								
Santa Margarita River-North Beach North	278	88	49.5	140.5								
Santa Margarita River-North Beach South	802	221	277.5	303.5								
Santa Margarita River - Saltflats	22	11	1.5	9.5								
Santa Margarita River - Saltflats Island	20	1	2	17								
Batiquitos Lagoon Ecological Reserve- Totals	562			562								
W1	18			18								
W2	453			453								
E1	60			60								
E2	0			0								
E3	31			31								
San Elijo Lagoon Ecological Reserve	0			0				0			0	0
Fairbanks Ranch				0								0
San Dieguito Lagoon Ecological Reserve				0								0
Mission Bay												
FAA Island	49	32	9	8	1-Jun-12	43	0	43	6	5	1	44
North Fiesta Island	1	0	0	1		1	0	1	0	0	0	1
Mariner's Point	142	92	36	14	20-Jun-12	128	20	108	14	0	14	122
Stony Point	17	2	2	13	17-Jun-12	9	2	7	8	2	6	13
San Diego River Mouth	12	12	0	0		12	2	10	0	0	0	10
San Diego Bay												
Lindbergh Field & Former Naval Training Center	130	23	5	102	15-Jun-12	118	11	107	12	12	0	107
US Navy												
NI MAT	10	10	0	0								nr
Naval Base Coronado - Totals	1068	238	27	803								nr
Delta Beach North	255	98	11	146								nr
Delta Beach South	144	45	2.5	96.5								nr
NAB Ocean	669	95	13.5	560.5								nr

	Pair Estimation II				Pair Estimation III							
Site name:	Total nests:	Number of unsuccessful nests before 20 June:	Estimated broods lost before 20 June:	Total pairs not renesting:	Date of second wave start (if any):	Total first wave nests:	Estimated renesters first wave:	Total Pairs first wave:	Total nests 2nd wave:	Estimated renesters 2nd wave:	Total Pairs 2nd wave:	Total Pairs:
D Street Fill/Sweetwater Marsh NWR	114	47	30	37	15-Jun-12	106	13	93	8	8	0	93
Chula Vista Wildlife Reserve	64	9	4	51	15-Jun-12	33	12	21	31	15	16	37
South San Diego Bay Unit, SDNWR - Saltworks	90	35	1	54	15-Jun-12	48	18	30	42	23	19	49
Tijuana Estuary NERR	283	151	0	132	15-Jun-12	234	125	109	49	49	0	109
Imperial County												
Salton Sea	0											

Appendix B-3 Legend: nr=not reported

Appendix B-4: Productivity in 2012.

Site name:	Total nests:	Total eggs:	No. of eggs hatched:	Hatching Success:	Date of first chick:	Date of last hatch:	Max # active nests	Date of max active nests	Date of first fledgling:	Fledgling estimate method:	Total fledglings:
Sacramento Area											
Bufferlands	2		2								0
San Francisco Bay Area											
Alameda Point	382	692	398	0.5751	29-May-12	30-Jul-12	223	30-May-12	17-Jun-12	2 week count	17
Montezuma Wetlands	30	unknown	unknown	unknown	18-Jun-12	7-Aug-12	17	18-Jun-12	5-Jul-12	3WD	15-18
Napa Sonoma Marsh Wildlife Area - Totals	35	63	34								4-30
NSMWA-Green Island Unit	12	21	0	0.0000	N/A	N/A			N/A		0
NSMWA-Huichica Creek Unit	23	42	34	0.8095	9-Jul-12	15-Aug-12	14	11-Jul-12	9-Jul-12	3WD	4-30
Pittsburg Power Plant											
Hayward Regional Shoreline	189	367	228	0.6212534	4-Jun-12	2-Aug-12	135	5-Jul-12	24-Jun-12	3WD	121-146
Eden Landing	0										0
Kings County											
Kettleman City Evaporation Ponds	0										0
San Luis Obispo/Santa Barbara Counties											
Oceano Dunes SVRA	46	82	52	0.6341	22-Jun-12	2-Aug-12	34	21-Jun-12	13-Jul-12	Other	42
Vandenberg AFB-Purisima Pt.	18	32	21	0.65625	29-Jun-12	18-Jul-12	15	22-Jun-12	19-Jul-12	3WD	10
Coal Oil Point Reserve	0										0
Ventura County											
Ormond Beach	6	10	3	0.3	13-Jun-12	13-Jun-12	`	1-Jun-12			0
Hollywood Beach	1	1									0
Santa Clara River/McGrath State Beach	42	69	34	0.4928	21-Jun-12	25-Jun-12	26	13-Jun-12	12-Jul-12	3WD	8
Pt Mugu- Totals	844	1463	467	0.3192	4-Jun-12	2-Jul-12	550	4-Jun-12	26-Jun-12	Other	15
Holiday Beach	60	109	44	0.4037	4-Jun-12	2-Jul-12	33	15-Jun-12	Unk	3WN	4
Holiday Beach Salt Panne	3	5	2	0.4000	12-Jun-12	12-Jun-12	2	22-Jun-12	N/A	N/A	0
Eastern Arm	0	0	0	n/a	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ormond Beach East	781	1349	421	0.3121	4-Jun-12	28-Jun-12	517	4-Jun-12	26-Jun-12	Other	11
Los Angeles/Orange Counties											
Venice Beach/Marina del Rey	14	14	0	0	none	none	5	6-Jun-12	none	none	0
LA Harbor	211	358	268	0.7486	4-Jun-12	9-Jul-12	142	29-May-12	25-Jun-12	3WD	35
Seal Beach NWR - Anaheim Bay	121	213	171	0.8028169	6-Jun-12	11-Jul-12	90	6-Jun-12	27-Jun-12	R	40
Bolsa Chica Ecological Reserve -Totals	305	527	137	0.2600	26-May-12	3-Jul-12			1-Jul-12		66-95
Nest Site 1 (NS1)	176	306	45	0.1471	26-May-12	19-Jun-12	85	8-May-12	no data	3WD	1
Nest Site 2 (NS2)	46	82	29	0.3537	29-May-12	14-Jun-12	37	31-May-12	N/A	3WD	0
Nest Site 3 (NS3)	27	45	17	0.3778	7-Jun-12	14-Jun-12	24	31-May-12	N/A	3WD	0

Site name:	Total nests:	Total eggs:	No. of eggs hatched:	Hatching Success:	Date of first chick:	Date of last hatch:	Max # active nests	Date of max active nests	Date of first fledgling:	Fledgling estimate method:	Total fledglings:
South Tern Island (STI)	56	94	46	0.4894	26-May-12	3-Jul-12	40	22-May-12	1-Jul-12	3WD	15
Huntington State Beach	542	947	805	0.8501	22-May-12	22-Jun-12	458	22-May-12	19-Jun-12	3WD	90
Burris Sand Pit/Burris Basin	11	22	18	0.8182	21-Jun-12		11	11-Jun-12	17-Jul-12		7
Upper Newport Bay Ecological Reserve	20	36	21	0.5833333							4
Tern Island	20	36	21	0.5833333	25-May-12	13-Jun-12		13-Jun-12			4
New Tern Island	0	0	0								0
San Diego County											
MCB Camp Pendleton - Totals	1245	2152	1328	0.6171	21-May-12	30-Jun-12	941	23-May-12	15-Jun-12	3WD, other	25
Red Beach											
Delta Beach											
White Beach	123	191	16	0.0837696	28-May-12	18-Jun-12	58	23-May-12	25-Jun-12	3WD, other	5
Santa Margarita River - North Beach North	278	468	254	0.542735	21-May-12	22-Jun-12	189	23-May-12	15-Jun-12	other	6
Santa Margarita River - North Beach South	802	1425	1023	0.7178947	26-May-12	7-Jun-12	673	22-May-12	19-Jun-12	3WD, other	13
Santa Margarita River - Saltflats	22	33	16	0.4848485	7-Jun-12	30-Jun-12	11	5/22/12-6/2/12			0
Santa Margarita River - Saltflats Island	20	35	19	0.5428571	26-May-12	28-Jun-12	12	5/22/12-6/2/12	7-Jul-12	other	1
Batiquitos Lagoon Ecological Reserve - Totals	563	992	740	0.7459	24-May-12	2-Jul-12	462	27-May-12		R	34-38
W1	18	31	23	0.7419	29-May-12	11-Jun-12	14	14-May-12	18-Jun-12	R	2
W2	454	790	600	0.7595	24-May-12	2-Jul-12	369	27-May-12	15-Jun-12	R	31-35
E1	60	114	78	0.6842	25-May-12	15-Jun-12	53	21-May-12	15-Jun-12	R	1
E2	0	0	0	0			0				0
E3	31	57	39	0.6842	29-May-12	6-Jun-12	26	16-May-12	N/A	R	0
San Elijo Lagoon Ecological Reserve	0	0									0
Fairbanks Ranch	0	0									0
San Dieguito Lagoon Ecological Reserve	0	0									0
Mission Bay											
FAA Island	49	80	31	0.3875	30-May-12	21-Jun-12		23-May-12	none	n/a	0
North Fiesta Island	1	2	0	0.0000			1	20-Jun-12			0
Mariner's Point	142	236	63	0.2669	30-May-12	15-Jun-12	96	27-May-12	20-Jun-12	3WD	0 to 2
Stony Point	17	23	8	0.3478261	8-Jun-12	13-Jul-12	12	17-Jun-12			0
San Diego River Mouth	12	20	0	0			9	3-Jun-12			0
San Diego Bay											
Lindbergh Field & Former Naval Training Center	130	197	136	0.6904	31-May-12	6-Jul-12	84	3-Jun-12	21-Jun-12	R/2WD	36
NI MAT	10	15	0	0.0000	N/A	N/A	5	11-May-12	N/A	N/A	0

Site name:	Total nests:	Total eggs:	No. of eggs hatched:	Hatching Success:	Date of first chick:	Date of last hatch:	Max # active nests	Date of max active nests	Date of first fledgling:	Fledgling estimate method:	Total fledglings:
Naval Base Coronado - Totals	1068	1608	813	0.5056	18-May-12	3-Jul-12			13-Jun-12		10-19
Delta Beach North	255	392	191	0.4872	18-May-12	22-Jun-12	157	23-May-12	13-Jun-12	other	5
Delta Beach South	144	203	82	0.4039	21-May-12	30-Jun-12	77	28-May-12	2-Jul-12	other	2
NAB Ocean	669	1013	540	0.5331	22-May-12	3-Jul-12	356	29-May-12	22-Jun-12	other	10-12
D Street Fill/Sweetwater Marsh NWR	114	162	65	0.4012	26-May-12	3-Jul-12	75	29-May-12	22-Jun-12	R/2WD	9
Chula Vista Wildlife Reserve	64	98	55	0.5612	2-Jun-12	31-Jul-12	27	10-Jul-12	29-Jun-12	R/2WD	18 to 20
South San Diego Bay Unit, SDNWR - Saltworks	90	133	29	0.2180451	13-Jun-12	24-Jul-12	30	3-Jun-12	15-Aug-12	R	1
Tijuana Estuary NERR	283	422	22	0.0521327	21-Jun-12	12-Jul-12	94	21-Jun-12	26-Jul-12		0
Imperial County											
Salton Sea	0	0									0

Appendix B-4: Productivity, clutch sizes in 2012.

			Number of nests			
Site name:	Nest total	Egg total	1 egg clutch	2 egg clutch	3 egg clutch	4 egg clutch
Sacramento Area						
Bufferlands	nr	nr	nr	nr	nr	nr
San Francisco Bay Area						
Alameda Point	382	692	80	294	8	0
Montezuma Wetlands	30	unknown	unknown	unknown	1	unknown
Napa Sonoma Marsh Wildlife Area - Totals	35	62	11	21	3	0
NSMWA-Green Island Unit	12	20	5	6	1	0
NSMWA-Huichica Creek Unit	23	42	6	15	2	0
Pittsburg Power Plant						
Hayward Regional Shoreline	215	367	68	142	5	0
San Luis Obispo/Santa Barbara Counties						
Oceano Dunes SVRA	46	82	12	32	2	0
Vandenberg AFB-Purisima Pt.	18	32	4	14	0	0
Ventura County						
Ormond Beach	6	10	1	5	0	0
Hollywood Beach	1	1	1	0	0	0
Santa Clara River/McGrath State Beach	42	69	15	27	0	0
Pt Mugu- Totals	844	1463	235	599	10	0
Holiday Beach	60	109	14	43	3	0
Holiday Beach Salt Panne	3	5	1	2	0	0
Eastern Arm	0	0	0	0	0	0
Ormond Beach East	781	1349	220	554	7	0
Los Angeles/Orange Counties						
Venice Beach/Marina del Rey	14	14	14	0	0	0
LA Harbor	211	358	65	145	1	0
Seal Beach NWR - Anaheim Bay	121	213	33	87	0	1
Bolsa Chica Ecological Reserve -Totals	305	527	89	210	6	0
Nest Site 1 (NS1)	176	306	50	122	4	0
Nest Site 2 (NS2)	46	82	12	32	2	0
Nest Site 3 (NS3)	27	45	9	18	0	0
South Tern Island (STI)	56	94	18	38	0	0
Huntington State Beach	542	949	136	405	1	0
Burris Sand Pit/Burris Basin	11	22	1	9	1	0
Upper Newport Bay Ecological Reserve						
Tern Island	21	37	5	16	0	0
New Tern Island	0	0	0	0	0	0
San Diego County						
MCB Camp Pendleton - Totals	1245	2152	347	889	9	0
Red Beach	0	0	0	0	0	0
Delta Beach	0	0	0	0	0	0
White Beach	123	191	55	68	0	0
Santa Margarita River - North Beach North	278	468	90	186	2	0
Santa Margarita River - North Beach South	802	1425	186	609	7	0
Santa Margarita River - Saltflats	22	33	11	11	0	0
Santa Margarita River - Saltflats Island	20	35	5	15	0	0
Batiquitos Lagoon Ecological Reserve - Totals	563	992	136	423	3	0
W1	18	31	5	13	0	0
W2	454	790	118	333	2	0
E1	60	114	7	52	1	0
E2	0	0	0	0	0	0
E3	31	57	6	25	0	0
San Elijo Lagoon Ecological Reserve	0	0	0	0	0	0

			Number of nests			
Site name:	Nest total	Egg total	1 egg clutch	2 egg clutch	3 egg clutch	4 egg clutch
Fairbanks Ranch	0	0	0	0	0	0
San Dieguito Lagoon Ecological Reserve	0	0	0	0	0	0
Mission Bay						
FAA Island	49	80	18	31	0	0
North Fiesta Island	1	2	0	1	0	0
Mariner's Point	142	236	51	88	3	0
Stony Point	17	23	11	6	0	0
San Diego River Mouth	12	20	4	8	0	0
San Diego Bay						
Lindbergh Field & Former Naval Training Center	130	197	63	67	0	0
NI MAT	10	15	5	5	0	0
Naval Base Coronado - Totals	1068	1608	529	538	1	0
Delta Beach North	255	392	118	137	0	0
Delta Beach South	144	203	85	59	0	0
NAB Ocean	669	1013	326	342	1	0
D Street Fill/Sweetwater Marsh NWR	114	162	66	48	0	0
Chula Vista Wildlife Reserve	64	98	30	34	0	0
South San Diego Bay Unit, SDNWR - Saltworks	90	133	47	43	0	0
Tijuana Estuary NERR	283	422	144	139	0	0
Imperial County						
Salton Sea						

Appendix B-5: Non-Predation Mortality in 2012.

	No. of eggs					No. of nests					No. of dead			
Site name:	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	Comments on cause(s) of non-predation mortality:
Sacramento Area														
Bufferlands														
San Francisco Bay Area														
NSMWA-Green Island Unit	0	0	21	0	0	0	0	12	0	0	0			1 egg crushed early on, before being abandoned. 9 eggs were already abandoned when they were cracked/crushed by CAGO
NSMWA-Huichica Creek Unit	0	0	6	0	0	0	0	4	0	0	2			Dead chicks cause believed to be heat, found right near nest and perhaps mother abandonment
Montezuma Wetlands										12				
Pittsburg Power Plant														
Alameda Point	0	0	74	110	92	0	0	55	47	31	37	0	0	Extremely high predation drastically overshadowed mortality rates. We had 90 unknown-fate eggs that had been incubated for 19-25 days before found to be missing. Potentially these could have hatched and been depredated by AMKE..(but of course, we don't really know that...)
Hayward Regional Shoreline	0	0	41	42	16	0	0	32	0	9	14	2	1	
Eden Landing														
Kings County														
Kettleman City Evaporation Ponds														
San Luis Obispo/Santa Barbara Counties														
Oceano Dunes SVRA	0	0	2	10	10	0	0	1	5	7	1	0	0	1-2 day old chick found dead at nest from unknown cause.
Guadalupe-Mussel Rock														
Vandenberg AFB-Purisima Pt.	0	0	3	6		0	0	2	4	0	4	4	0	There were no signs of trauma on the chicks and fledglings found dead. We suspect they died of starvation. See Notes tab for diet info.
Coal Oil Point Reserve														

	No. of eggs					No. of nests					No. of dead			
Site name:	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	Comments on cause(s) of non-predation mortality:
Ventura County														
Santa Clara River/McGrath State Beach	1	1	16	1	2	1	1	12	1	1	2			Human damage: 1 crushed egg found several feet from the nest. 1 egg remained in the nest and appeared abandoned. The remaining egg was gone the following week with no sign of hatch or depredation. Transient activity on this part of the beach. Unknown: Nest was suspected to be abandoned, the following week there were no eggs and no evidence of predator or hatch.
Ormond Beach	0	0	5	0	0	0	0	3	0	0	0	0	0	
Hollywood Beach														
Pt Mugu - Totals	0	59	566	84	242	0	33	365	17	127	110	10	0	Severe windstorm om weekend of 26-May-12 caused abandonment. High tide series 1-6 June 2012 flooded back dunes washing out a series of nesting areas. More eggs/nests were suspected lost from flooding than reported here.
Holiday Beach	0	8	33	10	12	0	4	18	4	7	1	0	0	
Holiday Salt Panne	0	0	3	0	0	0	0	2	0	0	0	0	0	
Eastern Arm	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	
Ormond Beach East	0	51	530	74	230	0	29	345	13	120	109	10	0	
Los Angeles/Orange Counties														
Venice Beach/Marina del Rey	0	0	0	0	0	0	0	0	0	0	0	0	1	
LA Harbor	0	0	77	0	0	0	0	58	0	0	84	1	1	Low prey availability; adult abandonment
Seal Beach NWR - Anaheim Bay	0	0	3	27	0	0	0	4	16	0	42	3	1	n/a
Bolsa Chica Ecological Reserve -Totals	0	0	19	2	0	0	0	10	2	56	7	0	1	
South Tern Island (STI)	0	0	7	0	0	0	0	3	0	5	4	0	1	
Nest Site 1 (NS1)	0	0	2	2	0	0	0	2	2	25	1	0	0	natural causes
Nest Site 2 (NS2)	0	0	7	0	0	0	0	3	0	12	1	0	0	natural causes
Nest Site 3 (NS3)	0	0	3	0	0	0	0	2	0	14	1	0	0	natural causes
Huntington State Beach	0	0	73	54	9	0	0	53	9	4	150	0	0	
Burris Sand Pit/Burris Basin	0	0	4	0	0	0	0	2	0	0	0	0	0	
Upper Newport Bay Ecological Reserve														
Tern Island			1					1						
New Tern Island														

	No. of eggs					No. of nests					No. of dead			
Site name:	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	Comments on cause(s) of non-predation mortality:
San Diego County														
MCB Camp Pendleton - Totals	1	58	206	325	4	0	40	145	76	3	676	0	6	
Red Beach														
Delta Beach														
White Beach	0	4	42	52	0	0	3	32	4	0	4	0	1	
Santa Margarita River - North Beach North	0	42	70	94	4	0	30	46	5	3	102	0	1	2 chicks died hatching
Santa Margarita River - North Beach South	1	8	88	140	0	0	5	64	62	0	560	0	4	3 chicks died hatching
Santa Margarita River - Saltflats	0	4	0	15	0	0	2	0	0	0	10	0	0	
Santa Margarita River - Saltflats Island	0	0	6	24	0	0	0	3	5	0	0	0	0	
Batiquitos Lagoon Ecological Reserve - Totals														
W1	0	0	7	0	0	0	0	5	0	0	8	0	0	unknown
W2	0	4	59	84		0	3	51	61	0	385	4	1	unknown
E1	3	0	14	10	0	1	0	7	6	0	6	0	0	CLT nest misidentified as WSP nest was exclosed causing nest abandonment
E2	0	0	0	0	0	0	0	0	0	0	0	0	0	
E3	0	0	8	0	0	0	0	6	0	0	1	0	0	unknown
San Elijo Lagoon Ecological Reserve														
Fairbanks Ranch														
Mission Bay														
FAA Island	0	0	46	2	2	0	0	31	2	1	10	0	1	Suspected abandonment due to predator pressure- PEFA and AMKE hunting area
North Fiesta Island			2					1						Nest was abandoned close to expected hatching date when all CLTs left the area for unknown reasons.
Mariner's Point	0	0	163	0	0	0	0	97	0	0	22	0	0	
Stony Point			12					10			1			Dead chick possibly killed by ants
San Diego River Mouth			2					1						

	No. of eggs					No. of nests					No. of dead			
Site name:	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	Comments on cause(s) of non-predation mortality:
San Diego Bay														
Lindbergh Field & Former Naval Training Center			42	2	9			35	2	9	44		1	44 chicks dead of unknown cause, 11 to flooding; 1 fledgling to flooding, 2 to vehicles; abandonment of 7-20 nests due to fireworks explosion; nest abandonment & chick mortality possibly related to predator disturbance & limited prey fish availability
NI MAT	0	0	0	0	0	0	0	0	0	0	0	0	0	
Naval Base Coronado - Totals														
Delta Beach North	0	0	74	54	16	0	0	58	13	10	18	0	0	5 chicks died hatching
Delta Beach South	0	0	49	18	4	0	0	40	11	4	10	0	0	5 chicks died hatching
NAB Ocean	21	1	272	118	7	16	1	200	34	6	24	0	0	10 chicks died hatching
D Street Fill/Sweetwater Marsh NWR			52	4	20			40	4	16	16		1	nest abandonment & chick mortality possibly related to predator disturbance & limited prey fish availability
Chula Vista Wildlife Reserve			22	1	11			17	1	9	3			
South San Diego Bay Unit, SDNWR - Saltworks		3	18		24		2	13		19				nest abandonment likely related to predator disturbance
Tijuana Estuary NERR		23	79	2	69		16	57	2	46				nest abandonment likely related to predator disturbance

Appendix B-6: Predation in 2012.

Predator Species Name and Code	Predator Category		
	Possible	Suspected	Documented
great blue heron (GBHE)	X		X
great egret (GREG)	X	X	X
black-crowned night-heron (BCNH)	X	X	
ring-billed gull (RBGU)	X		
California gull (CAGU)	X	X	
western gull (WEGU)	X	X	
gulls spp. (GULL)	X	X	X
Caspian tern (CATE)	X		
elegant tern (ELTE)	X		
gull-billed tern (GBTE)	X	X	X
least tern (LETE)	X		
black skimmer (BLSK)	X	X	X
northern harrier (NOHA)	X	X	X
white-tailed kite (WTKI)	X		
Cooper's hawk (COHA)	X	X	X
red-tailed hawk (RTHA)	X	X	X
Swainson's hawk (SWHA)	X		
turkey vulture (TUVU)	X		
osprey (OSPR)	X		
merlin (MERL)	X		
American kestrel (AMKE)	X	X	X
peregrine falcon (PEFA)	X	X	X
raptor spp. (RAPTOR)			X
black-bellied plover (BBPL)	X	X	X
long-billed curlew (LBCU)	X		
barn owl (BNOW)	X	X	X
burrowing owl (BUOW)	X		
great horned owl (GHOW)	X	X	X
owls spp. (OWL)	X	X	X
American crow (AMCR)	X	X	X
common raven (CORA)	X	X	X
corvids spp. (CORVID)	X	X	X
horned lark (HOLA)	X	X	
rock pigeon (ROPI)	X		
loggerhead shrike (LOSH)	X		
European starling (EUST)	X	X	X
western meadowlark (WEME)	X		
red-winged blackbird (RWBL)	X		
great-tailed grackle (GTGR)	X		
unknown avian spp. (AVIAN)	X	X	X
unknown mammal (spp.) (MAMMAL)	X	X	X
opossum (OP)	X	X	X
river otter (R OTTER)	X	X	
long-tailed weasel (LT WEASEL)	X	X	X
black-tailed jackrabbit (BTJ RABBIT)	X		X
California ground squirrel (GS)	X	X	
pocket gopher (P GOPHER)	X		
mouse spp. (MOUSE)	X	X	
rats spp. (RAT)	X		
rodents spp. (RODENT)	X		
canid spp. (CANID)	X		
domestic dog (DOG)	X		
coyote (COYOTE)	X	X	X
gray fox (GFOX)	X		
red fox (RFOX)	X		
raccoon (RAC)	X		
striped skunk (ST SKUNK)	X		X
bobcat (BOBCAT)	X		
domestic cat (CAT)	X	X	
gopher snake (G SNAKE)	X		
southern Pacific rattlesnake (RATTLESNAKE)	X		
snakes spp. (SNAKE)	X		
Crab spp. (CRAB)	X		
ants spp. (ANT)	X	X	X
black-widow spider (BW SPIDER)	X		
trap-door spider (TD SPIDER)			X
Unknown (UNK)	X	X	X

Appendix B-6: Predation in 2012 (continued).

	Predation			Number of					Total number documented				
Site name	Possible	Suspected	Documented	Eggs	Nests	Chicks	Fledglings	Adults	Eggs	Nests	Chicks	Fledglings	Adults
Sacramento Area													
Bufferlands									0	0	0	0	0
San Francisco Bay Area													
NSMWA-Green Island Unit	GBHE, CAGU, CATE, PEFA, CORA, HOLA	PEFA							0	0	0	0	0
NSMWA-Huichica Creek Unit	CAGU, LETE, PEFA, owl, RWBB								0	0	0	0	0
Montezuma Wetlands	GBHE, GREG, CAGU, CATE, NOHA, RTHA, SWHA, CORA, HOLA, gs, cat								0	0	0	0	0
Pittsburg Power Plant	GBHE, GREG, RBGU, gull, CATE, WTKI, LBCU, ROPI, corvid, EUST, WEME, RWBL, r otter	r otter						r otter 4S	0	0	0	0	4
Alameda Point		AMKE, PEFA,	NOHA, AMKE, PEFA, avian	avian 16S		AMKE 77D, 264S	AMKE 2D, PEFA 1S	NOHA 1D, PEFA 9D 3S	16	10	341	3	13
Hayward Regional Shoreline	NOHA, RTHA, AMCR, CORA, rfox, rac	CAGU, PEFA	GBHE	CAGU 9S	CAGU 5S	GBHE 60-70D	PEFA 2S	PEFA 1S	9	5	70	2	1
Eden Landing									0	0	0	0	0
Kings County													
Kettleman City Evaporation Ponds									0	0	0	0	0
San Luis Obispo/Santa Barbara Counties													
Oceano Dunes SVRA		PEFA	PEFA, coyote				PEFA 1D 1S,		0	0	0	2	0
Guadalupe-Mussel Rock									0	0	0	0	0
Vandenberg AFB-Purisima Pt.			avian	avian 1					1	0	0	0	0
Coal Oil Point Reserve									0	0	0	0	0

	Predation			Number of					Total number documented				
Site name	Possible	Suspected	Documented	Eggs	Nests	Chicks	Fledglings	Adults	Eggs	Nests	Chicks	Fledglings	Adults
Ventura County													
Santa Clara River/McGrath State Beach	GBHE, RBGU, CAGU, WEGU, gull, NOHA, WTKI, COHA, RTHA, AMKE, PEFA, owl, HOLA, LOSH, dog, coyote	gs, unknown	AMCR, CORA	AMCR 3D, CORA 2D, gs 9S, unknown 4S	AMCR 2D, CORA 1D, gs 5S, unknown 3S				18	11	0	0	0
Ormond Beach	GBHE, GREG, WEGU, NOHA, WTKI, RTHA, OSPR, MERL, PEFA, AMCR, CORA, GTGR, gs, dog, mouse, coyote, rac			unk 2D	unk 1D				2	1	0	0	0
Hollywood Beach									0	0	0	0	0
Pt Mugu - Holiday Beach	GBHE,GREG, BCNH,RBGU, CAGU,WEGU, CATE, ELTE, GBTE, LETE, BLSK, NOHA, WTKI, COHA, RTHA, OSPR, MERL, AMKE, PEFA, BBPL, LBCU,BNOW, GHOW,BUOW, AMCR, CORA, HOLA, LOSH, EUST, WEME, RWBL, lt weasel, btj rabbit, p gopher, op, gs, mouse, sp rattlesnake		coyote	coyote 2D	coyote 1D				2	1	0	0	0

Site name	Predation			Number of					Total number documented				
	Possible	Suspected	Documented	Eggs	Nests	Chicks	Fledglings	Adults	Eggs	Nests	Chicks	Fledglings	Adults
Pt Mugu - Holiday Salt Panne									0	0	0	0	0
Pt Mugu - Eastern Arm									0	0	0	0	0
Pt Mugu - Ormond Beach East	GBHE, GREG, BCNH, RBGU, CAGU, WEGU, CATE, ELTE, GBTE, LETE, BLSK, WTKI, COHA, RTHA, OSPR, MERL, BBPL, LBCU, BNOW, BUOW, AMCR, HOLA, LOSH, EUST, WEME, RWBL, lt weasel, btj rabbit, p gopher, gs, mouse, sp rattlesnake		gull, NOHA, PEFA, AMKE, GHOW, CORA, op, coyote, unknown, raptor	NOHA 1D, CORA 1D, op 28D, coyote 1D, unknown 13D	NOHA 1D, CORA 1D, op 15D, coyote 1D, unknown 7D	gull 3D, NOHA 20D, AMKE 3D, GHOW 1D, unknown 2D	NOHA 6D, AMKE 1D, PEFA 1D, raptor 3D	NOHA 2D, PEFA 1D, raptor 2D	44	25	29	12	5
Los Angeles/Orange Counties													
Venice Beach/Marina del Rey				AMCR 14S				AMKE 1S	14	0	0	0	1
LA Harbor	GBHE, WEGU, CATE, ELTE, BLSK, RTHA, PEFA, AMCR, CORA, corvid, cat	BCNH, gull	AMKE	gull 1S, corvid 12P	gull 1S, corvid 9P	AMKE 1D	BCNH 1S	cat 1P	13	10	1	1	1
Seal Beach NWR - Anaheim Bay	GBHE, NOHA, RTHA, AMKE, PEFA, owl, CORA, ant	CORA, owl	avian	CORA 11S	CORA 8S			owl 1P	11	8	0	0	1
Bolsa Chica Ecological Reserve - Nest Site 1	BCNH, NOHA, COHA, AMCR, HOLA, gs, rat, dog, raccoon, snake, ant	gull, RTHA, AMKE, CORA, op,	corvids, coyote	corvid unk, coyote unk	corvid unk, coyote unk	corvid unk, coyote unk			unk	unk	unk	0	0
Bolsa Chica Ecological Reserve - Nest Site 2	BCNH, gull, NOHA, COHA, RTHA, AMKE, AMCR, raccoon, ant	CORA	corvid, coyote	corvid 3D, coyote 14D	corvid 2D, coyote 9D	coyote unk, corvid unk			17	11	unk	0	0

Site name	Predation			Number of					Total number documented				
	Possible	Suspected	Documented	Eggs	Nests	Chicks	Fledglings	Adults	Eggs	Nests	Chicks	Fledglings	Adults
Bolsa Chica Ecological Reserve - Nest Site 3	COHA, RTHA, AMKE, AMCR, raccoon	CORA	corvid, coyote	corvid 2D, coyote 4D	corvid 1D, coyote 2D				6	3	0	0	0
Bolsa Chica Ecological Reserve - South Tern Island	BCNH, gull, NOHA, COHA, AMKE, AMCR, op, coyote, ant	RTHA, CORA							0	0	0	0	0
Huntington State Beach	GBHE, GBTE, OSPR, CORA, EUST, rodent, dog, raccoon	AMKE, PEFA, coyote, ant	COHA, RTHA, AMKE, PEFA, AMCR	AMCR 8		COHA 2, RTHA 3, AMKE 3, ant 4		PEFA 4	8	4	12	0	4
Burris Sand Pit/Burris Basin	GBHE, COHA, AMKE, PEFA,								0	0	0	0	0
Upper Newport Bay Ecological Reserve - Tern Island	GBHE, GREG, BCNH, BLSK, WTKI, RTHA, OSPR, AMKE, AMCR, CORA, bobcat, coyote, cat, crab, ant	coyote	coyote	coyote 8D	coyote 4D				8	4	0	0	0
Upper Newport Bay Ecological Reserve - New Tern Island	GBHE, GREG, CAGU, WEGU, WTKI, RTHA, OSPR, AMKE, AMCR, CORA, coyote, bobcat, cat, crab, ant, t vulture								0	0	0	0	0
San Diego County													
MCB Camp Pendleton - Red Beach									0	0	0	0	0
MCB Camp Pendleton - Delta Beach									0	0	0	0	0
MCB Camp Pendleton - White Beach	GBHE, GREG, CAGU, WEGU, NOHA, COHA, RTHA, AMKE, PEFA, BNOW, GHOW, corvid, HOLA, EUST, op, gs, mouse, canid, dog, cat	CORA	AMCR, CORA, avian, mammal, lt weasel, st skunk, ant	CORA 99D/7S, mammal 1D, lt weasel 6D, st skunk 6D, unknown 5D	CORA 65D, mammal 1D, lt weasel 3D, st skunk 4D, unknown 3D			avian 1D	124	76	0	0	1

	Predation			Number of					Total number documented				
Site name	Possible	Suspected	Documented	Eggs	Nests	Chicks	Fledglings	Adults	Eggs	Nests	Chicks	Fledglings	Adults
MCB Camp Pendleton - Santa Margarita River - North Beach North	GBHE, GREG, CAGU, WEGU, NOHA, COHA, RTHA, AMKE, PEFA, BNOW, GHOW, EUST, op, lt weasel, gs, mouse, dog, coyote, raccoon	HOLA	AMCR, CORA, avian, st skunk, unknown, td spider	gull 2D, AMCR 7D, CORA 18D, corvids 30D, avian 1D, mammal 4D 3S, unknown 7D	gull 1D, AMCR 5D, CORA 12D, corvid 21D, avian 1D, mammal 5D, unknown 5D	avian 1D, td spider 2D	avian 2D,	avian 4D	69	50	3	2	4
MCB Camp Pendleton - Santa Margarita River - North Beach South	GBHE, GREG, CAGU, WEGU, GBTE, COHA, RTHA, AMKE, EUST, op, gs, dog, coyote, st skunk,	PEFA, GHOW, owl, CORA, corvid, mammal, lt weasel, mouse	gull, NOHA, PEFA, BNOW, GHOW, AMCR, CORA, corvid, avian, mammal	AMCR 86D, CORA 2D/1S, corvid 1D, avian 1D, mammal 3D, lt weasel 45S, mouse 1S, ant 29D	AMCR 60D, CORA 2D 1S, corvid 1S, avian 1D, mammal 3D, lt weasel 28S, mouse 1S, unknown 20D	NOHA 3D, AMCR 3D,	avian 3D	PEFA 2D 3S, BNOW 4D, GHOW 6D 9S, owl 2D, avian 13D	169	117	6	3	39
MCB Camp Pendleton - Santa Margarita River - Saltflats	GBHE, GREG, CAGU, WEGU, NOHA, COHA, RTHA, AMKE, PEFA, BNOW, GHOW, AMCR, HOLA, EUST, op, lt weasel, gs, mouse, canid, coyote, raccoon, st skunk	CORA	avian, mammal, ant	CORA 1S, avian 5D, unknown 7D	CORA 1S, avian 4D, unknown 6D				13	11	0	0	0

	Predation			Number of					Total number documented				
Site name	Possible	Suspected	Documented	Eggs	Nests	Chicks	Fledglings	Adults	Eggs	Nests	Chicks	Fledglings	Adults
MCB Camp Pendleton - Santa Margarita River - Saltflats Island	GBHE, GREG, CAGU, WEGU, NOHA, COHA, RTHA, AMKE, PEFA, BNOW, GHOW,AMCR, HOLA, EUST, op, lt weasel, gs, mouse, canid, coyote, raccoon, st skunk	CORA	avian, mammal, unknown	CORA 1S, avian 5D, unknown 7D	CORA 1S, avian 4D, ants 6D				13	11	0	0	0
Batiquitos Lagoon Ecological Reserve - W1	BCNH, COHA, PEFA, GHOW, AMCR, CORA, coyote, raccoon, cat	GREG	GREG			GREG 2S	GREG 1D		0	0	2	1	12
Batiquitos Lagoon Ecological Reserve - W2	GREG, GBHE, BCNH, COHA, GHOW, AMCR, CORA, rat, cat	GREG, WEGU, gull, GBTE, PEFA, BNOW, coyote	PEFA, coyote	WEGU 1S, coyote 3D	WEGU 1S, coyote 2D	gull 50-100S, GBTE 1S, PEFA 1D, BNOW 50+S, coyote 2S & 4D	PEFA 1D	PEFA 1D	4	3	50-100+	1	1
Batiquitos Lagoon Ecological Reserve - E1	GBHE, GREG, NOHA, PEFA, GHOW,AMCR, CORA,raccoon, st skunk	RTHA	RTHA	RTHA 9D	RTHA 5D	RTHA 4D & 67S			9	5	71	0	0
Batiquitos Lagoon Ecological Reserve - E2									0	0	0	0	0
Batiquitos Lagoon Ecological Reserve - E3	GBHE, PEFA, GHOW, AMCR, CORA	BLSK		BLSK 5S	BLSK 3S				5	3	0	0	0
San Elijo Lagoon Ecological Reserve	GBHE, GREG, BCNH, CAGU, WEGU, COHA, RTHA, AMKE, AMCR, CORA, dog, coyote, raccoon								0	0	0	0	0

	Predation			Number of					Total number documented				
Site name	Possible	Suspected	Documented	Eggs	Nests	Chicks	Fledglings	Adults	Eggs	Nests	Chicks	Fledglings	Adults
Fairbanks Ranch									0	0	0	0	0
Mission Bay													
FAA Island	GBHE, WEGU, rat, rodent	AMKE, PEFA		GBHE 3S,WEGU 6S, rat 2	GBHE 2S,WEGU 6S, rat 1	AMKE 7D		PEFA 1D	11	9	7	0	1
North Fiesta Island									0	0	0	0	0
Mariner's Point		gull, PEFA, owl, AMCR, EUST		WEGU 0-7S,AMCR 0-7S, EUST 3S		PEFA 41S		owl 1S	0-17	0	41	0	1
Stony Point	GBHE, WEGU, AMKE, PEFA, AMCR, CORA, ant	EUST		EUST 3S	EUST 3S	GBHE 0-7P, WEGU 0-7P, AMKE 0-7P, PEFA 0-7P, AMCR 0-7P, CORA 0-7P, ant 1P			3	3	0-8	0	0
San Diego River Mouth	unk	AMCR		AMCR 20S, unk 0-20P	unk 5-7S				0-40	7	0	0	0
San Diego Bay													
Lindbergh Field & Former Naval Training Center	GBHE, BCNH, WEGU, COHA, AMKE, PEFA, AMCR, CORA, rat	COHA, AMKE, PEFA, AMCR, CORA,	AMKE, PEFA, CORA	CORA 4D 2S	CORA 3D 2S	AMKE 1D 2S		PEFA 1D	6	5	3	0	1
NI MAT	AMCR, CORA	AMCR, CORA		AMCR 3S, CORA 4S, mammal 2S, unknown 6D	AMCR 2S, CORA 4S, mammal 1S, unknown 4D				15	11	0	0	0

Site name	Predation			Number of					Total number documented				
	Possible	Suspected	Documented	Eggs	Nests	Chicks	Fledglings	Adults	Eggs	Nests	Chicks	Fledglings	Adults
Naval Base Coronado - Delta Beach North	GBHE, GREG, GBTE, NOHA, COHA, RTHA, AMKE, PEFA, BNOW, GHOW, AMCR, CORA, EUST, avian, mammal, bt jackrabbit, dog	GBTE, AMCR, CORA, EUST, avian, mammal	GBHE, GBTE, PEFA, BBPL, EUST, avian, mammal, unknown	GBTE 1D, AMCR 5D, CORA 20D, EUST 2S, avian 8D, mammal 4D, unknown 41D	GBTE 1D, AMCR 3D, CORA 12D, EUST 1S, avian 7D, mammal 4D, unknown 26D	GBTE 5D-8D, NOHA 1D, avian 2D, mammal 1S	mammal 2S	GHOW 1D, avian 13D	81	54	12	2	14
Naval Base Coronado - Delta Beach South	GBHE, GREG, GBTE, NOHA, COHA, RTHA, AMKE, PEFA, BNOW, GHOW, AMCR, CORA, cat	GBTE, AMCR, CORA, avian, mammal, unknown	AMCR, CORA, avian, mammal, bt jackrabbit, unknown	GBTE 1S, AMCR 4D 2S, CORA 1D 7S, avian 3D, mammal 3D, bt jackrabbit 2D, unknown 26D	AMCR 2D 1S, CORA 5D, avian 2D, mammal 2D, bt jackrabbit 1D, unknown 20D			avian 5D	49	33	0	0	5
Naval Base Coronado - NAB Ocean	GBHE, CAGU, WEGU, GBTE, NOHA, COHA, RTHA, AMKE, BNOW, GHOW, AMCR, CORA, corvid	GBTE, BBPL, GHOW, AMCR, CORA, corvid, mammal	gull, GBTE, RTHA, BBPL, GHOW, owl, AMCR, CORA, corvid, avian, unknown	gull 3D, GBTE 6D 6S, BBPL 2D, AMCR 18D 2S, CORA 31D 8S, corvid 2D, avian 22D, mammal 1S, unknown 18D	gull 2D, GBTE 3D 3S, BBPL 1D, AMCR 9D 1S, CORA 18D 5S, corvid 2D, avian 11D, unknown 11D	GBTE 38D-44D 1S, RTHA 2D	avian 1D	GHOW 1D 1S, owl 1D, avian 11D,	119	66	47	1	14

	Predation			Number of					Total number documented				
Site name	Possible	Suspected	Documented	Eggs	Nests	Chicks	Fledglings	Adults	Eggs	Nests	Chicks	Fledglings	Adults
D Street Fill/Sweetwater Marsh NWR	GBHE, GREG, BCNH, WEGU, gull, GBTE, NOHA, WTKI, COHA, RTHA, AMKE, PEFA, BNOW, AMCR, CORA, EUST, WEME, op, gs, rat, coyote, g fox, raccoon, st skunk, cat, g snake, bw spider, ant	GBTE, NOHA, COHA, RTHA, AMKE, PEFA, BNOW, CORA, cat, ant	GBTE, NOHA, ant	GBTE 1S, NOHA 11D 9S	GBTE 1S, NOHA 8D 5S	GBTE 2D 1S, NOHA 1D 3S, ant 3D			21	14	10	0	0
Chula Vista Wildlife Reserve	GBHE, GREG, CAGU, WEGU,CATE, GBTE, NOHA, RTHA, OSPR, AMKE, PEFA, BNOW, rat, st skunk, cat	GBTE, NOHA, RTHA, AMKE, PEFA, BNOW	GBTE, NOHA, PEFA	GBTE 1S, NOHA 2D 6S	GBTE 1S, NOHA 2D 8S	GBTE 3D 1S, NOHA 2D	PEFA 1D 1S	PEFA 1D 2S	9	11	6	2	3
South San Diego Bay Unit, SDNWR - Saltworks	CAGU, WEGU, gull, CATE, ELTE, GBTE, BLSK, NOHA, AMKE, PEFA, GHOW, BUOW, AMCR, CORA, gs, rat, coyote, st skunk, cat, unk	gull, GBTE, NOHA, coyote, unk	gull, GBTE, BLSK, NOHA, coyote	gull 8D, GBTE 2S, BLSK 2D, NOHA 3S, coyote 6S 35D, unk 3D	gull 4D, GBTE 1S, BLSK 1D, NOHA 2S, coyote 5S 25D, unk 2D	GBTE 3D			59	40	3	0	0
Tijuana Estuary NERR	GBHE, BCNH, CAGU, WEGU, GBTE, NOHA, WTKI, COHA, MERL, AMKE, PEFA, GHOW, AMCR, CORA, op, gs, dog, coyote, cat, snake	BCNH, GBTE, NOHA, op, coyote	GBTE, op, coyote	BCNH 1S, GBTE 1S, NOHA 1S, op 4D, coyote 101D 119S	BCNH 1S, GBTE 1S, NOHA 1S, op 3D, coyote 71D 77S	GBTE 2D			227	154	2	0	0

Appendix B-6 Legend: P: Possible; S: Suspected; D: Documented

Appendix B-7: Site-specific Summaries and Notes (excerpts taken from California least tern data reporting spreadsheets).

Site name:	Summary of breeding season at site:
Sacramento Area	
Bufferlands	The pair nested for the fifth straight year, but failed to fledge young. One individual showed up on 5/21. The other member of the pair was not noted until 6/14. Seen making a scrape on 6/15. The first nest failed (eggs likely eaten by coyotes seen in ponds). A second nest hatched two chicks, detected on 7/19, but only one was seen on 7/22, and after 7/24 there were no additional sightings. The adults continued at the site into August, last seen on 8/8. There was also a single adult bird seen in Natomas on 7/4, which is new for the county outside of the WTP/Bufferlands.
San Francisco Bay Area	
Alameda Point	Very High chick predation by PEFA and AMKE caused high numbers of renesting attempts and high numbers of failed-to-hatch, abandoned and unknown fate eggs. 31 nests containing all eggs of unknown fate had been incubated at least 19 days before being found missing by monitors. 27 nests contained 1 chick and 1-2 eggs of unknown fate. Many adult birds left Alameda Point mid-season due to the predation pressure and might have renested at Hayward Shoreline Regional Park, as that colony's numbers more than doubled mid-season. Very High chick predation by PEFA and AMKE caused high numbers of renesting attempts and high numbers of failed-to-hatch, abandoned and unknown fate eggs. 31 nests containing all eggs of unknown fate had been incubated at least 19 days before being found missing by monitors. 27 nests contained 1 chick and 1-2 eggs of unknown fate. Many adult birds left Alameda Point mid-season due to the predation pressure and might have renested at Hayward Shoreline Regional Park, as that colony's numbers more than doubled mid-season.
Montezuma Wetlands	My list of possible predators comprises only those observed during surveys this year; many more occur at the site and have been seen in other years. Despite collecting more data this year than in any previous year, we still don't have the data to confidently draw certain conclusions. A confounding factor this year is that one colony wasn't discovered until July 5, but on that date it had nests, chicks, and fledglings, so it had clearly been occupied through June. Our total numbers include minimums for this colony back-calculated by the presence of chicks and fledges seen on July 5. At one of our colonies there were 13 nests and 1 brood on June 23. On July 5, there was just a single nest left. Two chicks hatched from that one nest on around July 8 and the pair successfully raised one of them for at least 15 days, through July 24. By July 28 the colony was deserted and remained so for the rest of the season. The other colony remained very active through the end of August.
NSMWA-Green Island Unit	All nests abandoned, we think, due to active presence of peregrine falcon(s).
NSMWA-Huichica Creek Unit	In 2012, we think the group moved to this location, only a few miles away, and re-nested. Huichica Creek update for 2011: There were 5 nests (11 eggs) that were all depredated within a week.
Pittsburg Power Plant	Several Am. Avocets and Killdeer were observed in incubation posture across consecutive weeks on various parts of the nesting area; young were observed on June 17 at the same time as two presumed LETE nests (present since May 18) - all observed birds including young were absent the following survey on June 19. No evidence of predation was observed on walkthrough. A river otter was observed and photographed on the nesting site on July 20th.

Hayward Regional Shoreline	This year we had approximately 162 California least tern breeding pairs (a range of 128.5 to 182 which is based on pair estimate calculations I, II, & III) on Island #5 at the Hayward Regional Shoreline located along the eastern shore of San Francisco Bay. We had a total of 189 incubated nests of which 143 hatched producing a total of 228 chicks. Preliminary evidence suggests that of the 367 eggs laid at the site, a total of 134 fledglings were produced (a range of 121 to 146 is based on the difficulty quantifying the exact fledgling number). Terns were first seen on April 19, 2012 and last recorded at the Hayward Shoreline colony on August 8, 2012. In addition, we observed three Western snowy plover nests on the site this breeding season, of which 3-5 fledglings were produced. This is the fifth year in a row that both these special status species have nested on the island. Fourteen dead chicks, and two depredated fledgling and one adult California Least tern were found on the site. The only disappointing news was that during the middle to latter part of July the colony experienced an unusually high rate of predation on chicks less than seven days old, presumably consumed by a solo Great blue heron that was seen on the island after dark.
San Luis Obispo/Santa Barbara Counties	
Oceano Dunes SVRA	At Oceano Dunes SVRA a minimum of 41 breeding pairs established 46 nests and produced 42 fledglings. The fledgling to pair ratio was 1.02. The number of breeding pairs is an increase from 33 pairs in 2011. Beginning in 2006, almost all chicks have been given a unique color band combination allowing individuals to be recognized in the field. During the seven-year period 2006-12, 78.8% (330/419) of the chicks have been documented to fledge (seen at 21 days old or older). Between 2005-2012, information was collected on how long 333 color banded fledglings continued to be seen on site. See attached table of number of days color-banded California least tern fledglings hatched at ODSVRA continued to be seen on-site after reaching fledge age (21 days old) during the eight-year period, 2005-12.
Guadalupe/Mussel Rock	At Rancho Guadalupe Dunes I saw 2 least terns flying north on May 8. That is my only sighting so far this season.
Vandenberg AFB-Purisima Pt.	Overall, 2012 was an average to below average year at the Purisima Point colony. Adult colony attendance was initially low, but numbers increased and peaked during the week of 30 May. We estimate the 2012 breeding population to be 18 pairs which is 45% smaller than the 17-year mean. Hatching success in 2012 (66%) was slightly higher than the 17-year mean of 57% and fledging success (48%) was slightly higher than the 17-year mean of 40%. Breeding success (0.56 fledglings per breeding pair) was very similar to the 17-year mean of 0.52 fledglings per breeding pair. The Purisima Point least tern colony continues to be characterized by years of anomalously high and low reproductive success, with very few years consistent with the 17-year mean (Figure 1). Results from 2011 and 2012 suggest that the Purisima Point colony may be once again within a period of decreased population and productivity. In 2011, breeding success fell below the 17-year average for the first time since 2006; and in 2012, the breeding population size fell below the 17-year average for the first time since 2008. Rockfish continue to dominate the least tern diet at the Purisima Point colony, but overall diet composition and near-colony foraging rates indicate that rockfish abundance adjacent to the colony may have decreased in recent years.

Ventura County	
Ormond Beach	The number of least terns observed on-site was dramatically lower than in 2011, and the number of LETE nests dropped from 60 in 2011 to 6 in 2012. Western snowy plover nests actually increased from 32 in 2011 to 41 in 2012 (however, the percent of nests that hatch was actually lower in 2012 compared to 2011). Predators were observed, but the failure of LETE nests due to predators could not be determined due to lack of sign (for several plover nests, predation was apparent though the species of predators could often not be determined). Note that one nest hatched one egg, but the other egg was left behind. One nest was found with one egg but no adults, and was ultimately classified as abandoned (incubation was never observed; nest was likely found after abandonment). One nest went from 2 eggs to 1 egg, and the 1 egg was abandoned. Unknown what happed to the 2nd egg. Three chicks (pre-fledgling) were observed from two nests on during one site visit but were never seen again, and fledges were never seen. As such, fledge success could not be determined.
Pt Mugu	Overall, the 2012 LETE breeding season at NBVC Point Mugu had a high potential but was extremely unproductive. A record high 844 nests were documented, but the minimum hatch rate was only 32%. There was high abandonment and significant nest loss due to high tides and strong winds. The amount of loss to flooding has not been observed during the last 12 years of intensive monitoring. Prey availability is suspected to be a driving factor in abandonment and chick loss. Only 15 fledglings were documented during surveys, which is a small fraction of the usual numbers seen at Point Mugu. The Ormond East colony is, by far, the largest of the sub-colonies at NBVC Point Mugu, with 92.5% of all nests. Unfortunately, although the colony continues to grow in size, productivity and fledgling rates remains low. A total of 365 nests were abandoned prior to expected hatching, with 127 unknown outcomes, which were likely lost due to an extreme wind event and a high tide which occurred so close together that we could not determine which event caused the losses. This was the first season in which northern harriers (three) were documented depredating adult and young terns (minimum of 28 taken). It is also suspected there may have been a pair of gull-billed terns on the colony, however this was not confirmed. Gulls, American kestrels, peregrine falcons, and great-horned owls were documented or suspected predating juvenile and adults LETEs. Predation pressure on the adults and a suspected food shortage may have resulted in the abandonment of later season nests and encouraged the departure of the adult terns nearly a month earlier than usual.
Holiday Beach	Holiday Beach is the second largest LETE sub-colony at NBVC Point Mugu. The number of terns nesting at this sub-colony is showing signs of rebounding following a 10% hatch rate (n = 70) in 2010 and a corresponding drop in nest attempts in 2011 (n = 31). In 2012, 42.6% of nests (n = 60) hatched. Only one confirmed predation, by a coyote, was documented. The majority of nests failed due to abandonment caused by wind, high tides, and other causes [See description in the Ormond East colony subsection]. Despite a reasonable hatch rate, fledgling productivity was quite low. Only 4 fledglings were documented out of 44 hatched eggs at this site. While the monitoring of this colony was not as intensive as on Ormond East, the lack of fledglings was likely due to avian predators targeting chicks and suspected decline in food availability.
Holiday Beach Salt Panne	Only three LETE nests were found on the Holiday Salt Panne during the 2012 breeding season. Two were late season nests that were ultimately abandoned. The site is good nesting habitat and typically has had a high hatch rate, but numbers have been down since ground squirrels predated 28 of 29 active nests in 2010. With continued aggressive ground squirrel predator management, hopefully more LETE will return to the site in the future.

Eastern Arm	No LETE nests were found on Eastern Arm in the 2012 breeding season. Some sections of this barrier beach are prone to washing out during high tides or strong swells, as well as this site is a challenge to manage predators due to its remoteness. Therefore, abandonment of this site may not necessarily be a bad thing.
Ormond Beach East	The Ormond East colony is, by far, the largest of the sub-colonies at NBVC Point Mugu. Unfortunately, although the colony continues to grow in size, productivity and fledgling rates remain low. A record high 781 nests were found in 2012; a 14.3% increase since 2011 (n = 683). Due to the diminished size of the satellite colonies, 92.5% of nests at NBVC Point Mugu were on Ormond East. Only 32% of nests hatched and 11 fledglings were confirmed this season. Several factors contributed to the lack of success in hatching and fledging juveniles. Nest failures at the egg stage were primarily due to weather conditions. For the second year in a row, the site was subjected to an extreme wind event from 24-27 May 2012, with gusts of up to 45 mph. The following week, 1-6 June 2012, a high tide series flooded the back dunes of the beach and washed out a large section of nesting area days prior to the first wave of expected hatches. Such severe flooding has not been observed during the last 12 years of intensive monitoring. In total, 345 nests were abandoned prior to expected hatching, 29 washed out, and 120 had unknown outcomes. Since the extreme wind event and the high tide occurred so close together and both resulted in missing nest markers, it was difficult to determine which event caused the losses. Many of the nests with fates reported as unknown were suspected to have been washed out. Avian predators were a particularly problematic for both juveniles and adults this season. Three northern harriers, a male-female pair and a possible juvenile, were routinely documented hunting on the colony. They were responsible for predating a minimum of 20 chicks, 6 fledglings, and 2 adult LETEs. Despite having observers in the blinds, the harriers were difficult to haze and were suspected of predating a higher number of LETE than were documented. Gulls, American kestrels, peregrine falcons, and great-horned owls were also documented predating juvenile and adults LETEs. Due to major problems with gulls in past years, predator management maintained a strong presence on the shoreline this season to discourage gulls from congregating. This technique appeared to be effective since gulls were responsible for minimal losses this season. However, walking the shoreline was not as effective in deterring the harriers. Since relocation and lethal removal of harriers was not in our permit, hazing was the only option. Towards the end of the season, several scarecrows were erected on the shoreline to deter avian predators. It is not clear how successful they were, but they will likely be used again in the future as part of the comprehensive predator management strategy. A minimum of five adult terns were predated during this season. Predation pressure on the adults and a suspected food shortage may have resulted in the abandonment of later season nests and encouraged the departure of the adult terns nearly a month earlier than usual.
Los Angeles/Orange Counties	
Venice Beach/ Marina del Rey	In 2012, California least terns (*Sternula antillarum browni*) arrived at the Venice Beach Colony on April 17 and departed after August 10. We estimate as many as 120 adult least terns were present at the site in 2012. Courtship activities began on April 17 and the first nest was found on May 8. All nests were predated between May 8 and June 4, when the last active nest was observed. We observed direct evidence of 14 one-egg nests. No chicks hatched or fledged due to a lack of foraging resources, and predation by crows (*Corvus brachyrhynchos*; crow). In 2012, crows were the primary predators on eggs, but unlike previous years, no predation occurred on adult least terns.

Bolsa Chica E.R.	This was an unsuccessful breeding season for least tern due primarily to the depredation of eggs and chicks by coyote and secondarily by ravens and gulls. Although nest numbers were high on all four nest sites within Bolsa Chica and the season total for nests was 305, only 16 fledglings were recorded.
South Tern Island (STI)	The first nests on STI were found during the first week of May. By 8 May there were 14 nests. The first chicks were seen at the end of May with no sign of any predation of eggs or chicks. The last nests were laid by 12 June with no second wave of nesting. A total of 56 nests were initiated on STI, producing an estimated 80 chicks. The first fledglings were seen on 15 June. A total of 15 fledglings came from STI. With the exception of one fledgling from Nest Site 1, these were all the least tern fledglings produced at Bolsa Chica during 2012.
Nest Site 1 (NS1)	By 8 May there were 85 nests established on NS1. Between 8th and 15th May, extensive coyote predation took place on this site. Aversion nests were created by predator management in an effort to thwart additional predation, but continued coyote presence was evident on successive surveys. By the end of May, gull tracks were also evident at a number of nests. Nesting continued on a limited basis by the terns but by 19 June there were only 19 active nests and no chicks were seen during surveys. A total of 176 nests were initiated on NS1 producing an estimated 86 chicks and only one verified fledgling.
Nest Site 2 (NS2)	Through the end of May, 27 nests were initiated on NS2 with no signs of either egg or chick predation. Between 7th and 14th June Coyote attacks were evident and by 14th June only 9 nests were active. A total of 46 nests were initiated on the site, producing 53 chicks; yet no fledglings were produced. All predation was attributed to coyote.
Nest Site 3 (NS3)	This site produced 27 nests and all were predated or abandoned by 14 June. Coyote and raven tracks were wide spread throughout the site. This site produced no fledglings.
Burris Basin	We still have a major visibility issue, we cannot monitor well from off the island due to cover interference. We also have a large and growing population of nesting Forester's Terns and Black Skimmers that will preclude least terns eventually without some intervention.
Upper Newport Bay Ecological Reserve - Tern Island	No signs of predation observed during the first wave. Dozens of American avocet and black skimmers observed along the eastern and central areas of side Tern Island. Terns mostly occupied the western end and central area of Tern Island. The second wave was more vulnerable to predation. Coyote tracks were observed along the northern edge of the island. Black skimmer adult and chick carcasses were found.
Upper Newport Bay Ecological Reserve - New Tern Island	New Least Tern Island was created in 2008 by the Army Corps of Engineers. Remote monitoring via scopes from east bluff was conducted weekly with occasional site visits. No nesting was ever observed. By the beginning of summer, the vegetation grew back on the island making remote monitoring difficult and the habitat unsuitable for the nesting birds. A lot of trash accumulated along the southern edge of the island.
San Diego County	
MCB Camp Pendleton	All summary counts are only counts of raw data and not all counts (max nests for example) were taken each survey day. Further analyses using statistical models may give results slightly different than those reported here. Number of site visits given is a minimum.
Delta Beach	All nests established on Delta Beach are considered birds nesting on the edge of the White Beach colony and therefore all observations and counts from nests on Delta are compiled into those for White Beach.

San Elijo Lagoon Ecological Reserve	Potential foraging, roosting, and nesting sites of the endangered California least tern and western snowy plover at San Elijo Lagoon Ecological Reserve and Cardiff State Beach were checked up to weekly through 2012, with Shauna Wolf conducting surveys along the beach, Robert Patton and Maryanne Bache monitoring potential nesting areas within the lagoon, and coordinating volunteers along public access trails to conduct monthly bird counts. Least terns were observed in very limited numbers again this year. One was observed foraging in the east basin on 12 May, 14 foraging along the beach on 11 June, one fledgling along the beach on 29 June, two adults along the beach on 9 July, and two over the west basin on 10 July. No nests were documented this season and no on-ground tern or plover activity observed on saltpanne east of the east basin dike or in other potential nesting areas. Human footprints, dog tracks, coyote and raccoon tracks were observed in the area, as were raptors and corvids.
Mission Bay	
FAA Island	The failure at this site was attributed to nest abandonment due to heavy predator pressure. Most CLT mortality occurred during the incubation stage resulting in abandoned eggs. The chicks that did have successful hatching were lost to abandonment due to possible adult depredation by American Kestrel and Peregrine Falcons, both were observed on the site and hunting the area during the time site abandonment.
North Fiesta Island	Nesting was completely unsuccessful at site this year. Only one nest was established, and it was abandoned close to expected hatching date. Up to 12 CLTs were seen at the site many times during the season, some landing on the site and seeming to be trying to nest. Possibly the presence of many predators discouraged these nesting attempts. No predation took place at the site although many avian predators were present all season. These included crows, ravens, kestrels, Great Blue Heron, Cooper's Hawk, Red-tailed Hawk, Peregrine Falcon, and Northern Harrier. The presence of these predators may have been the cause of unsuccessful nesting attempts at the site.
Mariner's Point	Site was unsuccessful this year. Of 142 nests only 36 hatched, and chicks were lost to predation or starvation soon after hatching. In early June many adults began leaving the site, abandoning their nests. Peregrine Falcons (two adults with one young) were seen at the site, and it was mostly deserted by mid-June. Two fledglings with adults appeared at the site 22 and 24 June. These were not thought to have hatched here as no chicks had been seen at the site for several weeks.
Stony Point	Site was unsuccessful this year. Of 17 nests only 5 hatched. Chicks were not seen again after hatching, and no fledglings were produced. Digging by gophers around the later nests and avian predators present in the area may have contributed to their abandonment.
San Diego River Mouth	This site was completely unsuccessful this year due to loss of all the eggs before hatching (two abandoned eggs in one nest were taken as well as eggs from active nests). Crows were observed on the site on many occasions and are the suspected predators. There was no evidence of predation other than the disappearance of the eggs.
San Diego Bay	
Naval Base Coronado	All summary counts are only counts of raw data and not all counts (max nests for example) were taken each survey day. Further analyses using statistical models may give results slightly different than those reported here. Number of site visits given is a minimum. Number of nests reported in mortalities are those nests that completely failed - nests with at least one hatch are considered to be successful. Predation rates by gull-billed terns on chicks are estimated to be a maximum count and include numbers of recovered bands as well as observed chick depredations.

Lindbergh Field & Former Naval Training Center	Prior to the terns' arrival, San Diego County Regional Airport Authority personnel applied herbicide, manually removed vegetation, and contractor Ocean Blue repaired plastic mesh chick barriers and covers over stormdrains. Zoological Society of San Diego subcontract personnel established a 30 m grid system in the two ovals used in recent years by terns for nesting, and assisted in repairs to chick barriers. Monitoring was conducted April through mid-August one to three days per week. Predator management was conducted by personnel from USDA Wildlife Services. Least terns were first observed foraging over the bay and in flight over the southeast end of Lindbergh Field on 16 April 2012. They were observed each visit after that through 7 August. At least 130 nests were initiated by 96 to 124 estimated pairs between 8 May and 3 July. The maximum number of concurrently active nests was 74 with 22 broods of chicks on 5 June. At least 103 nests were established in the main nesting oval 03-S east of the Ryan taxiway (2 BS), 20 nests in oval 03-S west of the Ryan taxiway (3BS), four nests in oval 04-S (3S), two nests in oval 02-S (1BS), and one nest between the perimeter road and taxiway bravo to the west of oval 03-S. At least 136 chicks from 84 nests hatched successfully. It is estimated that 36 young fledged from the site. Three nests of four eggs were found depredated with raven tracks and two other nests were found depredated and raven suspected. The outcome of nine nest and eggs were uncertain, but lack of evidence of hatching or chick presence indicates probable depredation. Thirty-five nests with 42 eggs were abandoned pre-term, and one single-egg clutch failed to hatch and was abandoned after prolonged incubation of 37 days. One egg failed to hatch and was abandoned after the other egg in its clutch hatched successfully. The abandonment of seven to 20 of these nests coincided with the malfunctioning of the Fourth of July fireworks presentation and subsequent single large explosion over the adjacent bay. On 7 July, a city-maintained water main ruptured under the Ryan taxiway and resulted in flooding approximately 90 percent of the 03-S nesting ovals. No nests were attributed as lost to the flooding since the last had appeared to have been abandoned by 5 July, however, carcasses of three chicks were recovered along the flotsam line. Band recovery data indicated that eight additional chicks had been lost to the flooding by being washed down stormdrains or through the airfield fence and across the highway to the bay. As a result of the flooding, one fledgling relocated to a taxiway and was crushed by an aircraft. On other dates and unrelated to the flooding, two other fledglings on taxiway and perimeter road adjacent to the nesting site were also hit by vehicles or aircraft. One adult and 44 chicks were found with no obvious cause of death. Another adult was observed being taken from the site by a peregrine falcon. One chick was observed taken by an American kestrel, and two others suspected based on injuries to their carcasses and their location beneath the perch where the first was seen to be taken. Nest abandonment and chick mortality coincided with regular disturbance and documented predation by kestrel, peregrine, and raven as well as sightings of Cooper's hawk and crows. Although no other definitive evidence of chick depredation was found, the lack of observations, recaptures, fledglings, and attentive adults indicates that up to 39 more chicks were likely preyed on. Other potential predators observed in the area included rats, great blue heron, black-crowned night-heron, and gulls.

D Street Fill/Sweetwater Marsh NWR	From mid- to late March, San Diego Unified Port District personnel completed mechanical scraping of the site to reduce vegetation and enhance it for use by least terns and snowy plovers. Biological monitors under contract with the Port manually removed non-native invasive plants from the site, pruned back vegetation, surveyed the grid system, and placed decoys and ceramic tiles for chick shelters. Predator management was conducted by personnel of US Department of Agriculture, Wildlife Services. Monitoring was conducted mid-March through mid-August one to three days per week. Least terns were first observed at the D Street Fill on 12 April 2012. They were observed each visit after that through 6 August. At least 114 nests were initiated by 78 to 93 estimated pairs between 5 May and 10 July. The maximum number of concurrently active nests was 75 with three broods of chicks on 29 May. At least 65 chicks from 47 nests hatched successfully. It is estimated that only nine young fledged from the site. The outcome of 16 nests with 20 eggs was uncertain, but lack of evidence of hatching or chick presence indicates probable depredation. Harriers were observed preying on four eggs of two nests, their tracks were found with seven depredated eggs from six nests, and they were suspected in the depredation of nine eggs from five nests due to the disposition of remains of the eggs. Harrier tracks were also found associated with the depredation/scavenging of 14 previously abandoned eggs from 11 nests. One egg was found depredated with longitudinal crease outside of the nest and gull-billed tern was suspected responsible. Forty nests with 52 eggs were abandoned pre-term, and four eggs failed to hatch and were abandoned after the other egg in each clutch hatched successfully. Fifteen chicks and one adult were found with no obvious cause of death. An additional chick was found dead being scavenged by ants, but whether ants contributed to its death could not be determined. Three other chicks appeared to have been depredated by ants. One chick was observed being taken by a northern harrier and prey being carried but not definitively identified was suspected to be two to three other chicks. One chick was observed being taken by gull-billed tern and at least one other was suspected of being taken. The band from another chick at D Street was recovered in a regurgitated pellet at the gull-billed tern nesting colony at South San Diego Bay saltworks. No other definitive evidence of chick depredation was found, but lack of observations, recaptures, fledglings, and attentive adults indicates that others were likely preyed on. The disappearance of up to 30 to 31 chicks coincided with documented predation and daily disturbances to the colony by northern harrier, and visits by Cooper's hawk, red-tailed hawk, American kestrel, peregrine falcon, gull-billed tern, barn owl, common raven, and feral cat. Other potential predator species observed in the area included great blue heron, great egret, night-heron, kite, gulls, crow, starling, meadowlark, opossum, rats, ground squirrel, skunk, raccoon, gray fox, coyote, and gopher snake. The majority of chick mortality and nest abandonment occurred through June and early July when mortality was reported at other colony sites and attributed to possible lack of prey fish availability, but also coincided with repeated hunting of the site by the aforementioned predators.

Chula Vista Wildlife Reserve	Prior to early April 2012 and the terns' arrival, Zoological Society of San Diego subcontract personnel coordinated herbicide application, mechanical scraping and dragging of the site, and weeded invasive non-native vegetation, surveyed the grid system, and placed ceramic tiles for chick shelters, decoys, and new signs. Monitoring was conducted mid-February through mid-September one to three days per week. Predator management was conducted by USDA Wildlife Services staff. Least terns were first observed at Chula Vista Wildlife Reserve on 12 April 2012, and on each visit through 9 September. A migrant group of two adults and two fledglings was observed foraging on 13 September. At least 64 nests were initiated by 29 to 37 estimated pairs between 12 May and 10 July with distribution throughout but most in the southwestern portion of the site. This included one nest far to the east of the site, located in the road just west of the gate. The maximum number of concurrently active nests was 27 with two broods of chicks on 10 July. At least 55 chicks from 36 nests hatched successfully. It is estimated that 18 to 20 young fledged from the site this season. The outcome of nine nests with 11 eggs was uncertain, but lack of evidence of hatching or chick presence indicates probable depredation. Nine eggs from six nests were documented to have been depredated, including one with longitudinal crease indicating having been hit by a gull-billed tern, two with harrier tracks, and others suspected of harrier predation. In addition, one previously abandoned egg was found depredated with harrier tracks. One depredated eggshell appeared to have been nibbled on by rodents, but it was unclear if that was a result of scavenging or from the initial predation. Fourteen nests were abandoned pre-term, one was abandoned after the other egg in its clutch was depredated, and two other nests were abandoned after one of two eggs in each clutch disappeared and were suspected of being depredated. One egg failed to hatch and was abandoned after the other egg in its clutch hatched successfully. Three chicks were found dead of undetermined causes. Peregrine falcons were observed taking one adult and one fledgling, and feather piles led to suspicion of their responsibility in the depredation of one to two other adults and at least one fledgling. The two observed predation incidents occurred within four days of the return to CVWR by a previously trapped immature peregrine. It had been trapped at CVWR, released five days later in Alpine, and returned to CVWR within four hours. A harrier was removed while taking one chick and the remains of a second chick were found in necropsy. A gull-billed tern was observed picking up and dropping a hatching egg, although the chick appeared healthy at least the following day. A gull-billed tern was observed carrying prey that was possibly a tern chick but could not be definitively identified. The bands from three chicks at CVWR were recovered in pellets at gull-billed tern nests at South San Diego Bay saltworks. This represents seven percent of bands used this season. No other definitive evidence of chick depredation was found, but lack of observations, recaptures, fledglings, and attentive adults indicates that others were likely preyed on. The disappearance of up to 25 to 27 chicks coincided with repeated hunting of the site by gull-billed terns, at least three peregrine falcons and five harriers, an American kestrel and red-tailed hawk, and up to six barn owls. Other potential predator species observed in the area included great blue heron, great egret, gulls, Caspian tern, osprey, striped skunk, feral cat, and rats. To the east of the site were opossum, ground squirrel, gray fox, coyote, American crow, and common raven.

Saltworks	Potential nesting sites of the endangered California least tern and western snowy plover were monitored one to three days per week March through September by Robert Patton, Matt Sadowski, Lea Squires, Kate Goodenough, and Brian Collins. Predator management was conducted by USDA Wildlife Services staff. Least terns were first observed at the saltworks on 17 April 2012, although they had been seen at Adjacent Chula Vista Wildlife Reserve on 12 April. They were observed each visit after that through 15 August, then two to three were seen on 24 and 31 August, and on 13 September. At least 90 nests were initiated by 30 to 49 pairs between 13 May and 18 July in four concentrations or subcolonies. The maximum number of concurrently active nests was 30 on 3, 13, and 17 June, and on 4 July. Thirty-four nests were established near the wooden bridge/sluice on the southeast edge of pond 25, east edges of ponds 26 and 27, and west edge of pond 30; 10 nests were established on west dike IV, east dike VI, and north dike VII; and 42 nests were established on the new fill in southeast pond 11. A significant number of nests appeared to be renests as evidenced by multiple waves of nesting, followed by large numbers depredated, then an increase again in new nests, frequently in close proximity or even within the same scrapes as recently depredated nests. Only 29 chicks from 19 nests hatched successfully. The majority of chicks were not seen beyond the first three days following hatching with predation the most likely limiting factor. Only one is estimated to have fledged from the site, and it had been the last to hatch. Thirteen nests with 18 eggs were abandoned. Two nests with three eggs on the pond 11 island were flooded by high tides. At least 59 eggs from 38 nests (44 to 66 percent) were depredated, including two eggs from one nest destroyed by encroaching black skimmers. Twenty-five nests with 37 eggs were found depredated with coyote tracks (including seven nests on the pond 11 island), two eggs from two other nests were suspected of being depredated by coyote, and three previously abandoned eggs from two nests were depredated by coyote. Eight eggs from four nests were depredated by gulls, as were three previously abandoned eggs in two nests. Tracks and shell damage indicated predation of two eggs in one nest by gull-billed tern. A harrier was observed scavenging seven previously abandoned eggs from four nests and was suspected in depredating three eggs from two active nests. The fate of 24 eggs from 19 nests was uncertain, but lack of evidence of hatching or chick presence indicates probable depredation. Three chicks were depredated by gull-billed terns, including one carcass found adjacent to a gull-billed tern nest, one seen being carried by a gull-billed tern adult and offered to two large chick/fledglings, and one seen taken from its nest by a gull-billed tern. Bands of additional least tern chicks that had originated from most other sites around San Diego Bay this season were found in regurgitated pellets at gull-billed tern nest and brood sites. No other definitive evidence of chick depredation was found, but lack of observations, recaptures, fledglings, and attentive adults indicates that the other chicks were likely preyed on by the above-mentioned species. Other predator species observed in the area included red-tailed hawk, kestrel, peregrine falcon, burrowing owl, great horned owl, raven, crow, ground squirrel, cat, skunk, and small rodents.

Tijuana Estuary NERR	Potential nesting sites of the endangered California least tern and western snowy plover were monitored one to three days per week from mid-February to late October by Robert Patton, Matt Sadowski, Lea Squires, and Brian Collins. Predator management was conducted by USDA Wildlife Services staff. California least terns were first observed at Tijuana Estuary on 17 April 2012. They were observed each visit after that through 12 July, and small numbers of migrants were observed 26 July through 2 August, and 23 to 30 August. At least 283 nests were initiated by 94 to 109 pairs between 10 May and 12 July. The maximum number of concurrently active nests was 94 on 21 June. Nests were distributed in four concentrations or subcolonies. The rivermouth shifted significantly to the south again this season, opening up potential nesting habitat north of the rivermouth but eliminating what had been the largest potential nesting area and historic least tern colony site south of the rivermouth. At least 84 nests were established on upper beach immediately north of the rivermouth but south of the barrier dune, and two were established at the historic north site on the east side of the barrier dune between Seacoast Dr. and the rivermouth. At least 17 nests were located in upper beach and dune areas south of the rivermouth in what remained of the historic south rivermouth site. Between the beach parking lot and equestrian access trail at Border Field State Park, 158 nests were established, and 22 nests were established north of the trail. It is possible that additional nests were initiated but depredated before being found and counted by monitors. Only 22 chicks hatched from 14 nests, although evidence of hatching for many simply consisted of eggshell and/or tracks and feces. No chicks were seen beyond the first week following hatching with predation the primary limiting factor. This season at Tijuana Estuary, no fledglings were produced and no chicks survived to fledging age. Fifty-four nests with 73 eggs were abandoned pre-term. Twenty-three eggs in 16 nests were flooded by extreme high tides. The outcome of 62 nests with 75 eggs was undetermined but predation was suspected. At least 81 percent of eggs were depredated: 152 nests with 225 eggs. These included 73 nests with 107 eggs found depredated with coyote tracks, and 68 nests with 110 eggs depredated but with tracks obscured by blowing sand, suspected of being depredated by coyote since they were found on the same dates and in same areas as those with tracks. Two nests with four eggs were found depredated with opossum tracks, one egg found depredated near night-heron tracks, and one egg with longitudinal crease suspected inflicted by gull-billed tern. The increased coyote presence and predation this season were thought to be due to two factors: Following prolonged drought, San Diego experienced two winters of above-average rainfall followed by average rainfall last winter. Populations of prey species including insects, rodents, and rabbits responded to the increased vegetation, and populations of predator species such as coyotes increased in turn. Construction and staging activity associated with the border fence project resulted in significant disturbance and fragmentation of upland habitats on the slopes adjacent to the estuary this season, likely causing coyotes to expand and/or relocate foraging ranges into marsh and beach habitats. Two chicks were documented depredated by gull-billed terns when one was seen being carried from the site and the band of another was found in regurgitated pellet at the gull-billed tern colony in South San Diego Bay. Additional chick predation was suspected by each of the above-mentioned species as well as by northern harrier. Other potential predator species observed in the area were ants, snakes, small rodents, ground squirrel, great blue heron, night-heron, kite, Cooper's hawk, kestrel, peregrine falcon, gulls, great horned owl, crow, raven, meadowlark, cat, and dog.
Imperial County	
Salton Sea	The only sightings of Least Terns at the Salton Sea in 2012 were single birds at the south end on 02 and 29 June. No indication of nesting.