Least Tern *Sterna antillarum*

The beaches that are now the summer playground of millions of southern Californians were once the home of the Least Tern. With disturbance and development of its habitat, this once common bird became rare and was among the first species listed as endangered in 1970 by both the California Department of Fish and Game and U.S. Fish and Wildlife Service. Intensive study, monitoring, and management have allowed San Diego County's Least Tern population to increase from about 500 pairs in the late 1970s to about 2100–2800 pairs 1997–2002 and nearly 4000 pairs in 2003. The tern's future, however, is now in the hands of man: special protection of colony sites and control of weeds and predators are inescapable if a ground-nesting bird like the Least Tern is to survive in its now urbanized environment.

Photo by Anthony Mercieca

Breeding distribution: The Least Tern's nesting sites in San Diego County in the late 20th and early 21st centuries are listed in Table 7, on the basis of data provided by Robert T. Patton and recorded by him, Elizabeth Copper, Brian Foster, and Shauna Wolf.

The colonies at Aliso Creek, the Santa Margarita River mouth, Naval Amphibious Base, and Tijuana River mouth are also notable because they are the county's only sites where the tern still nests on dunes and flats more or less in their natural condition. At Batiquitos Lagoon, the terns nest on several artificial sand flats installed for them at the time the lagoon was dredged and reopened to the tide, as part of an attempt at restoration of this badly silted lagoon in the mid 1990s. Around Mission and San Diego bays, most of the tern's nesting sites are fills, islands, or dikes built of dredge spoil, sometimes covered with sand.

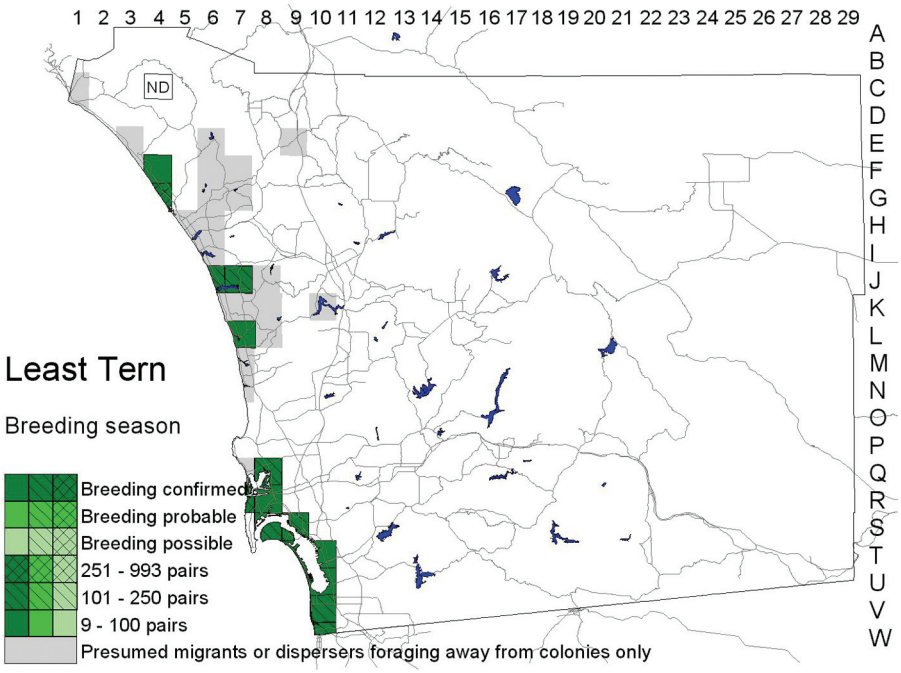
Least Terns have a high level of fidelity to colonies where they have established themselves as adults, less so to their natal colonies (Atwood and Massey 1988). But high levels of disturbance and a high rate of nest failure mean that shifting among colonies is frequent. Site fidelity may be lower in San Diego County than in Los Angeles and Orange counties (area of Atwood and Massey's study) because in San Diego there are more colonies with less distance between them. The terns sometimes take advantage of new sites (whether they were designed for the birds or not) as soon as they are created. For example, during the building of Seaport Village in downtown San Diego in 1977, 17 pairs nested on new bayfill there, and

Table 7 Estimated Minimum Number of Nesting Pairs of the Least Tern in San Diego County, 1997–2003

Site	Square	1997	1998	1999	2000	2001	2002	2003
Aliso Creek mouth	F4	17	33	53	36	37	39	87
Santa Margarita River mouth	G4	808	727	619	993	953	545	1091
Batiquitos Lagoon (west half)	J6	142	93	126	110	113	147	398
Batiquitos Lagoon (east half)	J7	129	86	28	26	62	72	176
San Elijo Lagoon	L7	9	1	8	15	8	1	0
Mission Bay: FAA Island	Q8	20	31	66	173	184	192	216
Mission Bay: north Fiesta Island	Q8	76	21	0	15	53	60	60
Mission Bay: Mariner's Point	R7	268	528	562	282	227	220	250
Mission Bay: South Shores	R8	0	9	0	0	0	0	0
Naval Training Center	R8	0	0	0	0	2	0	0
North Island Naval Air Station	S8	22	59	75	128	105	71	165
Lindbergh Field	S9	102	17	20	25	35	48	46
Naval Amphibious Base	T9	410	495	570	541	664	534	954
D Street Fill	T10	38	5	30	28	30	23	79
Chula Vista Wildlife Reserve	U10	0	2	2	0	0	3	25
Salt works	U10/V10	36	39	15	35	35	26	39
Tijuana River mouth	V10/W10	211	81	87	178	252	146	358
Total		2288	2227	2261	2585	2760	2127	3944

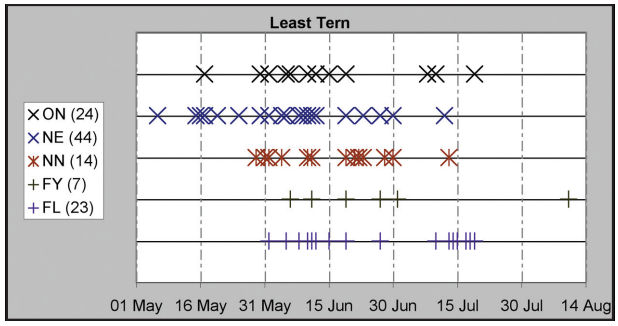
the first year after the installation of the Chula Vista Wildlife Reserve in 1980, 55 pairs nested there. The trend over time, however, with development of the coastline almost complete, has been for the tern's distribution to become more stable from year to year.

Least Terns forage in the bays and estuaries near their colonies, on the ocean near shore, and at inland lakes in the coastal lowland. No nesting was reported inland during the atlas period 1997–2001, but in earlier years the birds established small, ephemeral colonies up to 4 miles from the coast. For example, in 1981, nine pairs nested in Encinitas (K7) in a then-vacant lot 2 miles from the beach and 2 miles from San Elijo Lagoon. O'Neill Lake, Camp Pendleton (E6), is the terns' most heavily used inland foraging site, with up to 40 there 26 July 1999 (P. A. Ginsburg). More birds go inland after the young fledge in late July and August and the birds are no longer tied to their nests. But even in the middle of the breeding season some birds forage inland, with up to 15 at O'Neill Lake 15 June 1998 (P. A. Ginsburg) and 10 at San Dieguito Reservoir (K8) 14 June 1998 (J. Determan). The most inland sites are Depot Lake in the Fallbrook Naval Weapons Station (D6; one on 16 May 2002, J. R. Barth), Lake Hodges (K10; two on 14 June 1999, R. L. Barber), and a pond in the San Luis Rey River valley at the mouth of Keys Creek just east of Interstate 15 (E9; two engaging in courtship feeding 10 June 2001, J. E. Pike). At 15.8 miles from the beach the last locality is the farthest inland. Apparently Least Terns move inland much more in the northern than the southern half of San Diego County. South of the San Dieguito River we had no records during the atlas period, though in past years Least Terns have been seen in Mission Valley (R9), along the Sweetwater River at Bonita (T10/T11), and at the Dairy Mart pond in the Tijuana River valley (V11).



Nesting: The Least Tern's nest is a simple scrape in the sand or dirt, usually lined with a few broken bits of shell or debris. At Lindbergh Field and North Island, the birds nest in cracks in the pavement, other gravelly areas, or the small depressions for electric lights to guide airplanes at night, in spite of the heavy traffic of aircraft around them. Within a colony, nests may be within a few feet of each other, as on the FAA Island when large numbers of terns use that site, or well separated, as in most colonies—a strategy for making the nests difficult for predators to discover.

In southern California, the Least Tern lays its eggs generally



from mid May to early July. A second "wave" of laying by two-year-olds and birds that lost their first clutches follows the first by about four to five weeks (Massey and Atwood 1981). At the Santa Margarita River mouth in 1997, the terns began laying 6 May (exceptionally early), began hatching 29 May, and finished hatching 13 July (B. Foster). At the salt works in 1998, they laid from at least 15 May to 30 June and hatched from 12 June to 21 July (Terp and Pavelka 1999). The terns may lay as late July, but these eggs are abandoned by mid August. Eggs being incubated up to 8 August can still hatch into chicks that fledge (E. Copper).

Migration: Least Terns typically begin arriving in San Diego in mid April. During the atlas period the earliest report was 13 April (Batiquitos Lagoon, M. Baumgartel), but in 1995 it was 4 April (two on San Diego Bay, B. Foster, NASFN 49:308, 1995), and in 1994 it was 30 March, the earliest ever (E. Copper, NASFN 48:341, 1994). Postbreeding dispersal begins immediately after the chicks start fledging in June. By the first week of July, flocks can be seen away from colonies (52 birds at San Onofre State Beach, C1, 6 July 1997, P. D. Jorgensen), but many remain in San Diego County through August. Most Least Terns leave the county in early September, and by mid September the species is rare. There are two records of stragglers as late as October: of one near Imperial Beach (V10) 9 October 1993 (G. McCaskie, AB 48:152, 1994) and one at the San Diego River mouth (R7) 27–28 October 1981 (C. G. Edwards, E. Copper, AB 36:218, 1982).

Birds banded as chicks in San Diego County have been seen in nesting colonies as far north as Alameda County, the northern limit of the Least Tern's range in California. Least Terns banded in southern California, including San Diego County, have been seen in winter along the Pacific coast of Guatemala, of Chiapas, southern Mexico, and of Colima, western Mexico (Massey 1981).

Conservation: The Least Tern's increase over the final quarter of the 20th century is a success, but there is no room for complacency. The forces that made the tern an endangered species are as strong as ever and would overwhelm it without intensive management. A basic problem is that the colony sites are now fixed: with the rest of the San Diego County coastline developed, no alternative sites are available if a site is overgrown with vegetation and so becomes unsuitable or when predators learn the location of a colony and return repeatedly. Accelerated silting in of lagoons, the result of the vegetation being stripped from watersheds during development, has eliminated some former nesting sites, as at Los Peñasquitos Lagoon (N7). The tern's strategy of shifting colony sites as conditions demand is no longer possible.

Many techniques have been used to encourage and protect the terns. Teams of volunteers organized by the San Diego Audubon Society and U.S. Fish and Wildlife Service have controlled invasive vegetation that would otherwise overrun sites such as Mariner's Point, Fiesta Island, the FAA island, and the Tijuana River mouth. Papier-mâché models of Least Terns have been set out as decoys to draw the birds to nest at sites where they can best be protected. Sites that lack adequate protection for chicks have been supplied with pieces of Spanish roof tiles, under which the chicks can take refuge. Some sites have been fenced and posted—fencing must be of sturdy chain link to be really effective, though this sometimes provides perches from which predators can survey the colony. Predators have been controlled through both trapping and shooting. The list of predators attacking the Least Tern in San Diego County is long and varied, including the Western Gull, American Kestrel, Common Raven, California ground squirrel, coyote, opossum, rat, ant, and domestic dog and cat. Even species as apparently innocuous as the Western Meadowlark and Domestic Pigeon have destroyed Least Tern eggs (E. Copper). In one week in 1999, a single coyote destroyed or caused the abandonment of about 340 of the 790 nests at the Santa Margarita River mouth, site of California's largest Least Tern colony (B. Foster). Unfortunately, several known predators are themselves rare, declining, or endangered species, including the Peregrine Falcon, Northern Harrier, Burrowing Owl, Loggerhead Shrike, and Gull-billed Tern, making predator control for the sake of the Least Tern a balancing act.

Adequate funding and coordinated management for activities this intensive is a constant challenge. Sites must be cleared before the birds arrive—not after. Vehicles, horses, and pedestrians must be kept out of colonies before they crush eggs and chicks. Control appropriate for one predator is inappropriate for another, and which predator will strike which colony next is difficult to predict.

Oceanographic variations may also affect the Least Tern's food supply and nesting success. From 1993 to 1997, San Diego County colonies produced an average of 1200 fledglings per year, but in 1999 the figure was only around 100. That year, newly hatched chicks were smaller than normal by roughly 25%, and many died within just a couple of days of hatching. The nest-abandonment rate was also higher than normal, so many of the eggs laid never had a chance to hatch. An ocean cooler than usual, as a result of La Niña, apparently delayed the breeding of the small fish on which the terns feed (B. Foster). Conversely, the increased ocean temperature and reduced fish abundance associated with El Niño also have a negative effect: Atwood and Massey (1988) suggested that the dip in California's Least Tern population in 1984 was due to high mortality in the winter range during El Niño. The population did not recover to its 1983 level until 1988 (Massey et al. 1992).

Taxonomy: The type locality for the California Least Tern, *S. a. browni* Mearns, 1916, is in San Diego County, on the beach at the international border. The validity of this subspecies has often been questioned, but Johnson et al. (1998) investigated the Least Tern's variation in color and upheld the distinction of *browni* from subspecies *athalassos* of the Mississippi basin and *antillarum* of the Atlantic coast on the basis of a combination of color differences. The trend of these is that *browni* differs from these two in its paler nape but duller back and darker (though still whitish) breast. Johnson et al. did not compare *browni* with two subspecies in Mexico, but the more northern of these, *S. a. mexicana* van Rossem and Hachisuka, 1937, was described as still darker than *browni*, the difference evident in the field.