

CALIFORNIA LEAST TERN

RECOVERY PLAN

Prepared by the

California Least Tern Recovery Team

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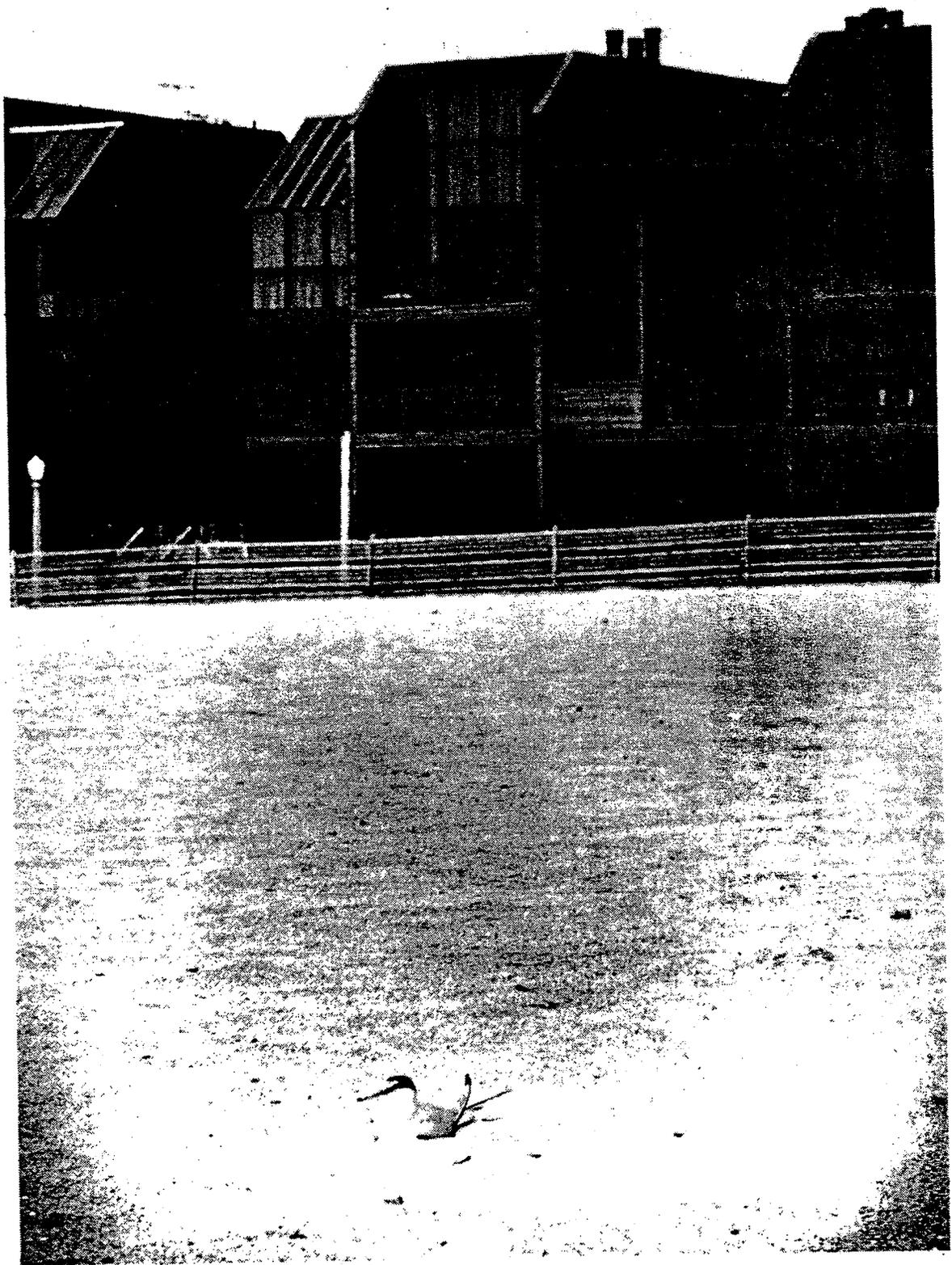
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Cover: Original sketch by Narca Moore-Craig, Sacramento, California
 Photo by: Bill Beebe



Frontispiece - California Least Tern at Venice Municipal Beach, Los Angeles County, CA. Photograph by Bill Beebe, (Santa Monica Evening Outlook), June 1977. "Encroachment of civilization in its coastal breeding range threatens the survival of the California least tern".

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PART I

INTRODUCTION

Once the beaches of southern California teemed with California least terns (*Sterna albifrons browni*). Today, numbers are so depleted that both the U.S. Fish and Wildlife Service (1973) and California Fish and Game Commission (California Department of Fish and Game 1976) consider these birds in danger of extinction and classify them as an endangered species.

Preventing extinction and returning the California least tern population to a stable, nonendangered status are the goals of the California Least Tern Recovery Team. This recovery plan summarizes available biological information on the terns, identifies their environmental needs, and proposes orderly and comprehensive action to restore them to a viable population and ultimately, to delist the species from its endangered classification.

Nomenclature

The California least tern is one of 12 recognized subspecies of the least (or little) tern (Brodkorb 1940, Burleigh and Lowery 1942, Peters 1934, Van Rossem and Hachisuka 1937), three of which inhabit the United States. Although known and studied at an early date (Holterhoff 1884, McCormick 1899), the California least tern was not described as a separate subspecies until Mearns (1916) published the description. Burleigh and Lowery (1942) and Massey (1976) have questioned the validity of this subspecies based on studies of morphological, behavioral and vocal characteristics. Perhaps in part due to its geographical isolation from other subspecies, *Sterna albifrons browni* is still accepted by most authorities

(AOU checklist, 1957). The subspecific status of the California least tern has no bearing on its Endangered species listing because distinct population segments of a vertebrate species may be listed under the Endangered Species Act of 1973, as amended.

Description

Least terns are the smallest members of the subfamily Sterninae, measuring about nine inches long with a 20-inch wingspread. Sexes look alike, being characterized by a black cap, gray wings with black wing-tips, orange legs, and a black-tipped yellow bill. Immature birds have darker plumage and a dark bill, and their white heads with dark eye stripes are often quite distinctive. The California least tern cannot be reliably differentiated from other races of the least tern on the basis of plumage characteristics alone (Burleigh and Lowery 1942).

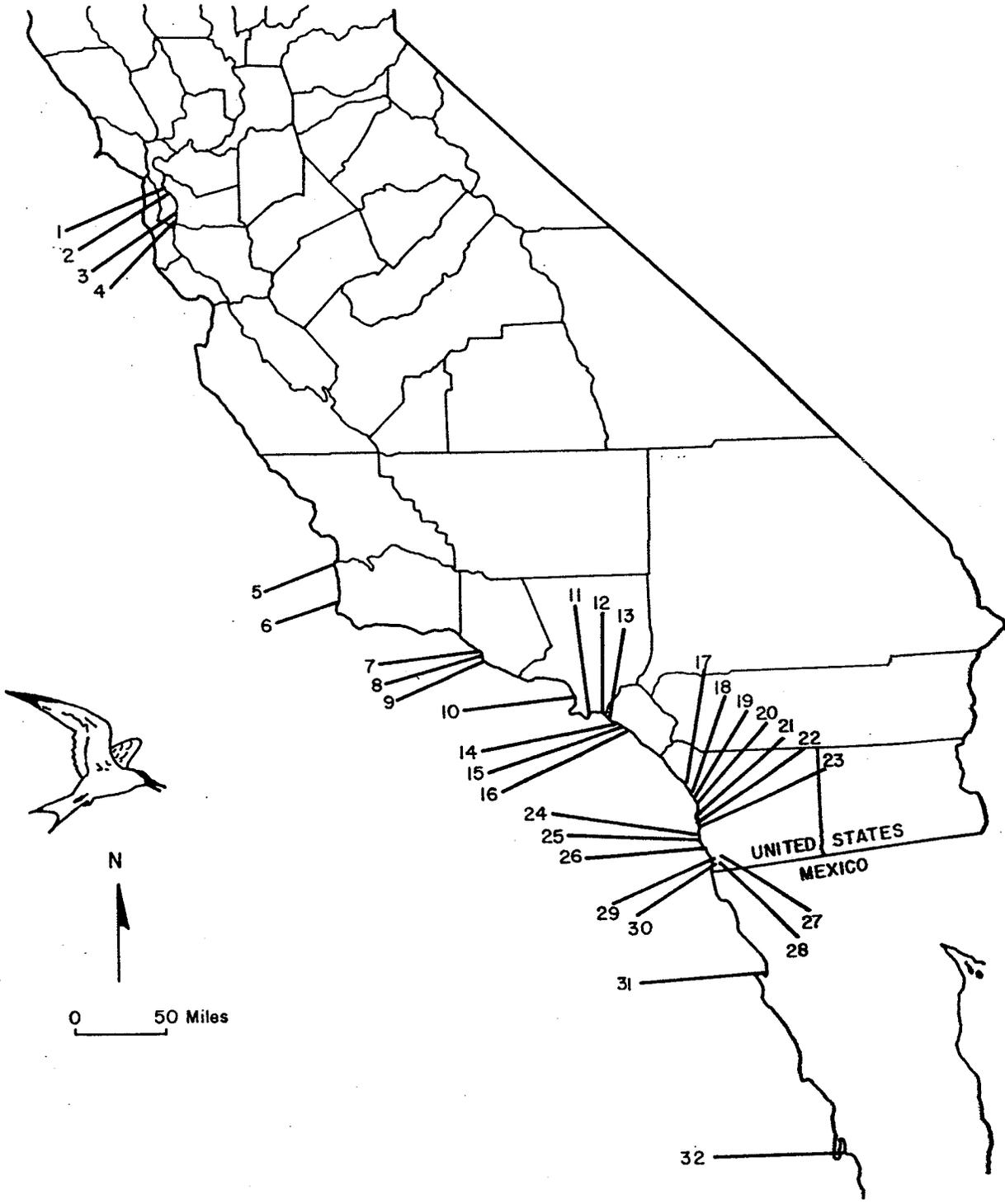
Distribution

The California least tern is migratory, usually arriving in its breeding area during the last week of April and departing again in August (Davis 1968, Massey 1974, Swickard 1971). However, terns have been recorded in the breeding range as early as 13 March and as late as 31 October (Sibley 1952) and 24 November (San Diego Natural History Museum specimen records).

The historical breeding range of this subspecies has usually been described as extending along the Pacific Coast from Moss Landing, Monterey County, California, to San Jose del Cabo, southern Baja California, Mexico (A.O.U. 1957, Dawson 1924, Grinnell 1928, Grinnell and Miller 1944). However, least terns were nesting several miles north of Moss Landing at the mouth of the Pajaro River, Santa Cruz County, California, at least from

1939 (W.E. Unglish, Western Foundation of Vertebrate Zoology egg collection) to 1954 (Pray 1954). Also, although nesting at San Francisco Bay was not confirmed until 1967 (Chandik and Baldrige 1967), there are numerous spring and summer records for the area, so nesting may have occurred previously (Allen 1934, Chase and Paxton 1965, De Benedictis and Chase 1963, Grinnell and Wythe 1927, Sibley 1952). Since 1970, nesting sites have been recorded from San Francisco Bay to Bahia de San Quintin, Baja California (Figure 1 and Appendix B). The nesting range in California has apparently always been widely discontinuous, with the majority of birds nesting in southern California from southern Santa Barbara County south through San Diego County. Between the city of Santa Barbara and Monterey Bay, a distance of over 200 miles, the only certain breeding locations are the mouths of the Santa Ynez and Santa Maria rivers in Santa Barbara County. Apparently, reliable local sources have also reported least terns once nesting at Morro Bay, San Luis Obispo County. While San Francisco Bay appears to be the usual northern limit of the least tern's range, there are four records of single birds at Humboldt Bay (Yocom and Harris 1975, P. Springer pers. comm.) and two specimens collected at Fort Stevens, Clatsop County, Oregon (Walker 1972).

In Baja California, two nest sites are identified in the literature: Scammons Lagoon (Bancroft 1927, Grinnell 1928), and San Jose del Cabo (Grinnell 1928, Lamb 1927). In 1975, a nesting colony was found near Ensenada (Massey 1977) and in 1976, a small colony was discovered at Bahia de San Quintin (Wilbur, pers. comm.). Several other nesting areas in Baja California are suspected.



Key to Figure 1

- | | |
|-------------------------|------------------------------------|
| 1 - Alameda Island | 17 - Santa Margarita River |
| 2 - Bay Farm Island | 18 - Buena Vista Lagoon |
| 3 - Coyote Hills | 19 - Agua Hedionda Lagoon |
| 4 - Bair Island | 20 - Batiquitos Lagoon |
| 5 - Santa Maria River | 21 - San Elijo Lagoon |
| 6 - Santa Ynez River | 22 - San Dieguito Lagoon |
| 7 - Santa Clara River | 23 - Los Penasquitos Lagoon |
| 8 - Ormond Beach | 24 - Mission Bay |
| 9 - Mugu Lagoon | 25 - North San Diego Bay |
| 10 - Playa del Rey | 26 - North Island |
| 11 - Terminal Island | 27 - Sweetwater Marsh |
| 12 - San Gabriel River | 28 - South San Diego Bay Saltworks |
| 13 - Huntington Harbour | 29 - Coronado Cays |
| 14 - Bolsa Bay | 30 - Tijuana River |
| 15 - Huntington Beach | 31 - Estero de Punta Banda |
| 16 - Upper Newport Bay | 32 - Bahia de San Quintin |

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The migration routes and winter distribution of the California least tern are almost unknown. There appear to be no confirmed records of least terns on the Pacific Coast of South America, and there are only a few reports from the Pacific Coast in Honduras, Guatemala and Panama. Because several races of least terns are recognized in western Mexico, and most subspecific plumage differences are observable only in breeding plumage, racial allocation of wintering birds is seldom possible without banding or special, readily discernable markings done prior to migration. From 1954 through 1972, 508 California least terns were banded on their breeding grounds; 1,783 least terns of at least one year of age were banded from 1973 to 1979 (Massey 1973, Rypka 1978, Massey and Atwood 1979). As of 1979, 39 banded terns have been recovered, all in California during the breeding season (Massey and Atwood, pers. comm.).

Life History

Breeding behavior

Least terns arrive in the vicinity of the nesting areas from mid-April to early May. Some pair bonds may form before arrival in the nesting areas, others begin to form within the group almost immediately, and active courtship may be observed within the first few days after arrival (Davis 1968, Swickard 1971, Massey 1974).

Courtship follows a well-defined pattern, beginning with "fish flights" wherein a male carrying a fish is joined by one or two other terns in high flying aerial display. Aerial glides (pairs flying in unison) follow. Posturing and parading on the ground occur in the late stage of courtship with the male holding a small fish in his beak as he courts

the female. During copulation, the female takes the fish from the male and eats it (Wolk 1954, Hardy 1957, Davis 1968, Massey 1974).

Nest location and construction

The least tern usually chooses its nesting location in an open expanse of light-colored sand, dirt, or dried mud close beside a lagoon or an estuary where food can be procured (Craig 1971, Swickard 1971, Massey 1974). Formerly, sandy ocean beaches regularly were used, but increased human activity on the beaches has made most of them uninhabitable.

Recently, nesting observed has occurred on mud and sand flats back from the ocean or on man-made land fills (Longhurst 1969, Craig 1971).

Least terns are colonial but do not nest in as dense concentrations as many other terns. Although nests have been found as close together as 2.5 feet (Davis 1968), usual minimum distances between nests are 10-15 feet, with averages usually much greater (Wolk 1954, Hardy 1957, Massey 1974). Swickard (1971) found nest densities to be 16-18 per acre. In other instances, colonies are widely dispersed with over 300 feet between nests. Accordingly, at present no meaningful data are available on representative nesting densities of least terns.

The nest is a small depression in which the eggs are deposited. In sand, it is scooped out by the bird (Davis 1968, Swickard 1971, Massey 1974), but in hard soil, it may be any kind of natural or artificial depression - for example, a dried boot print (Swickard 1971). After the eggs are laid, the nests are often found to be lined with shell fragments and small pebbles. Swickard found a nest depression completely lined with small twigs.

The eggs

Least tern eggs measure approximately 31 x 24 mm (1.2 x 0.9 in.), and are buffy with various brownish and purplish streaks and speckles (Bent 1921, Davis 1968, Hardy 1957, Massey 1974). One to four eggs are laid, with two to three-egg clutches being reported most often (Anderson 1970, Massey 1974). Egg laying usually occurs in the morning, with the eggs laid on consecutive days (Davis 1968, Massey 1974).

The nesting season extends from approximately 15 May into early August, with the majority of nests completed by mid-June (Bent 1921, Grinnell 1898, Swickard 1971). July and August nests may be mainly renests after initial attempts failed. Most authorities agree that least terns are capable of successfully raising only one brood per pair in a season.

Incubation

Incubation, which begins with the laying of the first egg, is irregular at first but becomes steady after the clutch is completed (Davis 1968, Massey 1974, Swickard 1971). Both parents participate, but the female initially takes a much greater part than the male (Davis 1968, Hagar 1937, Hardy 1957, Massey 1974, Swickard 1971). Extremes of from 17 to 28 days have been documented.

Post-hatching period

Eggs usually hatch on consecutive days, and the chicks are initially weak and helpless. The adults brood continuously during the first day (Davis 1968), but by the second day, the chicks are strong and make short walking trips from the nest. From the third day on, they are increasingly mobile and active (Davis 1968, Massey 1974). Flightless young have been seen as late as the first week of September (Tijuana River mouth, R.G. McCaskie and J.M. Sheppard, pers. comm.).

Flight stage is reached at approximately 20 days of age, but the young birds do not become fully proficient fishers until after they migrate from the breeding grounds. Consequently, the parents continue to feed the young even after they are strong fliers (Massey 1974, Swickard 1971, Tompkins 1959).

Nest success and survival of young

Although California least tern colonies have, on occasion, suffered heavy losses of eggs and young to predators or unfavorable weather conditions, egg hatch and nestling survival are generally high. Eighty to 90 percent hatching success was reported by both Massey (1974) and Swickard (1971) during the 1970-72 period. Infertility appears to be a minor cause of least tern egg failure. For example, Massey found only six infertile or addled eggs out of 157 laid in her study area. Predators have been implicated in a number of egg losses, with Norway rat (Rattus norvegicus), striped skunk (Mephitis mephitis), longtail weasel (Mustela frenata) and common crow (Corvus brachyrhynchos) often named as the known or suspected predators. Dogs and gulls also destroy eggs.

Fledging rates vary greatly from colony to colony and from year to year (Swickard 1971, Massey 1974). The maximum overall success rate (percent of eggs resulting in flying young) yet observed in a major colony is about 70 percent (Massey and Atwood 1979). Loss of tern chicks has been attributed to American kestrels (Falco sparverius) (Craig 1971), loggerhead shrike (Lanius ludovicianus) and common crows (Atwood et al. 1979, Bender pers. comm.), house cats (Edwards 1919) and dogs (Pentis 1972); to cold, wet weather (Pentis 1972); and to dehydration and starvation (Massey 1972). Burrowing owls (Athene cunicularia) have been known to

feed on nesting adult least terns and young (Collins, pers. comm.). Common ravens (Corvus corax) and red fox (Vulpes fulva) are also reported predators (Jorgenson and Collins, pers. comm.).

In the past, high tides washed away many California least tern eggs (Sechrist 1915, Shepardson 1909); however, many California least terns now nest in situations where tide level is not a factor. Summer rains sometimes cause serious loss where nests occur on soils less permeable than beach sands (Swickard 1971).

Longevity and breeding age

Banded least terns (including all three North American subspecies) have been recovered at up to 21 years of age, with 31 of 61 individuals being 5 years old or older (Massey and Atwood 1978). This suggests a relatively long life for individuals of this species.

Banding studies have demonstrated that the usual age of first breeding is 3 years, but that least terns occasionally do breed at age two. One-year old birds occur rarely in breeding areas during the nesting season; they do not participate in breeding activities nor are they in breeding plumage (Massey and Atwood 1978).

Food and Feeding habits

The California least tern obtains most of its food from shallow estuaries and lagoons, but colonies occasionally forage offshore in the ocean. Fish known to be eaten, in order of importance, are northern anchovy (Engraulis mordax), topsmelt (Atherinops affinis), various surf-perch (Embiotocidae), killifish (Fundulus parvipinnis), mosquitofish (Gambusia affinis), and numerous other species. The California least tern has not been observed eating anything but fish (Massey 1974).

Reasons for Decline

No reliable estimates are available of original numbers of California least terns, but they once were abundant and well-distributed along the southern California coast. Shepardson (1909) describes a colony of about 600 pairs along a three-mile stretch of beach in San Diego County. "Good-sized" colonies were located in Los Angeles County (Grinnell 1898).

Reduction in numbers was gradual. This subspecies appears to have escaped the slaughter inflicted on the East Coast populations by the millinery trade of the late 1800's (Bent 1921, Hagar 1927), although there were some early local losses to shooting (Holterhoff 1884) and egg collecting (McCormick 1899). It is doubtful these activities were widespread enough to adversely influence the population. Although certain least tern colonies were still thriving in the early 1900's, others were already beginning to feel the pressure of human influence.

The Pacific Coast Highway was constructed early this century along previously undisturbed beach, and summer cottages and beach homes were built in many areas. Soon children, dogs and cats were being blamed for disrupting tern nesting (Chambers 1908, Edwards 1919, Massey 1974). The buildup of human use of the beaches displaced more and more colonies at the same time their bay feeding areas were being developed, filled in, and polluted. By the 1940's, most terns were gone from the beaches of Orange and Los Angeles counties (Cogswell 1947), and they were considered sparse everywhere (Grinnell and Miller 1944). Continuing loss of both nesting and feeding habitat and high levels of human disturbance at remaining colonies have been responsible for the continued decline to the present time (Craig 1971).

Current Status

The least tern breeding population in California averaged approximately 600 pairs in 1973, 1974, and 1975 (Bender 1947a, Bender 1974b, Massey 1975). The breeding population was estimated at 664 pairs in 1976 and 775 pairs in 1977 (Jurek 1977, Atwood et al. 1977). The increases in 1976 and 1977 are partly attributable to more thorough surveys of colony locations resulting from experience gained in previous years. Part of these increases may have resulted from recent colony protection efforts. The size of the Baja California least tern population is unknown. The apparent stability in size of the California population segment the past five years is encouraging, but those factors that have contributed to the decline of the California least tern - loss of suitable nesting habitat, loss of suitable feeding areas and disturbance of nesting birds - continue to operate, and the bird's status continues to be precarious. There is potential, however, for creating or restoring nesting and feeding habitat in the vicinity of most of the existing colonies.

Recovery Needs

Actions needed to insure the recovery of the California least tern include preservation and management of existing nesting and foraging habitat, restoration of former nesting habitat and degraded coastal wetlands, creation of nesting islands, and protection of nesting colonies from excessive human disturbance and predation. Research is needed to refine and direct a number of these management actions. Recovery will depend upon a continuing cooperative effort by the U.S. Fish and Wildlife Service, California Department of Fish and Game, California Department of Parks and Recreation, U.S. Army Corps of Engineers, U.S. Navy, U.S. Marine Corps, U.S. Air Force, Federal Aviation Administration, numerous city, county and other local government agencies, private conservation organizations, and the governments of Mexico and other countries within the range of this species.

PART II

RECOVERY PLAN OBJECTIVES AND RATIONALE

The primary objective of this recovery plan is to direct protection and management efforts needed to restore and maintain the breeding population of California least terns at a secure level. To achieve this level, the population breeding annually in California must increase to at least 1,200 pairs distributed among colonies in at least 20 coastal wetland ecosystems throughout their 1977 breeding range. This breeding population would be about double the 1977 level. Concurrently, efforts should be directed toward protecting the existing breeding population in Baja California.

If the 1200 pair population level is achieved, delisting of the species can be considered, with these provisions: 1) Habitat, sufficient to support at least one viable tern colony at each of the 20 coastal wetland ecosystems, is being managed to conserve least terns, and 2) land ownership and management objectives are such that future habitat management for the benefit of least terns at those locations can be reasonably assumed.

The chief limiting factor influencing the number of least tern breeding pairs is the availability of suitable habitat in the breeding grounds. Therefore, much of this plan's action involves the protection and management of existing breeding areas and feeding grounds, and the restoration or creation of additional habitats. Particularly important are those areas deemed by the Recovery Team to be essential for the survival of this subspecies (Appendix B).

Proposed Actions

Preserving existing habitat

In California, least terns have nested in about 20 coastal wetland ecosystems since 1969. The numbers of colonies and their nest site locations in many of these areas have varied from year to year. At least two more nesting areas exist in Baja California, Mexico. If colonies are to continue to exist in these areas, their nesting and feeding habitats must be preserved (see Appendix B for a list of California least tern nesting and feeding areas).

For most existing colonies, the nesting area is the habitat element most in need of preservation. In California, only eight currently used colony nesting sites are now protected under State, Federal or other public ownership or jurisdiction. These sites are reasonably secure from adverse habitat alteration or are located where human access can be readily controlled. The remaining active colony nesting sites are located in areas where human disturbance is a recurrent problem, where needed management programs are now difficult or nearly impossible to implement, or where land use changes threaten the suitability of the site for breeding. For a few of these sites, construction and protection nearby of alternate nesting areas would be preferable to the protection of currently used, but always vulnerable nesting sites. For the remaining areas, however, efforts are now needed to preserve the critical nesting habitat through acquisition, zoning or other actions.

An ideal nesting substrate will not attract and support least tern breeding pairs if suitable feeding conditions do not exist within a reasonable distance. With few exceptions, colonies form adjacent to estuaries, lagoons,

bays or channels where food supplies are readily available. If efforts to preserve colonies are to be successful, the associated feeding areas also must be preserved.

Habitat preservation efforts are also needed in major foraging areas which are used by least terns before and after the nesting season. Especially important are feeding areas where least tern adults and their young form large feeding aggregations after the nesting season ends and before migration south begins.

In areas where nesting sites and/or feeding areas are protected under public ownership or jurisdiction, this plan recommends that responsible agencies develop and implement least tern management plans. Coordination of plans is the responsibility of the California Department of Fish and Game with assistance from the U.S. Fish and Wildlife Service.

Many of the least tern habitat preservation recommendations included in this recovery plan correspond with wetland habitat recommendations by State and Federal agencies in other resource plans. With the passage of the Nejedly-Hart State, Urban, and Coastal Park Bond Act of 1976, funding is being made available to implement acquisition recommendations of the Coastal Zone Conservation Commission and State agencies. Additionally, other coastal wetland areas are being acquired under funding sources such as the Environmental Protection Program and the Wildlife Conservation Board. These proposed acquisitions will benefit least tern colonies in many wetland areas. Federal funding could be considered using the Land and Water Conservation Fund Act of 1965 as authorized by the Endangered Species Act of 1973 or through Grant-in-aid funding provided to the States under the latter Act.

As more information becomes known about the nesting and feeding areas of colonies in Baja California, there will be need by the Mexican Government to identify and preserve these crucial habitat areas.

Creating or restoring habitat

Construction of new nesting sites, restoration of abandoned nesting areas and restoration of feeding areas are recommended actions at many coastal wetlands. These actions are necessary to encourage new colonies to form in potential breeding habitats and to enhance conditions that will allow existing colonies to increase in size.

Least terns readily accept man-created bare ground areas as nesting sites. This is evidenced by the fact that from 1969 to 1977, colonies have chosen nest sites on at least 23 man-made land fills or other earthen structures in coastal wetland areas. In 1975 and 1976, 60 percent of known breeding pairs nested on man-made substrates. Experience at Camp Pendleton (Swickard 1971) and Bair Island colony sites demonstrates that specially constructed nest sites can be acceptable to breeding least terns. As of 1976, efforts had been made at only four sites to create habitat for new colonies or to restore abandoned nesting sites. Further research and experimentation is needed to refine this management technique.

In some areas, recommended management actions include the construction of alternate nesting sites where currently used sites are highly vulnerable to disturbance or are jeopardized by habitat loss. In some instances where land development plans would cause the destruction of a nesting site, construction of an alternate nest site may be the only feasible alternative to avoid detrimental impacts.

Least tern colonies need dependable supplies of small fish to support the adults and young throughout the breeding season. Several southern California coastal wetlands are now in degraded condition (e.g., Mudie et al. 1974, 1976). This plan recommends that responsible management agencies investigate and implement actions that are needed to improve feeding conditions for least terns in wetland areas or portions of wetland ecosystems which lack adequate fish populations. In some wetlands or portions of wetland systems, restoring tidal circulation is essential to restoring estuarine fish populations. Runoff or pollution also may be factors in degrading fish food supplies.

Establishment of Mission Bay Least Tern Coordinating Committee

Mission Bay, in San Diego, is a major least tern nesting and feeding area with special management and protection problems. Since 1969, from 70 to 200 pairs have nested in this area, the number of colonies and their locations varying each year. Only one site, a small island leased by Federal Aviation Agency, is well protected and has supported a successful colony annually for many years. In the rest of Mission Bay, colony locations and sizes have formed unpredictably each year. Frequently, these groups have had poor breeding success as they were located in areas where human and dog disturbances are constant problems. Two fenced sanctuaries, including the Crown Point Sanctuary - formally dedicated as a least tern nesting sanctuary - have not been used by the terns after protective efforts were implemented. The special problems of least terns at Mission Bay necessitate the establishment of an interagency committee to guide local habitat enhancement and protection efforts for least tern colonies. This committee should include representatives from the City of San Diego, California Department of

Fish and Game, U.S. Fish and Wildlife Service, Federal Aviation Administration, and California Least Tern Recovery Team. It is recommended that local Fish and Game Department biologists lead this program.

Management of nest sites

At some breeding sites, habitat management actions are needed annually to provide suitable nesting substrates for breeding terns. Growth of vegetation, wind, rain, tidal action, vehicle or human foot traffic, and other factors contribute to the deterioration of the quality of nesting substrates. Generally, site preparation actions are needed between February 1 to April 15, no later than May 15 or the start of the nesting season. Pre-breeding season management actions may include site inspections to evaluate management needs, removal of vegetation, deposition of sand or other substrate material, disking and leveling of substrates, prevention of rain or tidal water flooding, and placement of clay, concrete or other artificial shelters in or near nesting sites to provide shade for chicks. Schedules for annual nest site enhancement actions on State or Federal management areas must be incorporated in management plans for those areas.

Where potential nesting sites have been created, annual nest site enhancement actions and experimentation should be continued for at least five years in efforts to entice breeding pairs to establish new colonies. If, after this 5 year period, a colony has not become established, the site should be re-evaluated as a potential nesting area.

Protecting colonies

Predation and human disturbances are recurrent threats to many least tern colonies each year. Some disturbance and predation can be tolerated in a

colony, but when these factors become excessive, they can cause breeding failure for the season or even abandonment of a site by the birds.

Colony protection efforts recommended in this plan are directed toward preventing human disturbance and minimizing predation at colonies.

Efforts needed before May 15 each year may include surveillance of known or potential colony sites to identify potential predation or other disturbance problems, relocation or elimination of potential predators, posting admonitory signs, erection of barriers or fences to control or exclude humans or vehicles or domestic animals where such disturbance problems may occur, and placement of low screens or fences to prevent undesirable wandering of chicks away from nesting areas. Signs and barriers to restrict human disturbance should be placed no closer than 30 meters (100 feet) from nearest nests.

Actions needed during the nesting season include regular patrol and surveillance to identify predation and law enforcement problems and to implement necessary corrective actions, for example fencing and posting signs at newly discovered colony sites. Such actions are particularly important early in the nesting period. Colony protection efforts must also include the development of procedures by management agencies for protecting colonies in emergency situations.

Efforts to prevent human disturbances at colonies can be facilitated if the public is informed of the need for colony protection. Conservation education efforts include placement of interpretive signs near some colonies and distribution of news releases prior to and during nesting seasons.

Research needs

To develop and implement effective least tern management and protection programs, current and adequate information is needed on population status annually, and on the breeding, feeding, and other biological requirements of the birds.

Breeding population surveys are needed annually in California and in Baja California. These surveys are needed to identify active colony sites, determine colony size and evaluate breeding success. This information is necessary for evaluating management and protection efforts. There is also a need to refine census techniques to reduce the time and costs involved in data collecting, yet not sacrifice the quality of data collected.

The research by Massey (1974) needs to be supplemented by additional studies on the breeding biology of least terns. This will entail the banding and color marking of large numbers of least tern chicks. Investigations are needed to determine the following:

1. The degree of colony fidelity - that is, the degree to which birds return to the same breeding area year after year.
2. The degree to which birds shift breeding colonies or establish new ones.
3. The age at which birds first breed and the expected life span of individuals.
4. The location and importance of roosting, loafing and feeding areas used during the breeding season.
5. Techniques for aging young birds in colonies.
6. Factors affecting clutch size, renesting attempts, and breeding success.

7. Factors causing colony disruption and nest site abandonment.

Banding and marking studies are also needed in the breeding area to determine migration patterns and to identify the winter distribution of this subspecies.

As mentioned earlier, research on least tern habitat requirements and management techniques is necessary to carry out effective habitat management programs. This recovery plan recommends several habitat research actions:

1. Refinement of techniques used by Swickard (1974) and others to create nesting substrates and to enhance known colony sites.
2. Development of methods to enhance feeding conditions in coastal water bodies. This may include the construction and stocking of fish ponds near known or potential colonies.
3. Determination of the distribution and associated habitat requirements of least terns during the non-nesting season. This includes research to determine the location and significance of roosting sites and non-nesting season feeding areas.
4. Determination of the effects on least terns of environmental pollutants in feeding areas and development of programs for monitoring these effects.
5. Determination of how much habitat is necessary to (1) maintain the current population and (2) provide for the prime objective "recovered" population. Associated supporting details include the number of acres with their biomass of small fish now being regularly used by terns, what are the food mass requirements for a nesting pair, and how much area of lagoons, bays, etc.

is needed to support a given number of terns through the nesting period (e.g., 100 pairs/100 acres of minimum fish density waters).

RECOVERY PLAN OUTLINE

Primary Objective: Increase the least tern breeding population in California to a secure level of at least 1,200 pairs distributed in at least 20 coastal wetland ecosystems distributed throughout its current breeding range, while encouraging the preservation of the existing breeding population in Baja California.

1. Provide adequate breeding and feeding habitat in California.
 11. Provide for suitable number, distribution and quality of colony nesting areas.
 111. Preserve and manage nesting areas of existing colonies.
 1111. Develop and implement least tern management plans for secure nesting areas.
 11111. Bair Island.
 11112. U.S. Naval Air Station, Alameda.
 11113. San Elijo Lagoon.
 11114. Mugu Lagoon, U.S. Navy.
 11115. Santa Margarita River Mouth.
 11116. Huntington State Beach Least Tern Natural Area.
 11117. Upper Newport Bay Ecological Reserve.
 11118. Los Penasquitos Lagoon.
 11119. San Diego Bay Salt Pond Dikes.
 1112. Preserve and manage nesting areas for currently insecure colonies.
 11121. Acquire and manage nesting habitat now in private ownership.

- 111211. Agua Hedionda Lagoon (eastern part).
- 111212. Los Penasquitos Lagoon.
- 11122. Preserve adequate nesting habitat in Baticuitos Lagoon.
- 11123. Develop least tern nesting area at bay-front end of "D Street Fill," Sweetwater marsh.
- 11124. Identify special site protection problems of certain insecure colonies and implement corrective action as needed.
 - 111241. Ormond Beach.
 - 111242. Playa del Rey.
 - 111243. San Diego International Airport.
 - 111244. San Gabriel River.
 - 111245. Terminal Island, Reeves Field.
 - 111246. Santa Clara River Mouth.
 - 111247. Grand Caribe Island, Coronado Cays.
- 11125. Develop and implement management plans to establish secure nesting areas for colonies on public lands.
 - 111251. Tijuana River Estuary.
 - 111252. Naval Training Center, San Diego.
 - 111253. North Island Naval Air Station.
 - 111254. Chula Vista Wildlife Reserve.
- 11126. Select and develop secure, alternate nesting areas for vulnerable existing colonies.
 - 111261. Oakland Municipal Airport.
 - 111262. Other colonies as needed.

- 1113. Secure and manage a minimum of five least tern nesting sites in Mission Bay.
 - 11131. Establish an interagency coordinating committee to maintain annual breeding sites for least tern colonies.
 - 11132. Annually maintain Crown Point sanctuary.
 - 11133. Annually maintain FAA Island site.
 - 11134. Annually maintain and protect South Fiesta Island breeding area.
 - 11135. Establish and manage at least two additional breeding sites.
- 112. Provide adequate nesting habitat in former or potential breeding areas.
 - 1121. Construct and manage new nesting sites in protected areas.
 - 11211. Seal Beach NWR, Anaheim Bay.
 - 11212. Sunset Aquatic Park.
 - 11213. Bolsa Bay Ecological Reserve.
 - 11214. Upper Newport Bay Ecological Reserve.
 - 11215. Silver Strand, south end of ocean side.
 - 1122. Acquire potential breeding habitat, construct adequate breeding sites, develop and implement least tern management plans.
 - 11221. San Diequito Lagoon.
 - 11222. Mouth of Santa Ana River, southeast area.
- 113. Develop or refine management techniques for providing adequate nesting sites and implement techniques where needed.

- 1131. Investigate nest site requirements of colonies.
 - 1132. Investigate methods of enhancing nesting sites of existing colonies.
 - 1133. Investigate methods of constructing adequate nesting sites in potential breeding habitat.
12. Maintain adequate feeding habitat for colonies.
- 121. Protect existing coastal feeding grounds of colonies by maintaining high water quality and preventing tideland fill and drainage projects.
 - 122. Restore or improve tidal flow in wetlands to enhance feeding grounds.
 - 1221. Mugu Lagoon
 - 1222. Bolsa Bay
 - 1223. Anaheim Bay
 - 1224. Los Penasquitos Lagoon
 - 123. Investigate and implement actions needed to increase populations of fish eaten by terns in degraded or potential tern feeding areas.
 - 1231. Mouth of Santa Ana River, southeast area.
 - 1232. San Elijo Lagoon.
 - 1233. Batiquitos Lagoon.
 - 1234. Other areas as needed.
13. Protect breeding colonies annually by minimizing disturbance and mortality.
- 131. Prevent human disturbance at colonies.
 - 1311. Post admonitory signs.
 - 1312. Erect fences where needed.

- 1313. Provide adequate patrol and law enforcement.
 - 1314. Provide conservation education programs directed towards protecting nesting colonies.
 - 132. Minimize predation in colonies.
 - 1321. Monitor colonies to identify potential or actual predation problems.
 - 1322. Control problem predators as needed.
 - 133. Implement emergency actions when needed to protect threatened colonies.
2. Protect important non-nesting, feeding and roosting habitats from detrimental land or water use changes.
- 21. Harbor Lake (Los Angeles County).
 - 22. Guajome Lake (San Diego County).
 - 23. Lake Val Sereno (San Diego County).
 - 24. San Dieguito Lagoon (San Diego County).
 - 25. Buena Vista Lagoon (San Diego County).
 - 26. Oso Flaco and Dune Lakes (San Luis Obispo County).
 - 27. San Diego River Flood Control Channel (San Diego County).
 - 28. Belmont Shores (Los Angeles County).
 - 29. Identify and protect other habitats as needed.
3. Encourage the protection of breeding population outside the United States.
- 31. Protect least tern population and habitats in Baja California.
 - 311. Determine colony locations and population size.
 - 312. Identify least tern population and habitat protection problems.

313. Develop cooperative program between the United States and Mexican governments for least tern protection and habitat preservation.
32. Identify and protect key migration and winter habitats outside the United States and Mexico, if any exist.
4. Monitor population to determine status, distribution and progress of species management.
 41. Conduct annual breeding colony surveys.
 411. Determine colony locations.
 412. Estimate breeding population size.
 413. Determine breeding success.
 42. Determine effects of environmental pollutants on least terns.
 43. Investigate population dynamics, life history, and movements of terns through banding and marking.
 44. Identify major feeding areas.
5. Designate "critical habitat" under the Endangered Species Act of 1973 when determined that such action would enhance the recovery of the species.

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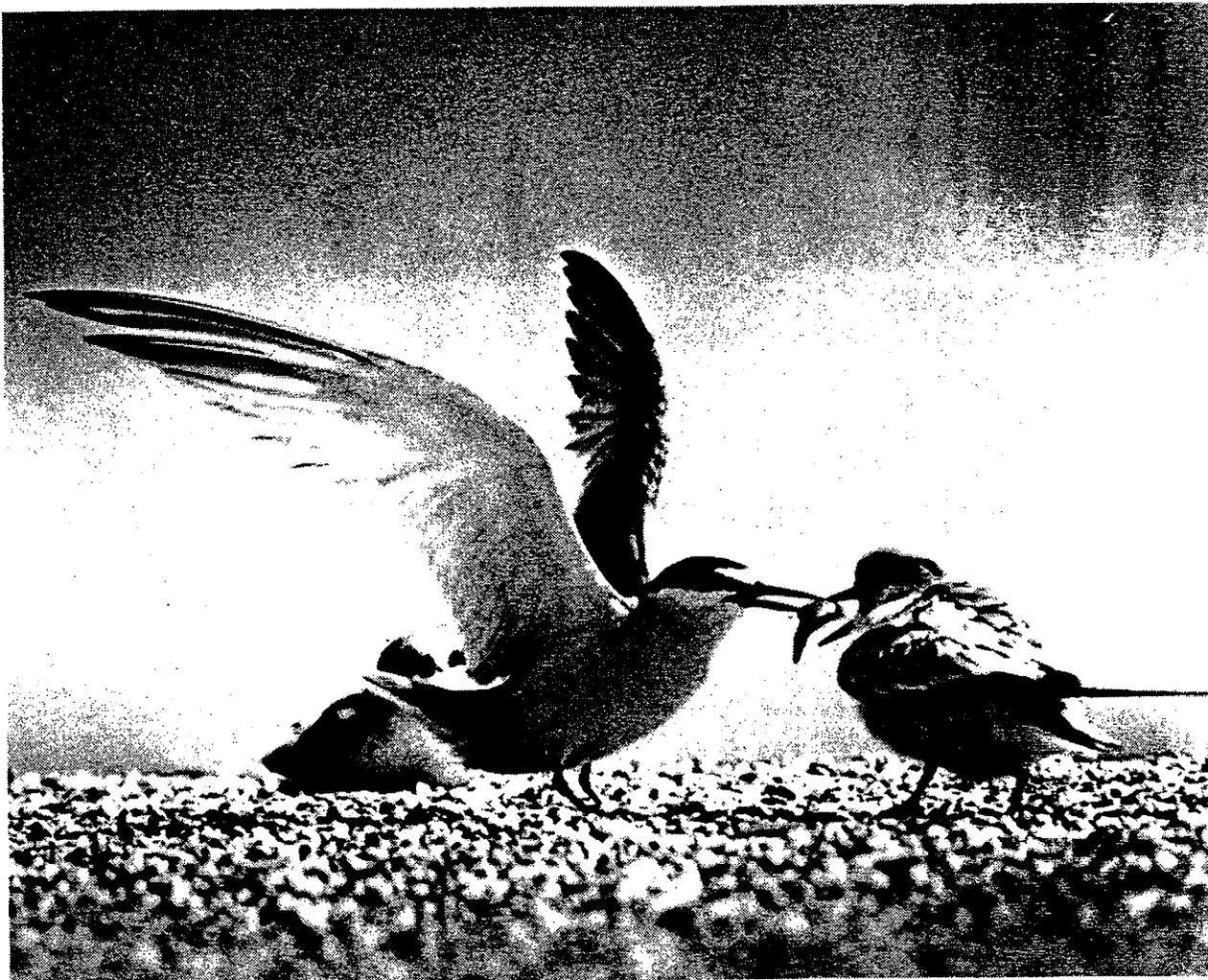


Figure 1 - California Least Tern adult feeding

101.14-39

PART III

SCHEDULE OF PRIORITIES, RESPONSIBILITIES AND ESTIMATED COSTS

| GROUP PRIORITY: 1/ | NAME OF ACTION OR OBJECTIVE | PLAN DESIG.# | RESPONSIBILITY | | TARGET DATE | ESTIMATED COSTS 3/ | | | | TOTAL |
|--------------------|--|--------------|--------------------------|---------------------------------------|-------------|--------------------|------------------|------|------|-----------|
| | | | LEAD 2/ | COOPERATORS 2/ | | YR 1 | YR 2 | YR 3 | YR 4 | |
| 2 | Acquire and manage eastern Agua Hedionda Lagoon nesting area | 111211 | DFG | SDCPR/City of Carlsbad | 1980 | | | | | \$100,000 |
| 2 | Preserve, restore and manage Batiquitos Lagoon nesting & feeding habitat | 11122, 1233 | DFG | DPR/SLC | | | To be determined | | | |
| 2 | Preserve and manage Sweetwater Marsh site (D Street) | 11123 | DFG | SDUPD/C of E/ FWS/City of Chula Vista | 1984 | | To be determined | | | |
| 35 | | | | | | | | | | |
| 2 | San Diego Bay Salt Ponds nesting site Management Program | 11119 | DFG/ Western Salt Co. | FWS/SDUPD | 1980 | 500 | 500 | 500 | | 1,000 |
| 2 | Manage FAA Island nesting site | 11133 | FAA | DFG/FWS City of San Diego | Ongoing | 500 | 500 | 500 | 500 | 2,000 |

1/ Priority 1 - Actions necessary to prevent extinction of the species.
 Priority 2 - Actions necessary to maintain the current status of the species.
 Priority 3 - All other actions enhancing the complete recovery (delisting) of the species.
 DFG - Calif. Dept. of Fish and Game; FWS - U.S. Fish and Wildlife Service; DPR - Calif. Dept. of Parks and Recreation; SDUPD - San Diego Unified Port District; SWRCB - State Water Resources Control Board; SLC - State Lands Commission; BCDC - San Francisco Bay Conservation and Development Commission; OCHBPD - Orange County Harbor, Beaches and Park Dept.; FAA - Federal Aviation Administration; CLTRT - California Least Tern Recovery Team; EPA - Environmental Protection Agency.
 3/ YR 1 - FY'81; YR 2 - FY'82; YR 3 - FY'83; YR 4 - FY'84.

| GROUP PRIORITY | 1/ ACTION OR OBJECTIVE | NAME OF | PLAN | RESPONSIBILITY | | | TARGET DATE | ESTIMATED COSTS ^{3/} | | | TOTAL | |
|----------------|--|---------|-------------|----------------|--|---------------------------|-------------|-------------------------------|-------|------|-------|-------|
| | | | | DESIG.# | LEAD ^{2/} | COOPERATORS ^{2/} | | YR 1 | YR 2 | YR 3 | | YR 4 |
| 3 | Develop and implement Tijuana River Estuary nest Management Program | | 111251 | DFG | FWS/DPR | | 1980 | To be determined | | | | |
| 3 | Develop Bair Island nest Management Program | | 11111 | DFG | FWS/SLC | | 1980 | 1,000 | 1,000 | | | 2,000 |
| 3 | Develop Alameda N.A.S. nest Management Program | | 11112 | US Navy | DFG/FWS | | 1978 | 500 | | | | 500 |
| 3 | Mugu Lagoon (Navy) nesting Mst. & feeding Program | | 11114, 1221 | US Navy | DFG | | 1980 | To be determined | | | | |
| 36 | | | | | | | | | | | | |
| 3 | Select & develop alternate site for Oakland Airport colony; & other colonies as needed | | 111261 | DFG | BCDC/Port of Oakland | | 1980 | To be determined | | | | |
| | | | 111262 | | deals with as yet unknown sites so costs & responsibilities shouldn't be shown | | | | | | | |
| 3 | Huntington State Beach nest Management Program | | 11116 | DPR | DFG | | Ongoing | 500 | 500 | 500 | 500 | 2,000 |
| 3 | Bolsa Bay new nest Mgt. Program; restore tidal flow | | 11213, 1222 | DFG | Signal Land-mark Inc. | | Ongoing | 500 | 500 | 500 | 500 | 2,000 |
| 3 | Develop North Island, N.A.S. nesting Mgt. Program | | 111253 | US Navy | DFG/FWS | | 1979 | 500 | 500 | | | 1,000 |
| 3 | Restore tidal flow, Los Penasquitos Lagoon | | 1224 | DPR | C of E/DFG | | 1980 | To be determined | | | | |

101.14-41

| GROUP PRIORITY: 1/ | NAME OF ACTION OR OBJECTIVE | PLAN DESIG. # | RESPONSIBILITY | | TARGET DATE | ESTIMATED COSTS ^{3/} | | | | TOTAL |
|-----------------------|---|------------------|-----------------------|---------------------------|----------------|-------------------------------|--------|------|------|----------|
| | | | LEAD ^{2/} | COOPERATORS ^{2/} | | YR 1 | YR 2 | YR 3 | YR 4 | |
| 2 | Manage Fiesta Island nesting site | 11134 | DFG/City of San Diego | FWS | Ongoing | 500 | 500 | 500 | 500 | \$ 2,000 |
| 2 | San Elijo Lagoon nesting area & food mgt., area programs | 11113, 1232 | DFG | SDCPR | 1980 | 20,000 | 500 | | | 20,500 |
| 2 | Santa Margarita River Mouth nesting Management Program | 11115 | USMC | DFG | 1980 | | 1,000 | | | 1,000 |
| 2 37 | North San Diego Bay Management nesting program | 111252 | FWS | DFG/U.S. Navy/SDUPD | 1980 | 500 | 500 | | | 1,000 |
| 2 | Protect existing feeding grounds and non-nesting, roosting habitats | 121, 2 | DFG | FWS/SERCB/C of E | Ongoing | 500 | 500 | 500 | 500 | 2,000 |
| 2 | Identify and correct special protection problems of certain insecure colonies ^{3/} | 11124 | DFG | Various | 1979 | 10,000 | 10,000 | | | 20,000 |
| 2 | Acquire and manage nesting habitat, Los Penasquitos Lagoon | 11118, 111212 | DPR | DFG | 1980 | To be determined | | | | |

^{3/} Such as Santa Maria River, Vandenberg AFB colonies, Santa Clara River, Ormond Beach, Playa del Rey, Venice Beach, San Gabriel River, Terminal Island.

| GROUP PRIORITY: 1/ | NAME OF ACTION OR OBJECTIVE | PLAN DESIG. # | RESPONSIBILITY | | | TARGET DATE | ESTIMATED COSTS ^{3/} | | | TOTAL |
|-----------------------|---|------------------|-----------------------|--|---------|------------------|-------------------------------|-------|------|---------|
| | | | LEAD ^{2/} | COOPERATORS ^{2/} | YR 1 | | YR 2 | YR 3 | YR 4 | |
| 3 | Manage Crown Point nesting sanctuary (Mission Bay) | 11132 | DFG/City of San Diego | FWS | Ongoing | 500 | 500 | 500 | 500 | 2,000 |
| 3 | Establish and manage additional nest sites in Mission Bay | 11135 | DFG/City of San Diego | FWS | 1980 | To be determined | | | | |
| 3 | Seal Beach NWR Mgt. new nesting sites; improve tidal flow | 11211, 1223 | FWS | US Navy/DFG | 1979 | 500 | | | | 500 |
| 3 | Manage Sunset Aquatic Park nesting sites | 11212 | OCHBPD | FWS/DFG | Ongoing | 500 | 500 | 500 | 500 | 2,000 |
| 3 | Develop Upper Newport Bay Ecological Res.; new nest sites | 11117, 11214 | DFG | | 1980 | 1,000 | | | | 1,000 |
| 3 | Preserve and manage San Dieguito Lagoon nesting habitat; feeding & roosting habitat | 11221, 24 | DFG | City of Del Mar/State Lands Commission | 1979 | | | | | 500,000 |
| 3 | Acquire and manage Santa Ana River Mouth breeding area; improve fish feeding area | 11222, 1231 | C of E | DFG/FWS | 1981 | To be determined | | | | |
| <u>Investigations</u> | | | | | | | | | | |
| 2 | Habitat management techniques development | 113 | DFG | FWS | 1980 | 3,000 | 3,000 | 3,000 | | 9,000 |

101.14-43

| GROUP PRIORITY | 1/ ACTION OR OBJECTIVE | NAME OF | PLAN DESIG. # | RESPONSIBILITY | | TARGET DATE | ESTIMATED COSTS ^{3/} | | | | TOTAL |
|-----------------------|---|---------|---------------|--------------------|---------------------------|-------------|-------------------------------|---------------------|-------|-------|--------|
| | | | | LEAD ^{2/} | COOPERATORS ^{2/} | | YR 1 | YR 2 | YR 3 | YR 4 | |
| 2 | Identify major feeding areas; protect non-nest & roosting areas | | 44 29 | DFG | FWS | 1979 | 3,000 | 3,000 | | | 6,000 |
| 2 | Investigate population dynamics, life history & movement of least terns via banding & marking | | 43 | DFG | FWS | Ongoing | 2,000 | 2,000 | 2,000 | 2,000 | 8,000 |
| 3 | Investigate effects of environmental pollutants | | 42 | DFG | EPA/SWRCB | 1980 | 500 | 500 | 3,000 | | 4,000 |
| 3 | Determine colony status of least terns in Baja California | | 311 | FWS | Mexico | 1980 | 2,000 | 2,000 | 3,000 | | 7,000 |
| 2 | Identify least tern preservation problems in Baja California | | 312 | FWS | Mexico | 1980 | To be determined | | | | |
| 2 | Identify key habitats outside U.S. and Mexico | | 32 | FWS | Other countries | 1980 | To be determined | | | | |
| <u>Administrative</u> | | | | | | | | | | | |
| 1 | Protect breeding colonies annually; minimize disturb. & mortality | | 13 | DFG | FWS | Ongoing | 5,000 | 5,000 | 5,000 | 5,000 | 20,000 |
| 2 | Designate critical habitat | | 5 | FWS | DFG | 1978 | 1,600 | 600 (FWS-Wash.D.C.) | | | 2,200 |

| GROUP PRIORITY: 1/ | NAME OF ACTION OR OBJECTIVE | PLAN DESIG.# | RESPONSIBILITY | | TARGET DATE | ESTIMATED COSTS 3/ | | | | TOTAL |
|-----------------------|---|-----------------|----------------|---------------------------------|----------------|--------------------|--------|--------|--------|--------|
| | | | LEAD 2/ | COOPERATORS 2/ | | YR 1 | YR 2 | YR 3 | YR 4 | |
| 1 | Conduct annual breeding colony surveys | 41 | DFG | FWS | Ongoing | 12,000 | 12,000 | 13,000 | 13,500 | 51,000 |
| 3 | Establish Mission Bay interagency coordinating committee to maintain breeding sites | 11131 | DFG | City of San Diego/FWS/FAA/CLTRT | 1980 | To be determined | | | | |
| 3 | Conduct public consrv. educat. program to protect nesting colonies | 314 | DFG | DPR, FWS | Ongoing | 1,500 | 1,500 | 1,500 | 1,500 | 6,000 |
| 3 | Develop U.S./Mexico cooperative tern preservation program | 313 | FWS | Mexico | 1980 | To be determined | | | | |
| 40 | | | | | | | | | | |
| | <u>Addendum</u> | | | | | | | | | |
| 3 | Construct and manage new nesting sites - Silver Strand | 11215 | DFG | DPR | Ongoing | To be determined | | | | |
| 2 | Develop and implement management plans for nesting areas - Chula Vista Wildlife Reserve | 111254 | DFG | SDUPD | Ongoing | To be determined | | | | |

101.14-45

APPENDIX

- A. Annotated List of California Least Tern Nesting Sites and Major Feeding Areas, 1969-1979.

Locational maps of the listed areas may be found in Appendix B. More specific detail is available from Area Office of the U.S. Fish and Wildlife Service and California Department of Fish and Game, both offices being located in Sacramento, California.

- B. Key Habitat Units

Maps of areas considered as important to the recovery of the California least tern. More specific detail is available from the U.S. Fish and Wildlife Service and California Department of Fish and Game, both offices being located in Sacramento, California.

- C. List of Agencies submitting comments on the Agency Review Draft.

- D. Informational Sign - "California Least Tern Nesting Area"

APPENDIX A

Annotated List of California Least Tern Nesting Sites and Major Feeding Areas, 1969-1979

This list includes the more valuable least tern use areas that so far have been identified from field investigations since 1969.

California

Alameda County

Alameda Naval Air Station. Wildlife agencies became aware of this colony in 1976. From 1977 through 1979 between 40 and 80 pairs nested on an asphalt apron on the airfield. There is some evidence that colonies have nested here each year since 1966 or 1967.

Bay Farm Island. From a few to 100 pairs have nested on sand fills on the island from 1969 through 1977. Several sites have been used, including the north end of Oakland Airport (1973 or 1974 to 1977) and portions of the "Utah Fill" (1969 to 1975). The airport site maintained a small colony of three to eight pairs between 1974 and 1977.

Coyote Hills. A group of 25-40 pairs was found on a salt pond dike north of Coyote Hills on July 22, 1971 and may have nested in the vicinity. At least 2 pairs nested there in 1978 and 1979.

San Mateo County

Bair Island. One to 15 pairs have nested on dried mudflats in 1969, 1970, 1974-1977, and 1979. A few pairs also nested in 1976 on a nearby dry salt pond west of Westpoint Slough; these were on the edge of a Forster's tern colony.

San Luis Obispo County

Nipomo Dunes. Large flocks of least terns have been observed since 1975 feeding and roosting in the vicinity of Oso Flaco Lakes and several of the Dune Lakes.

Santa Barbara County

Santa Maria River Mouth. A colony of about 25 pairs was first found nesting on the south side of the mouth in 1977,

but it is suspected that nesting had occurred in this area in previous years. About 20 pairs nested there in 1978 and in 1979.

San Antonio Creek. About eight pairs nested at this site in 1978, and four pairs in 1979.

Purissima Point. Five pairs nested north of the point in 1978, and about 25 pairs nested south of the point in 1979.

Santa Ynez River Mouth. Least terns have been observed in this area regularly each breeding season since 1969, but the only confirmed nesting was in 1971 when a colony comprising at least three nests was located.

Ventura County

Santa Clara River Mouth. Nesting by least terns was suspected in 1970. One pair nested on the sandy beach in 1975. Eighteen pairs, probably breeders that failed earlier in the season at Ormond Beach, nested here in 1977, and 10 to 20 pairs nested in 1978 and 1979.

Ormond Beach. From 6 to 30 pairs have nested here in 1974, 1976, 1977, and 1979. Success has been mixed, failures attributed primarily to heavy recreational use of this beach.

Mugu Lagoon. Nesting was first recorded in 1975. Colony size has decreased from 20 pairs in 1975, to 10 pairs in 1976, to five pairs in 1977. These birds may represent renestings after breeding failures at nearby Ormond Beach.

Los Angeles County

Venice Beach. Least terns have nested at Dockweiler State Beach north of the Ballona Creek Channel since 1977. About 80-95 pairs nested here in 1979.

Playa del Rey. Salt flats next to Ballona Creek Channel south of Marina del Rey were used by 10 to 22 pairs from 1973 to 1976, but the 1976 colony abandoned and may have nested elsewhere. Rains disrupted early nesting efforts here in 1977, apparently causing the birds to establish colonies on Venice Beach (35 pairs) and in the Channel at Beethoven Street (3 pairs). The salt flats were used by about 25 pairs in 1978 and 1979.

Terminal Island. From 24-85 pairs have nested here since 1973. Earlier nesting has been reported. More than 70 pairs nested on abandoned Reeves Field in 1973, 1974, 1976, and 1977, but birds were forced into using an alternate site on fresh land fill farther south in 1975.

Harbor Lake. This is a major post-nesting season feeding area for adult and young birds from south Los Angeles County breeding sites.

San Gabriel River. This site has been used by 10 to 60 pairs since 1971.

Belmont Shores, Long Beach. This is a major nighttime roosting site for birds in spring and summer. As many as 280 least terns were observed on this roost in 1977.

Orange County

Anaheim Bay. A tern nesting site prepared on NASA Island, Seal Beach NWR, was used for the first time by six pairs in 1979.

Sunset Aquatic Park. A sand fill at this site was used by six to 100 nesting pairs between 1969 and 1972.

Huntington Harbour. From six to 25 pairs nested at this site from 1971 to 1973, but use of the area was curtailed by land development.

Bolsa Chica. In 1977, a colony of seven pairs nested here for the first time in recent years. No birds nested in 1978 but in 1979 two colonies of about 20 pairs each nested on sites prepared for the terns.

Huntington Beach State Park. Site of the fenced Least Tern Natural Area, the colony has nested north of the Santa Ana River mouth regularly since 1969. The colony has ranged in size from five pairs in 1974 to 80-95 pairs in 1979.

Upper Newport Bay. A colony of 6 to 12 pairs nested at the uppermost end of the bay in 1977, 1978 and 1979.

San Diego County

Aliso Creek. Fifteen pairs nested here in 1979.

Santa Margarita River Mouth. Nesting has been recorded every year since 1969. From a low of 19 pairs in 1970,

the colony increased with protection to 250 to 300 pairs from 1971 to 1973. From 1974 to 1977 the colony remained at the level of 110 to 150 pairs, but in 1978 and 1979 it contained only 30-40 pairs.

Buena Vista Lagoon. About 10 pairs nested in 1969 at the upper end of the lagoon; no birds have nested since because of a lack of suitable nesting habitat. The lagoon remains an important feeding area.

Agua Hedionda Lagoon. Between 5 and 28 pairs have attempted to nest here most years since 1971, but breeding has frequently been disrupted, primarily by human activity.

Batiquitos Lagoon. Between three and 50 pairs have nested regularly here since 1969. Location and timing of nesting are highly influenced by spring and summer water levels in the lagoon. Most nesting has occurred at the east end of the basin at the mouth of La Costa Creek. Nesting also has been reported at the west end between the railroad tracks and Interstate 5, and, in 1979, just east of Pacific Coast Highway.

San Elijo Lagoon. Dikes, salt flats and sand flats have been used for nesting since at least 1966. Between four and 30 pairs have nested from 1969 to 1971 and from 1975 to 1979.

San Dieguito Lagoon. Lack of suitable, protected nesting areas have limited breeding here, but the lagoon is a valuable feeding area for large flocks of least terns. Several pairs bred successfully in 1969, and one pair failed to nest successfully in 1973.

Los Penasquitos Lagoon. Between five and 40 pairs have nested on salt flats at the upper end of the lagoon in most years since 1969.

Mission Bay. At least 10 different sites have been used by nesting terns in recent years. Between two and eight sites have been used each year since 1970 by between 70 and 200 pairs.

San Diego River. The flood control channel bordering Mission Bay is an important feeding area and roosting site. Two pairs of least terns nested near the river at San Diego Stadium in 1974, the only known use of this site.

San Diego International Airport. Since 1970, between 25 to 150 pairs have nested here. From 1970 to 1972 and in 1977, the colony was restricted to the eastern end of the airfield, but most of the colony nested on a landfill at the southwest portion of the airport from 1973 to 1976 until the fill was developed.

U.S. Naval Training Center, San Diego. Nesting was first recorded in 1977 when 35 pairs formed a colony on a cleared parcel of land. About 10 pairs nested in 1978. This group probably represented part of the population that was displaced by development on the nearby landfill at San Diego International Airport.

Harbor Drive - 5th Street Marina, San Diego. Approximately 17 pairs nested on a recent landfill in 1977. This group probably formed because of the abandonment of the San Diego International Airport landfill site.

North Island Naval Air Station. About 13 pairs attempted to nest in 1977, but efforts were unsuccessful. Although this was the first year the colony was documented, it may have existed here for at least 10 years, based on interviews with base personnel. Thirty-six pairs nested in 1978, again unsuccessfully. A house cat trapping program was instituted in 1979 and about 75 pairs nested, quite successfully.

Sweetwater River. Between 10 and 47 pairs have nested on a sandy fill north of the river mouth since 1973, but off-road vehicle use has limited nesting success here.

Coronado Cays. A sand fill in this heavily developed area supported five to seven pairs in 1974, 15 to 20 pairs in 1977, 8 to 10 pairs in 1978 and 38 to 40 pairs in 1979.

South San Diego Bay Saltworks. Between two and 70 pairs have nested on salt pond dikes of the Western Salt Company since at least 1968.

Tijuana River Mouth. From 100 pairs in 1962 and 1963, the colony decreased to two to five pairs that nested at least half the years from 1969 to 1975. Five to 10 pairs in 1976, 1977, and 1978 and 25-30 pairs in 1979 nested here. Nesting has been restricted to the sand spit south of the river mouth.

Lake Val Sereno and Guajome Lake. Post nesting feeding flocks have been observed at these lakes, but the use by birds appears to be sporadic.

Baja California

Bahia Todos Santos. A colony of 25 to 30 pairs was found on the east shore of Estero de Punta Banda in 1975, and a colony probably nested in the same area in 1976.

Bahia de San Quintin. It was suspected that a colony nested here in 1975, and in 1976 two nests were found and 10 to 12 birds were in the area. The size of the 1976 breeding colony was undetermined.

Other areas. Least terns have been reported in several additional areas of Baja California during breeding months in recent years, but nesting colonies have not yet been located. These areas are Río Santa Domingo, Laguna Manuels, Laguna Guerro Negro, Laguna Ojo de Liebre (Scammon's Lagoon), and Magdalena Bay.

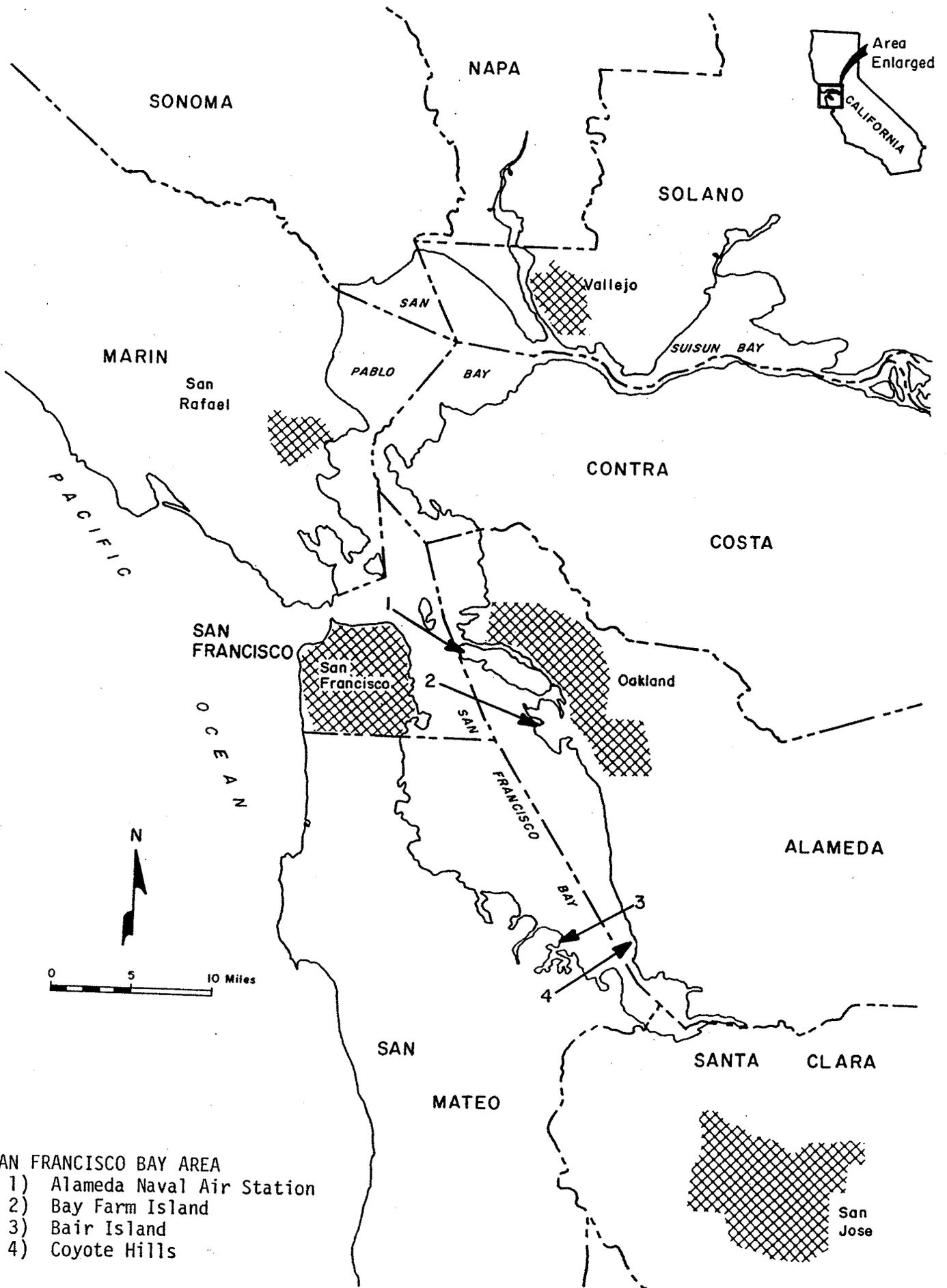
APPENDIX B

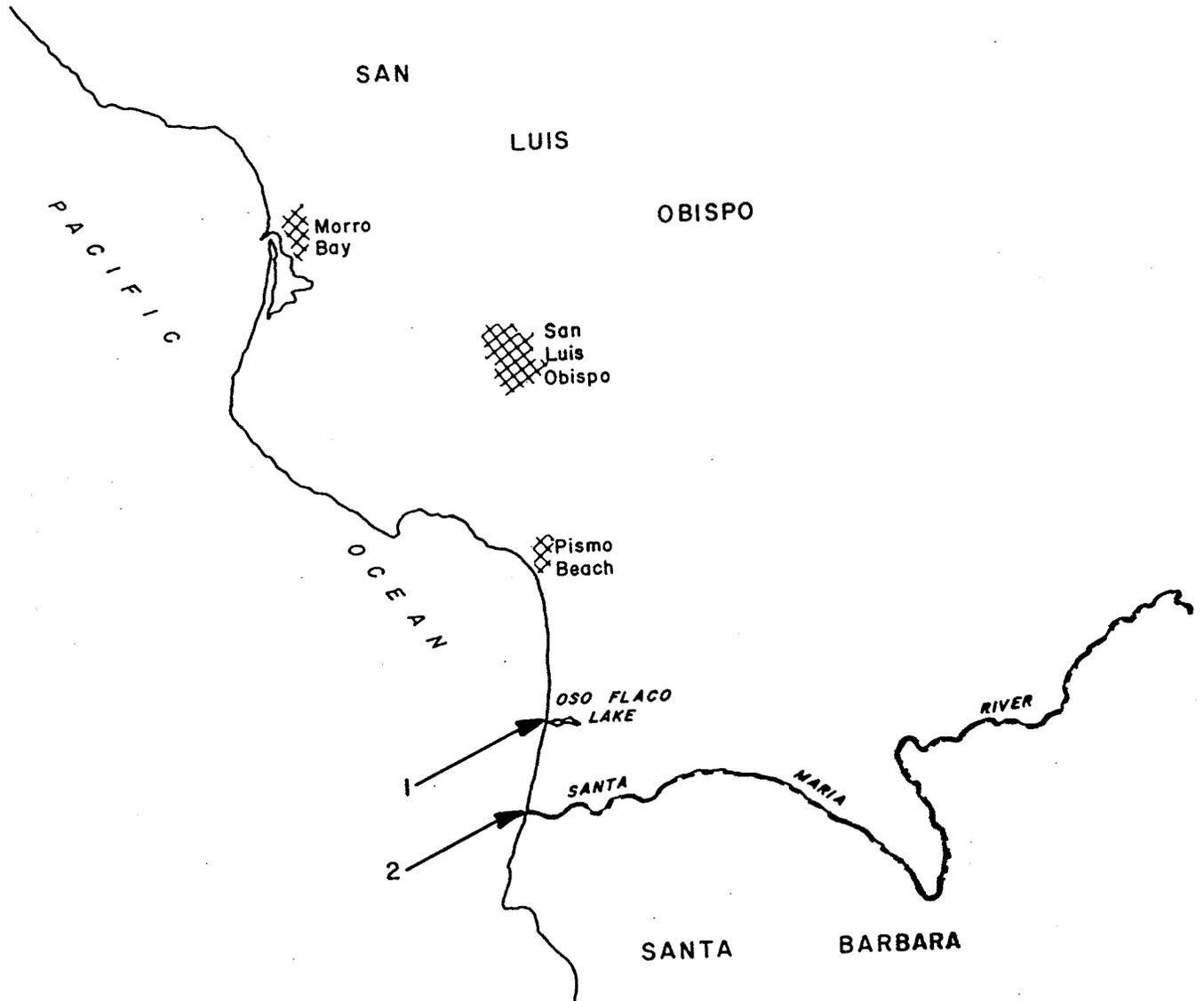
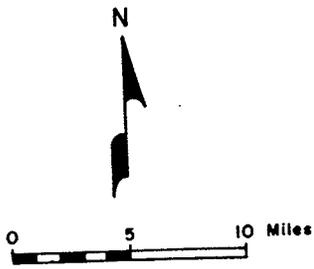
Key Habitat Units

The Fish and Wildlife Service has reached the conclusion that it is not reasonable or prudent at this time to determine critical habitat for the California least tern. This decision was based in part on the frequent changes this species makes in nesting colony locations. A study of the comments and data submitted in response to the draft recovery plan and informal critical habitat documents also indicate no real benefit would accrue to the species by such action.

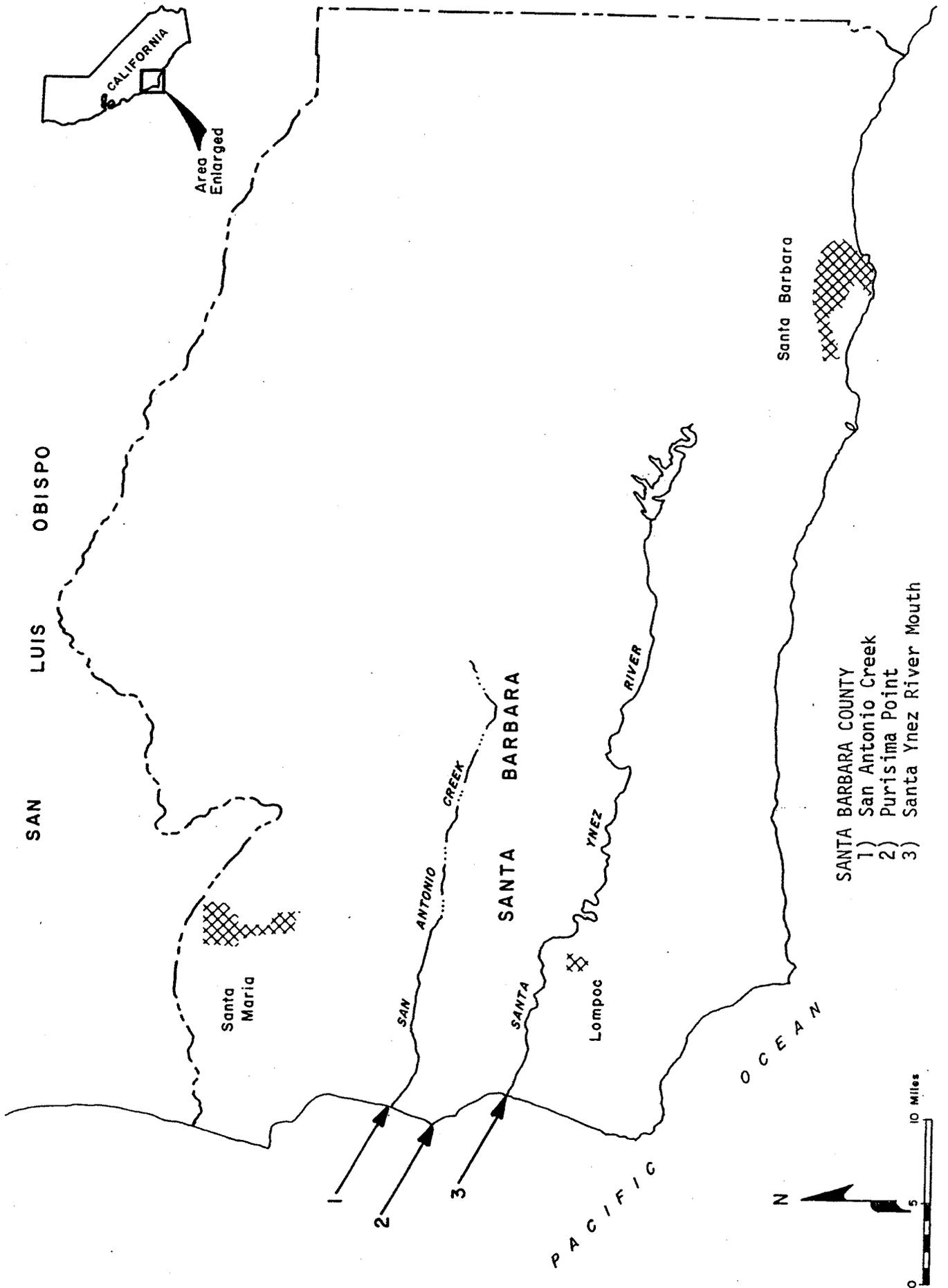
The California least tern is listed as an Endangered species on the U.S. List of Endangered and Threatened Wildlife and Plants. Therefore, regardless of whether or not critical habitat is ever determined for the species, all Federal agencies are required by Section 7 of the Endangered Species Act of 1973, as amended, to review the effects which any of their actions may have on this listed species. The protection afforded a listed species under the Act's critical habitat clause, in effect, simply complements the protection already given a species at the time of its listing as Threatened or Endangered.

The maps on the following pages locate major areas of importance for the planned recovery of the California least tern. Considered as Key Habitat Units, the disclosures replace the essential habitat maps usually found in recovery plans. Unit boundaries and legal descriptions are not included with the maps, although this documentation may be obtained in a general format by contacting the Area Office of the U.S. Fish and Wildlife Service or the California Department of Fish and Game, both offices being located in Sacramento, California.

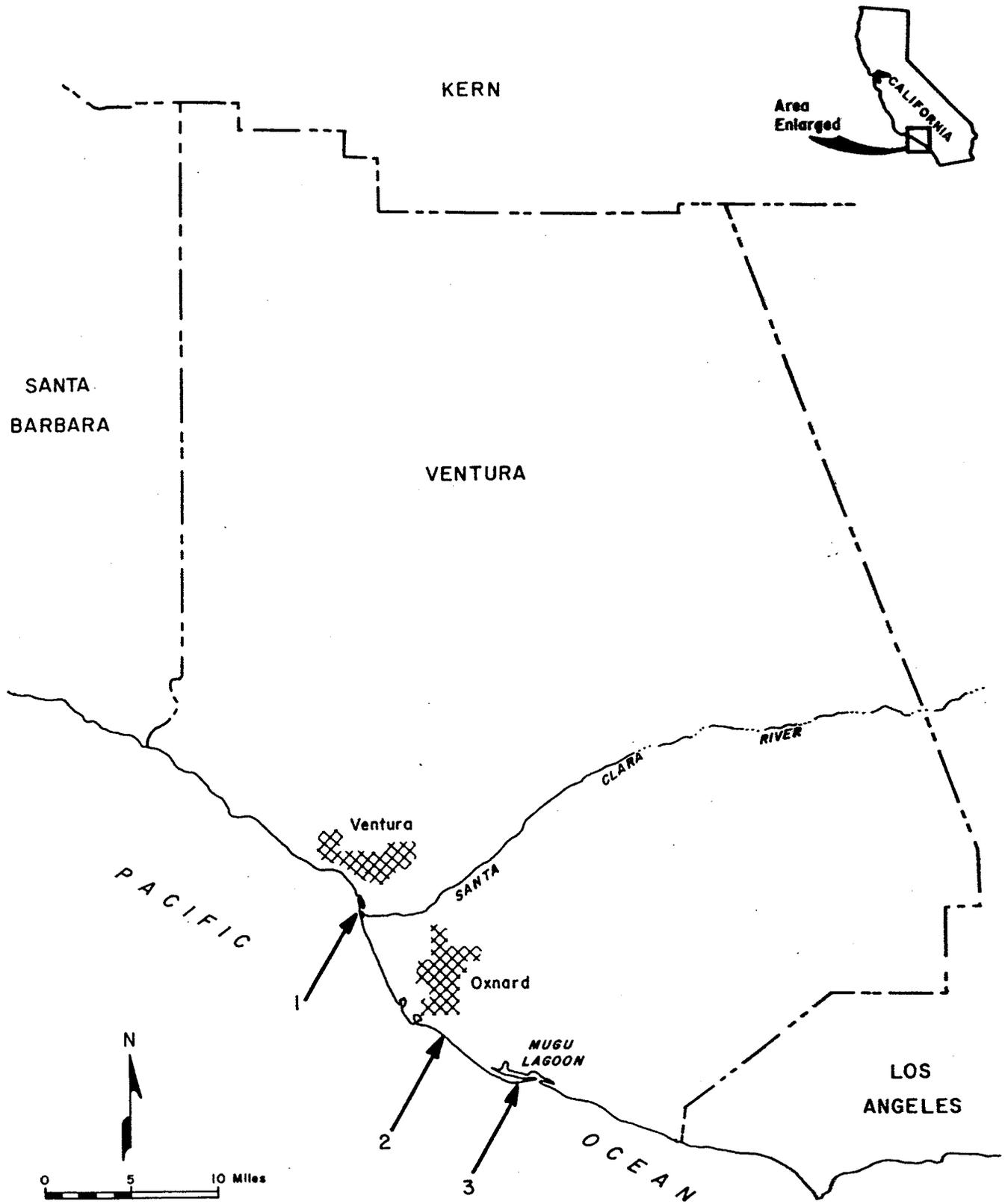




- SAN LUIS OBISPO COUNTY
- 1) Oso Flaco Lake
 - 2) Santa Maria River Mouth

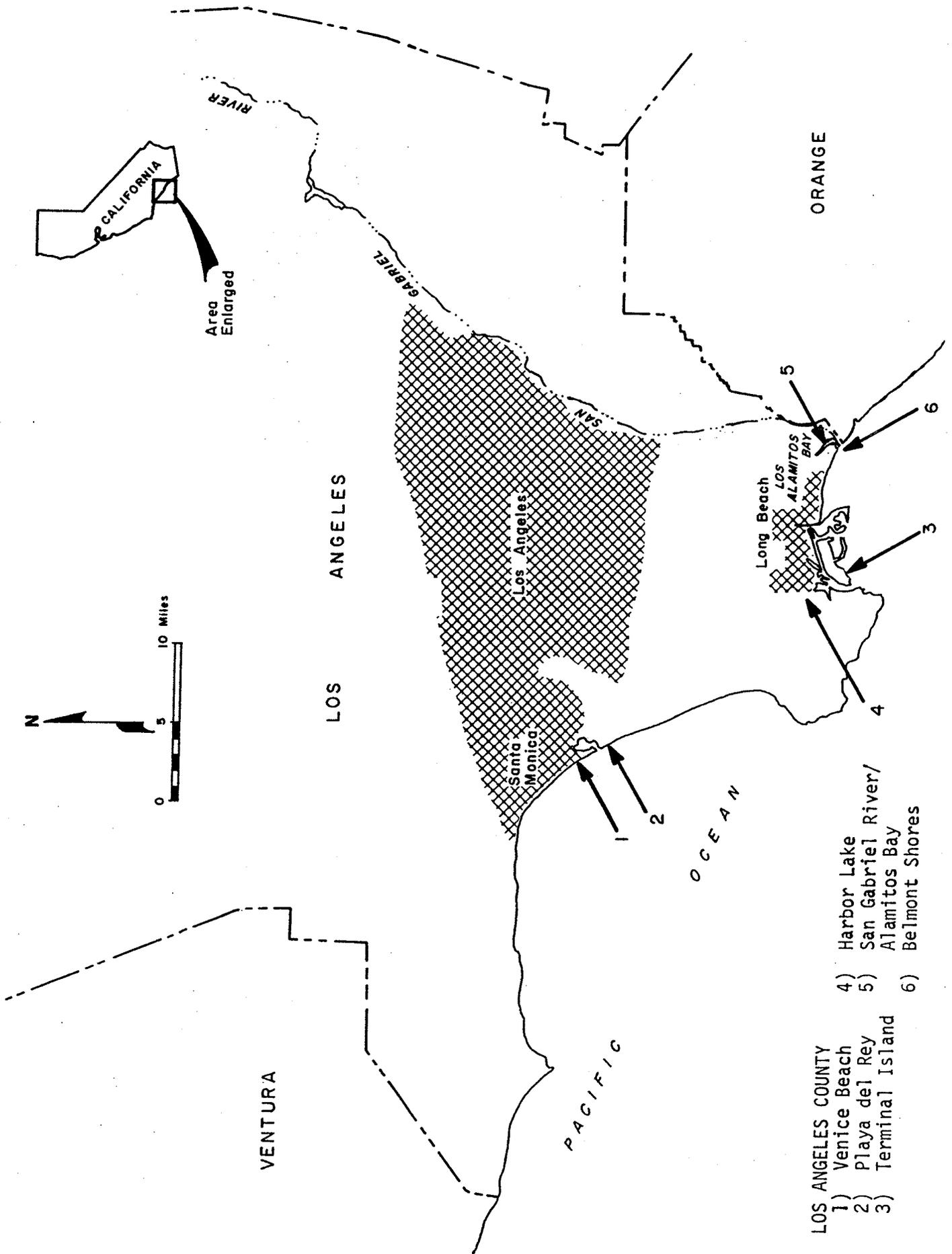


- SANTA BARBARA COUNTY
- 1) San Antonio Creek
 - 2) Purisima Point
 - 3) Santa Ynez River Mouth



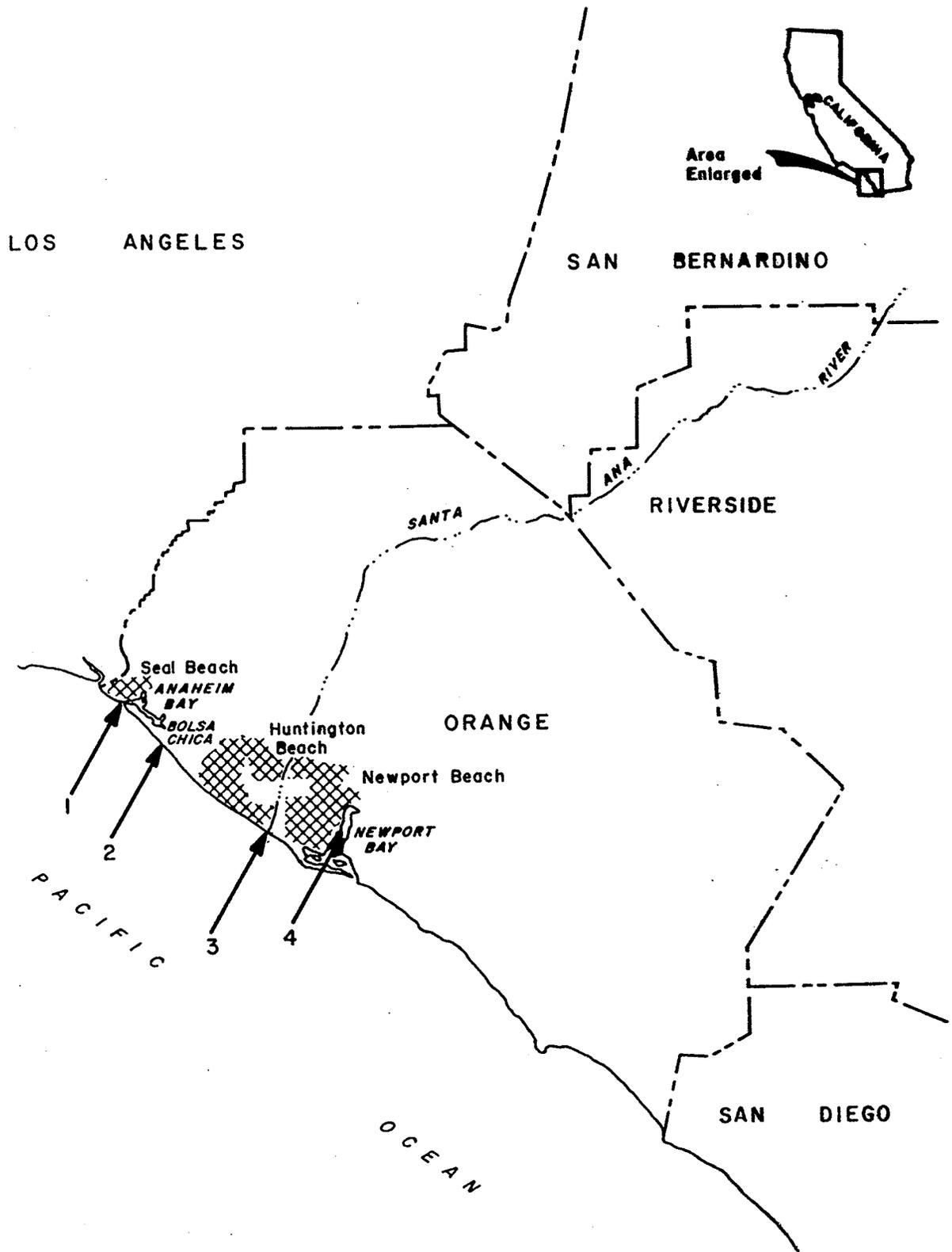
VENTURA COUNTY

- 1) Santa Clara River Mouth
- 2) Ormond Beach
- 3) Mugu Lagoon



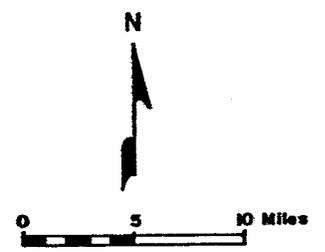
LOS ANGELES COUNTY

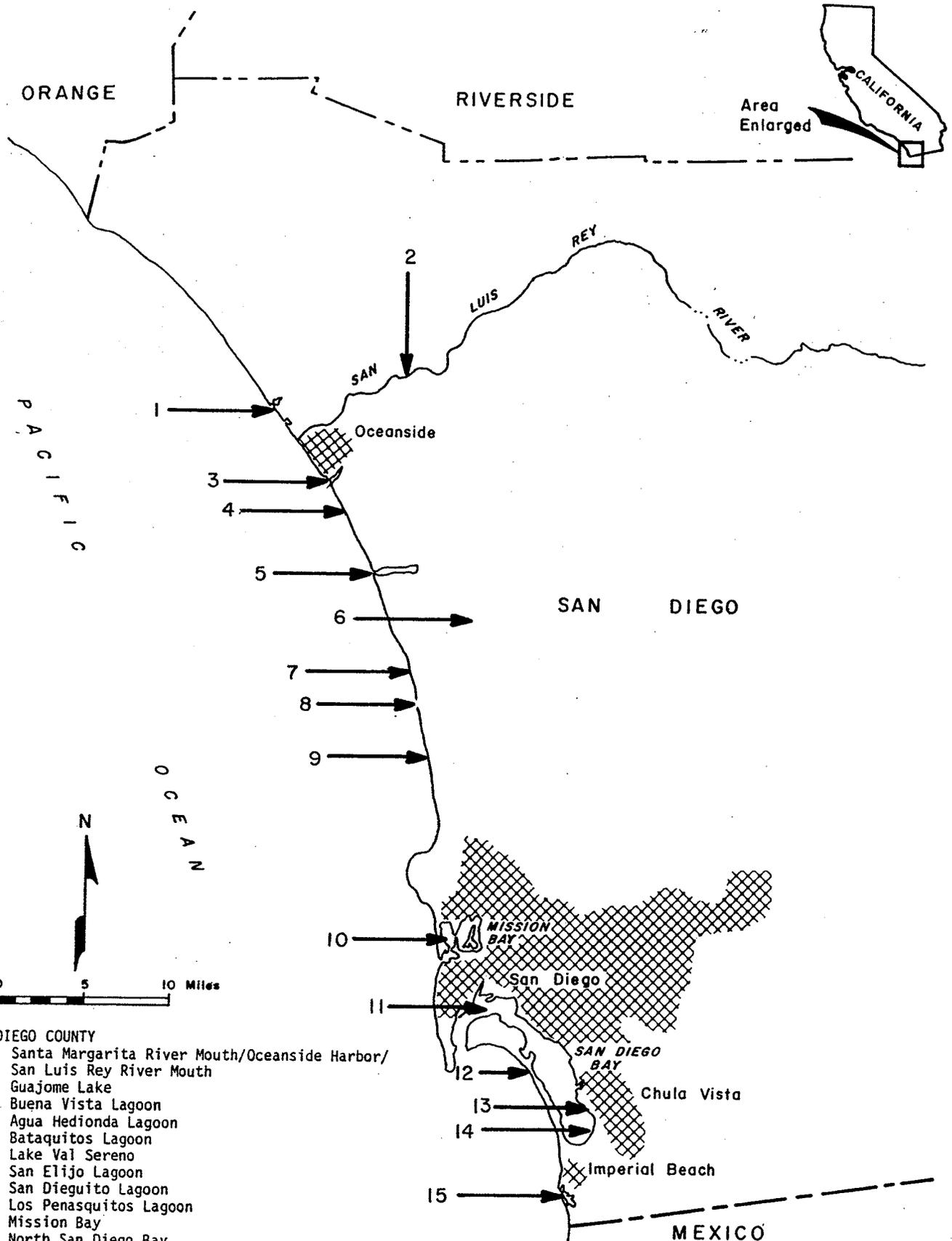
- 1) Venice Beach
- 2) Playa del Rey
- 3) Terminal Island
- 4) Harbor Lake
- 5) San Gabriel River/Alamos Bay
- 6) Belmont Shores



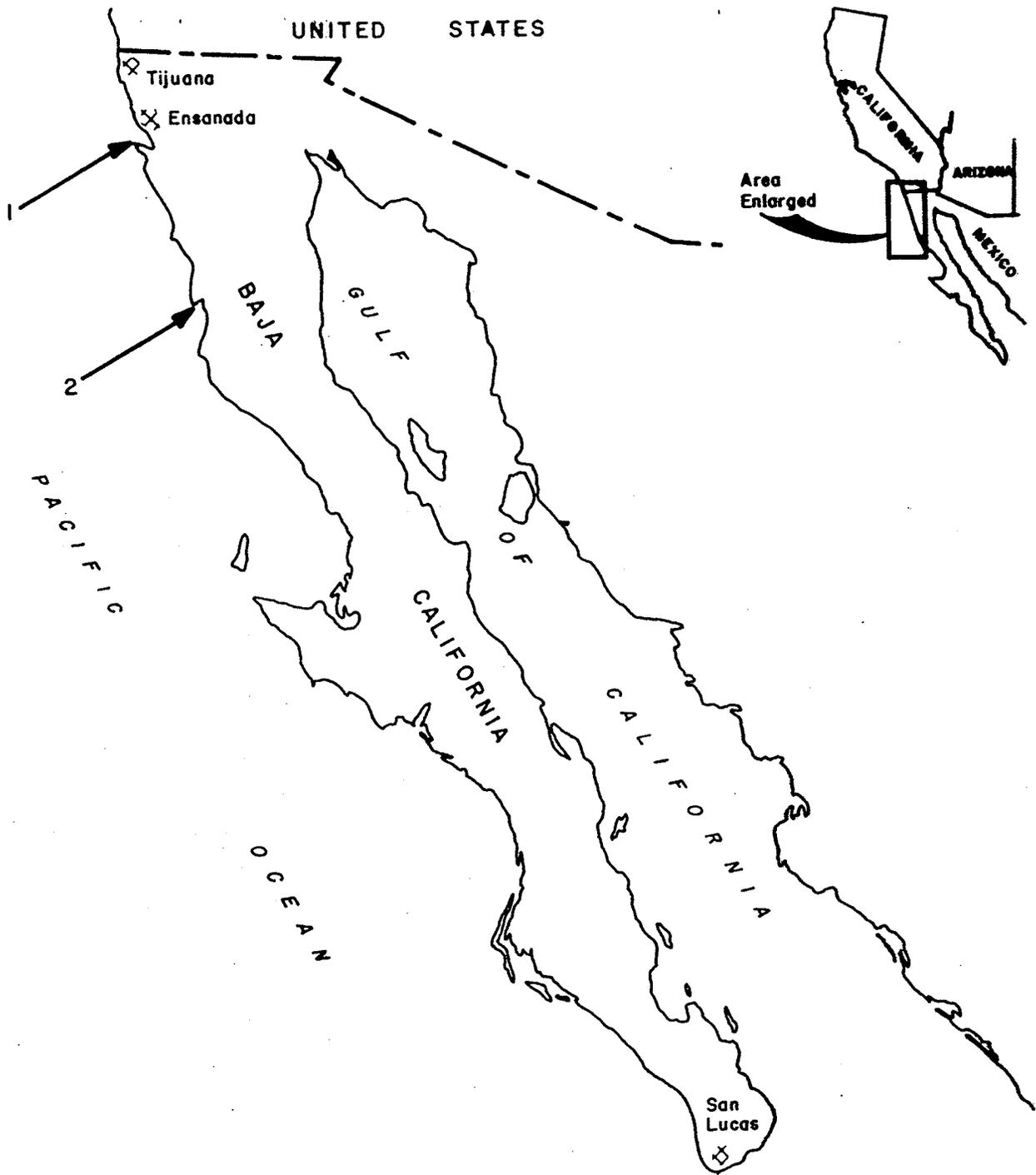
ORANGE COUNTY

- 1) Anaheim Bay/Huntington Harbour
- 2) Bolsa Chica
- 3) Santa Ana River Mouth
- 4) Upper Newport Bay

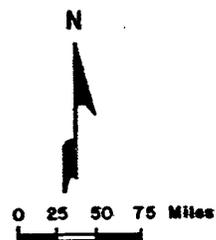




- SAN DIEGO COUNTY**
- 1) Santa Margarita River Mouth/Oceanside Harbor/
San Luis Rey River Mouth
 - 2) Guajome Lake
 - 3) Buena Vista Lagoon
 - 4) Agua Hedionda Lagoon
 - 5) Bataquitos Lagoon
 - 6) Lake Val Sereno
 - 7) San Elijo Lagoon
 - 8) San Dieguito Lagoon
 - 9) Los Penasquitos Lagoon
 - 10) Mission Bay
 - 11) North San Diego Bay
 - 12) Delta Beach
 - 13) Sweetwater Marsh
 - 14) South San Diego Bay
 - 15) Tijuana Estuary



- BAJA CALIFORNIA, MEXICO
- 1) Estero de Punta Banda, Mexico
 - 2) Bahia de San Quentin, Mexico



APPENDIX C

List of Agencies Submitting Comments

Federal Agencies

U.S. Fish and Wildlife Service - Washington, D.C.
Bureau of Land Management - Sacramento, California
DOT - Federal Aviation Administration - Los Angeles, California
Vandenberg Air Force Base
Corps of Engineers - San Francisco, California
Corps of Engineers - Los Angeles, California
Naval Facilities Engineering Command - San Bruno, California
Naval Air Station - Alameda, California
Naval Training Center - San Diego, California

State Agencies

California Coastal Commission - San Francisco, California
State Lands Commission - Sacramento, California
Department of Parks and Recreation - Sacramento, California
State Water Resources Control Board - Sacramento, California
Department of Fish and Game - Sacramento, California

County of Orange

Other

Del Mar, City of
San Diego, City of
Port of Oakland
Port of San Diego
Harbor Bay Isle Associates
Port of Los Angeles

CALIFORNIA LEAST TERN NESTING AREA

KEEP AWAY DO NOT DISTURB

**THIS ENDANGERED BIRD IS PROTECTED UNDER
CALIFORNIA STATE LAW AND FEDERAL LAW.**

**IT IS UNLAWFUL TO TAKE, HARASS, HARM, PURSUE, HUNT, SHOOT, WOUND, KILL, TRAP, CAPTURE OR COLLECT THIS SPECIES
OR TO ATTEMPT TO ENGAGE IN ANY SUCH CONDUCT.**

DEPARTMENT OF THE INTERIOR

U.S. Fish and Wildlife Service

Endangered Species Act of 1973

Public Law 93-205

State of California

THE RESOURCES AGENCY

Department of Fish and Game

Fish & Game Code, Sections 2050-2055

and Title 14, CAC, Section 670.5

48508-800 3-77 150 0 GSP

Figure 2 - Copy of admonitory sign posted at many California Least Tern nesting areas in southern California, to protect nesting sites by restricting human disturbance.

