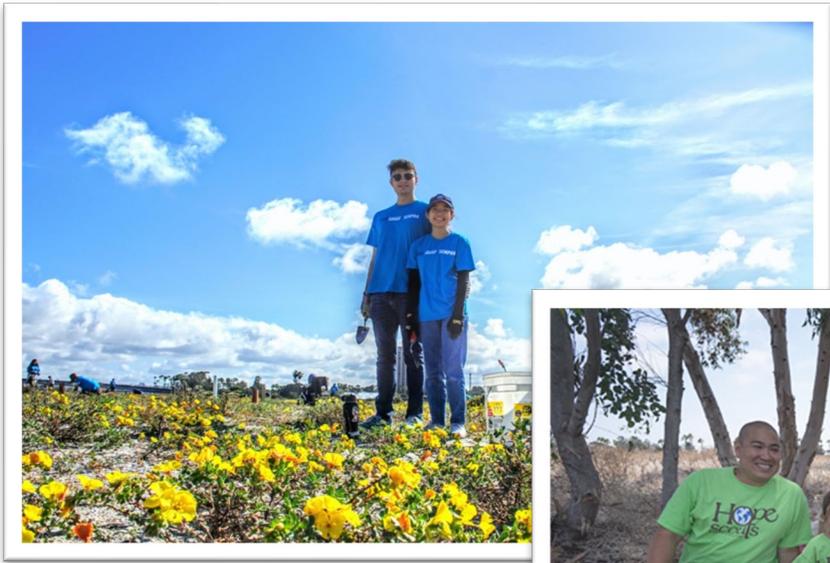


California Least Tern Long-term Management Plan

Mission Bay, San Diego, CA



The following document outlines a Long-term Management Plan to support the continued success of nesting California least terns (CLTE) in Mission Bay, created by San Diego Audubon Society and our collaborating partners, with the final document completed in May of 2022. Funding for this Long-Term Management Plan was provided by the San Diego Association of Governments' (SANDAG) TransNet Environmental Mitigation Program. Inquiries may be directed to Andrew Meyer, Director of Conservation (meyer@sandiegoaudubon.org), or Megan Flaherty, Conservation Manager (flaherty@sandiegoaudubon.org).

CA least Tern Long-term Management Plan for Mission Bay, San Diego

Working Group Members:

- Andrew Meyer, San Diego Audubon Society, Director of Conservation
- Dan Robinette, Point Blue Conservation Science, Senior Biologist
- Drew Castetter, US Department of Agriculture, Wildlife Services Specialist
- Hans Sin, California Department of Fish and Wildlife, Senior Environmental Scientist (Supervisor)
- Isabelle Kay, UC San Diego Natural Reserve System, Kendall-Frost Marsh Reserves Manager
- Jennifer Jackson, permitted with the California Department of Fish and Wildlife, Biological Monitor
- Jim Peugh, San Diego Audubon Society, Conservation Chair, Friends of Famosa Slough
- John Turman, US Department of Agriculture, South District Supervisor
- Jon Atwood, Mass Audubon, past Biological Monitor
- Karolynn Estrada, City of San Diego Park and Recreation Department, Senior Ranger, Mission Bay Park
- Kris Preston, US Geological Survey, Senior Ecologist
- Kyle Rice, California Department of Fish and Wildlife, Environmental Scientist
- Lesley Handa, Handa Ornithology Lab and San Diego Audubon Society
- Mark Berninger, Parks and Recreation Open Space Division, Natural Resource Manager
- Megan Flaherty, San Diego Audubon Society, Conservation Manager
- Nacho Vilchis, San Diego Zoo Wildlife Alliance, Associate Director, Recovery Ecology
- Patrick Gower, US Fish and Wildlife Service, Wildlife Biologist
- Rachel Smith, San Diego Zoo Wildlife Alliance, Senior Research Associate
- Richard Dhu, City of San Diego Park and Recreation Department, Park Ranger, Mission Bay Park
- Robert Patton, permitted with the California Department of Fish and Wildlife, Biological Monitor
- Sandy Vissman, US Fish and Wildlife Service, Wildlife Biologist
- Virginia Johnson, past Biological Monitor



Vision Statement:

Mission Bay will continue to provide high-quality and safe nesting sites for the endangered California Least Tern into the foreseeable future. By 2050, there will be no average net loss of the number of nesting pairs and fledglings produced, and an increase, moving closer to a 1:1 ratio of fledglings to nesting pairs, through continued and adaptive management practices. Mission Bay sites will continue to play a pivotal role in the species recovery in California and will continue to constitute a sizable proportion of the population in Southern California.

Mission Bay CA Least Tern Management Objectives:

The continued success and productivity of nesting CA least terns in Mission Bay will be achieved with a multi-pronged approach, with horizons of action including annual, near-term (by 2025), mid-term (by 2027), and longer-term (by 2037).

- 1.) Habitat management informed by the best available data and science to maximize the suitability of nesting areas, ensuring that vegetation cover is no more than 20% of the site total and reducing non-native vegetation cover to less than 20% of the vegetation on site by 2027
- 2.) Annual and effective predator control efforts that will reduce the impacts of predation events
- 3.) Annual biological monitoring efforts that will accurately record the numbers of nests, chicks, fledglings and adults while reducing human disturbance
- 3.) Ongoing reduction of impacts from edge effects including human and recreational disturbances through improved management, outreach, educational signage and community engagement by 2037
- 4.) Collaboration with City staff, wildlife agencies and other partners who will identify and respond to emerging conservation threats via annual post- and pre-season meetings
- 5) Establishment, by 2027, of a clear and permanent funding stream to ensure that all of the aforementioned objectives are met, using a combination of funding through the City of San Diego, partner agencies and organizations, and volunteer efforts
- 6) Identification of needed research to better understand regional CA Least Tern population dynamics, threats related to climate change and foraging resources, and potential solutions to these problems by 2037

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Acronyms and Abbreviations

Animal and Plant Health Inspection Service	APHIS
California Department of Fish and Wildlife	CDFW
California least tern	CLTE
Fledgling per pair	FPP
Federal Aviation Administration Island	FAA
Mariner’s Point	MP
Mission Bay Park Natural Resource Management Plan	MBPNRMP
Mission Bay	MB
Mission Bay Important Bird Area	MBIBA
Multiple Species Conservation Plan	MSCP
North Fiesta Island	NFI
Nuttall’s Lotus	NULO
Peregrine Falcon	PEFA
San Diego Audubon Society	SDAS
San Diego Management and Monitoring Program	SDMMP
Sea level rise	SLR
Stony Point	SP
US Fish and Wildlife Service	USFWS

1. Executive Summary

California least terns are an endangered, charismatic species that are iconic in the San Diego coastline. They are also one of the only listed avian species that nests within a large, developed park like Mission Bay, and thus face numerous, novel threats. Continuing pressures from predators, development, and human activity and worsening impacts from climate change require that their conservation needs are prioritized by our communities and land managers to ensure that California least terns continue to persist and thrive in our region. This Long-term Management Plan is an additional step towards mitigating these impacts and ensuring that Mission Bay supports a stable, productive nesting population well into the foreseeable future. A passionate group of experts contributed to make this plan a reality, and San Diego Audubon will work with partners to take action on the recommendations laid out in the years to come. Through the Vision, Objectives and specific recommendations, we envision no average net loss of the number of nesting pairs and fledglings produced in the Mission Bay area, and an increase in the fledglings to nesting pair ratio, an important indicator of species recovery.

We also envision increased collaboration with partners, scientists, land managers, funders and community members, which will allow for this work to support bay-wide initiatives on habitat protection, climate resilience, and engagement with the public. Achieving these needed goals will surely require hard decisions in the coming years, but this plan identifies continued and adaptive management practices that will ensure that California least terns nesting at the Mission Bay preserves have the best possible chance of success, and that these populations contribute to the overall recovery of the species.

2. Introduction: Goals of this Management Document

Statewide, there has been an ongoing decline in the population of California least terns (CLTE) since the late 2000s, with the trend especially significant in southern California. This has been mirrored by a decrease in nesting productivity, including the number of fledglings produced by each nesting pair. Over 60% of the nesting population of the species can be found in San Diego County, and Mission Bay is a key management area. It is therefore essential that sites in Mission Bay not only continue to successfully produce fledglings, but that nesting productivity is maximized to the greatest extent possible.

For decades, local and regional experts have worked collaboratively to ensure proper management of habitat for nesting California least terns in Mission Bay. This work has been focused on four nesting locations - Mariner's Point (MP), one of the most productive CLTE nesting sites in the state, located at the end of a peninsula jutting into Mission Bay from Mission Beach, Stony Point (SP) and North Fiesta Island (NFI), both located on Fiesta Island, and FAA Island (FAA), located in the middle of Mission Bay and leased from the City of San Diego by the Federal Aviation Administration (see Figure 5-1). This collaboration utilizes the biological and ecological expertise of State and Federal wildlife agencies and the long-term biological monitors, City of San Diego Park and Recreation staff, San Diego Audubon's pool of dedicated community volunteers, and the on-the-ground skills of the Mission Bay Rangers in order to

support the management of Mission Bay CLTE sites through the removal of vegetation, maintenance of signage and fencing, public outreach and education, predator management and monitoring, and more. These management actions are carried out annually based on the year-to-year needs, and are made possible through the generous support of the City of San Diego, U.S. Fish and Wildlife, U.S. Department of Agriculture, California Department of Fish and Wildlife, San Diego Association of Governments, and many other partners and stakeholders. This document consolidates the combined knowledge and expertise of land owners, resource agencies, regional land management coordinators, and local non-profits into a long-term strategy for CLTE management specific to Mission Bay Park, as well as surrounding City-owned park lands. This strategy seeks to:

1. maintain our existing successful nesting sites,
2. increase nesting site productivity when possible, and
3. define a pathway for Mission Bay to achieve the goals and guidelines stated in the US Fish and Wildlife (USFWS) CA Least Tern Recovery Plan.

This Long-Term Management Plan also identifies and discusses challenges that Mission Bay and the CLTEs have or will have in the coming decades. Where possible, recommendations for addressing these challenges are offered. In development of this plan, we will refer closely to numerous guiding documents, including the Mission Bay Park Natural Resource Management Plan (MBPNRMP), USFWS CA Least Tern Recovery Plan, the Mission Bay Conservation Action Plan, and priorities identified within the San Diego Management and Monitoring Program's (SDMMP) Management and Monitoring Strategic Plan. Along with conservation management actions, a key aspect of this Long-term Management Plan will be the identification of potential funding streams that can sustainably support the protection of CLTEs and their habitats in Mission Bay into the future.

3. Mission Bay Management Recommendations

3.1. Designation of Nesting Sites

Long-term Management Goal: By 2027, dedicate at least two additional areas as CLTE nesting sites in Mission Bay Park.

Supported by: MBPNRMP, USFWS Least Tern Recovery Plan, MB Park Master Plan.

The USFWS Recovery Plan calls for a minimum of six nesting reserves in Mission Bay, (see section 5.3.1) and in the last decade, there have only been four consistently used sites. Of the seven nesting sites that are listed in the MBPNRMP, three of these have not been used for over 30 years – Cloverleaf, Crown Point Shores and South Shores. CLTEs have not nested here regularly and these areas are not ideal as nesting sites due to their location near high density recreational uses, overgrowth of invasive plants, incompatible substrate, or some combination thereof. The remaining four, actively used CLTE nesting preserves in the MBPNRMP are Stony Point, FAA Island, North Fiesta Island, and Mariner's Point.

There are several options to meet the Recovery Plan’s goals for a minimum of six designated nesting sites for CLTEs in Mission Bay, but this is not an easy goal to attain and all the options come with downsides and complications. The following list outlines the Working Group’s reasoning for this Management Goal.

❖ **Recommendation:**

- Dedicate at least two additional areas as CLTE nesting sites by 2027.
 - Begin managing the areas in and near the Southern Wildlife Preserve as a seasonal least tern preserve by 2025, and monitor its use by California least terns for 5 years. CLTEs are often seen foraging over the river channel in this area, but the area also sees high levels of disturbance from members of the public and their pets entering the preserve.
 - Identify another CLTE nesting reserve by 2027, based on recommendations by US Fish and Wildlife, the Mission Bay Park Natural Resource Management Plan, and on-the-ground observations by biologists.
 - Ideally, these additional nesting sites would historically have had nesting CLTEs, or would be adjacent to areas that have had historic nesting, or active nesting. This is complicated because much of Mission Bay has been greatly altered, and there is no research that we know of that locates CLTE nesting colonies before the dredging and island building of the 1950s and 60s. The process of determining where the newly dedicated sites would be located should follow USFWS protocols, and would require the collaboration of local experts and City and wildlife agency staff.
 - A newly-designated nest site location should be near the mouth of the San Diego River. Terns have nested here as recently as 2012, and this was a relatively productive nesting site for years. It is also one of the only remaining natural dune systems in Mission Bay, and habitat protections recommended for nesting CLTEs would complement restoration work underway in the nearby Southern Wildlife Preserve and Smiley Lagoon. This area is also home to numerous other sensitive birds and plant species, including other state- and federally-listed species such as the Ridgway’s Rail (*Rallus obsoletus*).
 - Because Mariner’s Point has been the most productive nesting site in Mission Bay for several decades, the establishment of additional nesting areas nearby this site should be explored. This would also serve to relieve some of the pressures brought about by crowding, such as higher rates of predation and nest abandonment.
 - Suggested locations within the MBPNRMP are also worth investigating. These include West Ski Island, part of the new wetland preserve proposed on the northern end of Fiesta Island, or other coastal strand habitat where co-occurring species such as Nuttall’s Lotus (*Acmispon prostratus*) are found. West Ski Island has recently seen the establishment of Black Skimmer and Forster Tern nests, who successfully nested in 2021. There may be some competition for space between these larger species and CLTEs, and the island also sees high level of recreational activity from boaters.
 - There are also several other small manmade islands occurring in the Bay that may serve the same purpose. They would require appropriate substrate (which could be corrected via sand amendment), removal of vegetation, and protection from

disturbances by recreational users. Island nesting sites can also complicate predator control efforts.

- The establishment of two additional nesting sites would likely require the use of attractants, especially in areas where the birds have never nested before or where they historically nested but have not in the recent past.
- While not currently an active nesting site, some sort of vegetation management at the Cloverleaf site could improve habitat for other ground-nesting birds, or potentially CLTEs in the future.

➤ **Alternative 1: Expand the four active nesting sites.**

- This course of action may be deemed appropriate if wildlife agency staff determine that it is preferable to have fewer, larger and potentially more productive sites than more, smaller, potentially less productive sites, or if the Mission Bay requirements within the Fish and Wildlife Recovery Plan are modified.
- Potential benefits include expanding sites towards foraging areas and/or away from human stressors; relieving crowding (especially at Mariner’s Point), and potentially creating novel nesting areas which could relieve predator pressure for at least a few years.
- Potentially detrimental issues with this option are density dependent stressors such as food availability and predator pressure, logistics surrounding site expansion and coastal access.
- As is planned at the time of this report, the reconfiguration of the North Fiesta Island nesting preserve in the Fiesta Island Master Plan Update won’t substantially change the acreage of the new nesting area in comparison to the current preserve.

➤ **Alternative 2: Retain and attempt to improve nesting suitability at two or all of the unused sites.**

- Crown Point Shores and much of South Shores now has incompatible land uses for CLTE nesting. The Cloverleaf location has car and bike traffic nearby, but is not currently managed for another purpose. Improving the management of the Cloverleaf area for native, ground-nesting birds could be pursued and would be beneficial even if it doesn’t become CLTE nesting preserves. Removing non-natives and encouraging 20% cover of native species should be pursued by 2027.
- A field study report should be created to investigate which of the three sites have the most recent nesting history, appropriate substrate or habitat cover (or the potential for such following restoration), proximity to foraging/loafing/active nesting sites, etc., by 2025.

3.2. Annual Maintenance of Actively Used Nesting Sites

Long-term Management Goal: Continue and improve annual, site-specific habitat management, data collection, predator control and monitoring efforts at actively used sites.

Supported by: SDAS Annual Management Plan, MBPNRMP, MSCP.

The annual maintenance of active nesting sites has been documented in San Diego Audubon's Annual Management Plans for the California least tern nesting sites in Mission Bay, San Diego (San Diego Audubon Society 2022). This report includes a detailed timeline of the vegetation and site management tasks that needs to occur at these areas, as well as contact information regarding the parties responsible for those tasks.

There are also several ways in which this annual site maintenance can be expanded to further improve habitat suitability:

❖ **Recommendations:**

- Annually, avoid the use of plastic flagging or other plastic landscaping materials to reduce the release of micro-plastics.
- Annually, update the Annual, Site-specific Management Plans created by San Diego Audubon, City of San Diego and other partners.
- By 2025, improve analysis of vegetation data, including vegetation height, cover, and the relative percentage of invasive vs native plant species in order to determine whether vegetation at nesting sites are maintained at suitable characteristics. Currently, analysis of this data typically happens months after the data is collected.
- By 2025, explore the need for using decoys at well-established sites, and update protocols. While the use of tern decoys as attractants has become common at both historic and newly created nest sites, there are questions surrounding need at some of the consistently used MB sites, especially in areas where large numbers of CLTEs nest and open space is at a premium. There are also some concerns surrounding the potential for decoys to attract additional predators to the area.
- Annually, remove predator perches that are not needed and increase the use of bird deterrent strips on predator perches that must remain.
- By 2025, replace PVC grid with markers that do not provide predator perches, or create hazards for CLTEs as they enter or leave the site.
- By 2025, complete and build upon the current management study at North Fiesta Island, specifically the use of beach sand replenishment, salt, and solarization in reducing total and invasive vegetation cover.
- By 2027, investigate the need for additional rip-rap or other erosion control at sites that are experiencing erosion.

3.3. Predator Control

Long-term Management Goals: Maintain year-round, preventative and effective predator control efforts, streamline communication to improve efficiency, and explore strategies to reduce increasing predator pressure.

Supported by: MB IBA, MBPNRMP, MSCP, USFWS Least Tern Recovery Plan.

Since the 1980s, management of urban and natural predators has been an essential part of CLTE conservation efforts, with predation on eggs and chicks identified as a key limiting factor to successful nesting (Marschalek 2005). Throughout their nesting range, common predators

include corvids, gulls, great blue herons, gull-billed terns, American kestrels, peregrine falcons, and a diversity of mammals.

Several of the state's historically largest and most successful nesting sites have seen significantly lower productivity rates in years where predator control is not in place, with impacts carrying over into multiple nesting seasons. Populations of many urban predators, including gulls, corvids, coyotes, and feral cats, are increasing, and many raptor species benefit from anthropogenic nesting opportunities such as non-native trees and structures near nesting sites. Predation by protected species, or species of special concern, has become an emerging issue throughout their range. The populations of several state-protected predators are increasing, such as the peregrine falcon (*Falco peregrinus*). Predation by these species will likely be an ongoing and worsening problem in the years to come.

Predator control can be both preventive and reactive, although in recent years changes in regulations by the USFWS have resulted in much of the work being the latter. In the past, avian predators that were observed taking CLTEs multiple times were held in captivity over the course of the CLTE breeding season in order to prevent additional takes. The Fish and Wildlife Service changed tact on this over a decade ago, and now many raptors cannot be held for longer than 72 hours. This has resulted in a significant increase in the number of raptors observed at the CLTE nesting sites, many of whom resume depredating after being released (John Turman, APHIS, personal comm.).

The removal of peregrine falcons (PEFA) and other raptors is now only allowed after multiple predation events ("takes") or attempted predation events have been documented within a defined and chronological number of days. This policy is guided by the important need to limit human interaction with raptors and the ensuing detrimental impacts, including nest abandonment and death, and the protocol is written into USFWS permits. While understandable, this has greatly complicated predator control efforts at the CLTE nesting sites, where a significant amount of damage has often already been dealt to the CLTE nesting colony by the time the required number of predation events have been visually documented. It is typically also past the start of the raptor nesting season, and the presence of an established nest or young will bring many of the raptors back to whichever site they were removed from in a relatively short period of time. Whether successful or not, attempted takes by peregrine falcons and other birds of prey also contribute to higher levels of CLTE nest abandonment and create opportunities for scavenging birds such as corvids and gulls to pick off unattended eggs or chicks (Jackson, 2020). It should be noted that peregrine falcons visit and or hunt nearly every tern site every year in the Southern CA region. Some will return regularly or daily to a specific site or multiple sites and many are successful in their hunts (Turman, personal comm., 2021).

Recent USFWS and USDA regulatory changes have created new challenges for predator control staff, and there are policies which could be modified to the benefit of CLTEs. We encourage our partners within USDA to bring their perspectives to the table so we can explore potential solutions to these issues. This includes creating greater flexibility in decision making at the field and/or local FWS level. Often, permit restrictions require that certain matters be elevated to

either the Region 8 Migratory Bird office and/or CDFW Sacramento staff – to be decided by persons that are unfamiliar with site specific dynamics, localized predator densities, predation pressures, and other variables. This can hamper on-the-ground efforts and prevent effective predator management for CLTEs.

❖ **Recommendations:**

- Maintain annual, year-round, holistic and effective predator control.
 - Mission Bay has historically seen very high turnover rates for predator control staff, due largely to the seasonal nature of the job. Fortunately, this issue appears to be coming to a resolution, as the City of San Diego has just increased the funding for predator management and created a year-round position to start in the 2021-2022 season. This will incentivize predator control staff to remain in the position for multiple years, increasing institutional knowledge and ensuring high quality predator control coverage for the nesting terns, and we recommend maintaining this year-round position into the future.
- By 2027, streamline communications between predator control staff, biological monitors, volunteer predator monitors and land managers.
 - While some data concerning predator management is very sensitive, steps can be taken to improve day-to-day communications and ensure that all of the on-the-ground staff are aware of predator sightings, CLTE mortality events, site disturbances and more. On-site logbooks have been used by predator control, biological monitors and volunteers in the past to communicate these issues. This should be reinstated, with steps taken to ensure that they are not impacted by vandalism. This data could also be shared more readily through the use of shared online documents such as Google sheets, or with a shared spreadsheet that's accessible in the field through phones or tablets.
 - We encourage the City of San Diego to share the USDA predator reports with cooperating managers, including CDFW, biological monitors and SDAS.
 - The biological monitors and land manager partners should work with the City to obtain the annual predator control and biological monitoring reports in a manner that adheres to the Privacy Act. Major predator and mortality issues should be discussed at pre- and post-season meetings.
- By 2027, Explore strategies for reducing predator pressure, especially relating to permitting and regulatory measures.
 - Local peregrine populations have recovered to the point that there are now numerous successful nests within close proximity to Mission Bay, including Point Loma, Cabrillo, and Torrey Pines. Peregrines are a frequent sight at the Mission Bay CLTE nesting sites, often taking or disturbing CLTE adults and fledglings, and peregrine kills are found on site during both the nesting and non-nesting season. With the availability of both historic and man-made nesting structures, it is likely that the population will reach or even exceed

past numbers (Unitt 2014). A higher degree of coordination between PEFA biologists and CLTE managers, biological monitors, and USDA Predator Control could lower the impacts on Mission Bay's least terns from a growing peregrine population.

- The protected status of the peregrine falcon has created unique management issues at the CLTE nest sites, and the ongoing decline of CLTEs in the southern CA region may necessitate reevaluating the application of some of the protections that PEFAs currently have. Numerous local experts have stated the need to update these protocols, including the possibility of reinstating nesting season holds and removing barriers for their removal prior to the start of the nesting season (Patton, 2017).
- The requirement that three takes or attempted takes must occur and be witnessed and reported by predator control or a biological monitor prior to PEFA removal has hampered predator control efforts. There is room for interpretation in the guidelines that wildlife agencies follow regarding predator control, and we encourage the agencies to prioritize the protection of the endangered CLTEs as much as possible. While PEFAs are one of the most widely distributed raptor species in the world, CA Least Terns are limited to only a few remnant coastal nesting locations (Ferguson-Lees 2001).
- In addition, the banning of modified padded jaw foot-hold traps (i.e. pole traps) and the goshawk trap checking requirements has also made the capture of nocturnal birds of prey more difficult (Drew Castetter, personal comm). It should be noted that the Fish and Wildlife Service National Pole trap policy allows their use, but it has been banned by the Region 8 FWS office in CA for protection of threatened and endangered species. They can still be used in CA for protecting public safety at airports upon specific request to R8.
- The San Diego Audubon TernWatcher volunteer program alleviates predator pressure by 1.) increasing eyes on the nest and 2.) streamlining communications with USDA staff, and is an important component of the San Diego Audubon's program to involve the community in stewarding and supporting CLTEs. The program can be improved so that the TernWatchers do not become a disturbance themselves. Proper locations and protocols for the program should be updated, and should be modified in collaboration with Predator Control staff and Biological Monitors.
- The installation of cameras could assist with predator control efforts, and increase the understanding of predator/prey relationships (e.g., species, density and timing of predators). Live virtual cameras placed on goshawk traps would also allow more ease of trapping nocturnal raptors. This has been instituted at FAA Island since 2019, but could be instituted at other sites. This could also be used to monitor human disturbance and nest fate.

- Additional tactics for reducing predator pressure include the use of chick shelters and leaving some vegetation on site to provide shelter for chicks.
- Another emerging issue has been the intentional release of rehabilitated or trapped wildlife nearby CLTE nesting areas, which appears to be an issue at North Fiesta Island. This can be addressed by working with wildlife rehabilitation facilities and pest control companies to ensure that potential predators are not being released within close proximity to the nesting areas.
- Several municipalities in San Diego follow a Trap, Neuter, and Release policy for feral cats. Feral cats have been seen and captured in other preserves in Mission Bay, and their presence and impacts at CLTE nesting preserves should be closely monitored. Partners should work with municipalities to end the policy, or if that is not possible, to move the release sites far from critical nesting habitat.

3.4. Human Disturbance

Long-term Management Goal: Remove or minimize unnecessary human disturbance on an annual basis.

Supported by: MB IBA, MBPNRMP, MSCP

Located in the middle of a large public park, all of the active CLTE nest sites experience high levels of human disturbance. While the majority of the sites are protected by fencing, there are numerous types of human disturbance that impact nesting CLTEs, including the use of fireworks, proximity to recreation areas (especially with off-leash dogs), boating activity immediately adjacent to the nesting area, increase in predator population due to litter, use of drones and hang-gliders, and entrance onto the nesting site by members of the general public that disregard signage.

Site-specific actions to reduce these impacts are mentioned in Section 4, and Bay-wide actions are mentioned below:

❖ Recommendations:

- Enforce regulations surrounding the presence of off-leash dogs in areas where this is not permitted, especially areas which have especially sensitive or valuable wildlife habitat or are adjacent to CLTE nesting habitat, annually.
- Improve communication between the lifeguards and the Mission Bay Rangers to ensure that boaters, recreational users or Junior Lifeguard participants in prohibited areas are responded to appropriately, by 2025. San Diego Lifeguards have also been seen spraying FAA Island with salt water, which, although potentially helpful in preventing plant growth, could be extremely disruptive to nesting terns. Communication must take place to ensure that this does not occur during the nesting season.
- Replace lid-less trashcans to reduce the unintentional release of litter as soon as possible, at least by 2027.

- Reach out to local fishing gear companies about the need to properly dispose of fishing gear and avoid the use of certain types of lures in immediate proximity to the nesting sites (plastic lures have been found multiple times on site, most likely dropped by birds) by 2027. Support the City of San Diego’s programs to collect and recycle fishing line.
- Examine the impact of boating activity (including personal watercraft/jet skis) on CLTE behavior. This should be incorporated into the TernWatcher observations, by 2027.
- Reach out to residents near the Mariner’s Point nesting site to encourage them to contact the rangers or lifeguards if they see any intrusion by members of the public or other disturbances by 2027.
- Coordinate with local boat and jet ski rental businesses to ensure that the public is educated about where they can and cannot disembark, and why they should avoid pursuing birds in flight over the water. This should include creating informational materials to share with businesses and the public, by 2037.
- Ensure that all maps regarding the use of drones and/or gliders accurately depict restricted areas around and immediately above CLTE nesting sites. Information pertaining to the negative impacts of drone usage on wildlife should be added to the City’s drone operator guide by 2037.
- Monitor and share any impacts associated with fireworks, hang-gliders or drones, and establish protocols in dealing with illicit uses in protected areas by 2037.

3.5. Food Availability

Long-term Management Goal: Support regional efforts to increase understanding of the relationship between food availability and CLTE nesting success, revisit the Mission Bay Forage Study.

Supported by: USFWS Least Tern Recovery Plan

Although more research is needed, there appears to be link between declining fish abundance, shifting diet, and CLTE nesting productivity. There are a series of actions that could be taken to answer these questions and better support foraging and nesting CLTEs.

❖ Recommendations:

- Review the 1990 Foraging Study, with special attention paid to recommendations for future studies by 2025.
- Use this past study, and more current observations of CLTE nesting and foraging behavior, to undertake a diet study of Mission Bay CLTEs by 2025. Point Blue Conservation Science has been carrying out a diet study at a number of CLTE nesting locations throughout their range, but that has not included any of the Mission Bay nesting sites. Collaboration could gain valuable information about how CLTEs are provisioning their chicks in Mission Bay, but steps should be taken to reduce any potential impacts to nesting birds during the data collection process.
- Analyze the species of dropped fish at CLTE sites by 2025. Biological monitor Jennifer Jackson has been analyzing the species diversity of dropped fish at the CLTE sites for the

last several years, and this work could be expanded upon in order to better understand foraging patterns. This study could be continued with the help of local students and researchers.

- Map the foraging areas of the CLTEs at each Mission Bay nesting preserve by 2025. There is little to no understanding of which specific foraging areas the Mission Bay birds use. More information about this could also contribute to a better understanding of the link between nearby wetland habitats and CLTE nest sites, and could help prioritize the protection of these foraging areas.
- Annually, support the protection and restoration of eelgrass and other submerged aquatic vegetation in Mission Bay, which provides nursery habitat for a number of important forage fish.

3.6. Climate Change and Sea Level Rise

Long-term Management Goal: Minimize the effects of climate change, including sea level rise, to CLTE nest sites and foraging areas and support coastal wetland and associated habitats in Mission Bay.

Supported by: MBPNRMP, MSCP

Similar to much of the San Diego coastline, Mission Bay is critically vulnerable to high levels of flooding related to sea level rise (SLR) and storm surges, with potentially significant impacts to the coastal dune and dredge spoil habitats of CLTE nesting sites. The City of San Diego's 2019 State Lands Sea Level Rise Vulnerability Assessment analyzed impacts of a variety of SLR scenarios, with increases between 0.6-1.1 ft by 2030, 1.2-2.8 ft. by 2050 and 3.6-10.2 ft. by 2100 (City of San Diego 2019).

Stony Point, Mariner's Point, FAA Island, portions of the current footprint of North Fiesta Island, and the Southern Wildlife Preserve all have anticipated impacts due to both SLR and storm surges, yet these areas were not considered in a meaningful way in the Sea Level Rise Vulnerability Assessment. Preserving and restoring habitats to enable CLTE nesting locations to migrate to safety in the face of SLR is a critical long-term management need for this species, and will require further study. With improved modeling and a better understanding of the ongoing impacts from human emissions, the best available science should guide our planning for SLR impacts, as well as other effects of our climate crises, on CLTEs. Currently, the [USGS CoSMoS program](#) has the most up-to-date sea level rise modeling information for [Southern California](#). Future sea level rise planning efforts should more closely analyze the impacts to Mission Bay's wetlands, conservation lands and CLTE nest sites, and should prioritize land use decisions so that no nesting acreage is lost, and important foraging habitat is not negatively impacted.

❖ Recommendations:

- Mitigate and adapt to climate change, especially sea level rise, in Mission Bay, ensuring that City plans protect and maintain CLTE nesting habitat, foraging habitat, and associated coastal habitats (wetlands, eelgrass beds) until at least 2100.

- Ensure that future planning documents for the Mission Bay area consider the impacts of SLR on CLTE nesting sites, annually.
- Explore opportunities to use nature-based solutions to sea level rise in a way that also supports forage fish populations adjacent to CLTE nesting sites, annually.
- Prioritize the protection and expansion of important coastal habitats such as wetlands, mudflats and eelgrass in Mission Bay, in order to buffer the impacts of future sea level rise, annually.

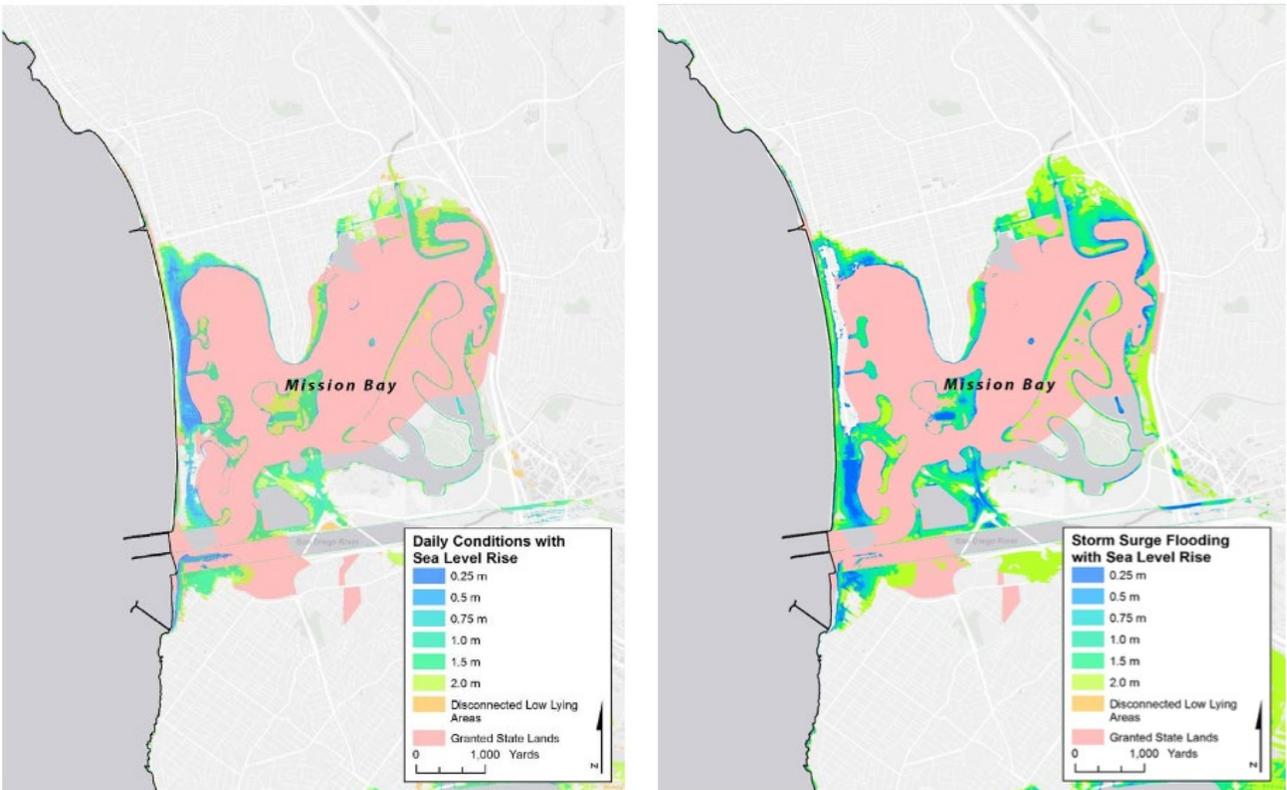


Fig. 3-1 and 3-2: Daily and storm surge conditions under various SLR scenarios predicted in the coming century. (City of San Diego 2019).

3.7. Sand Replenishment/Impaired Sand Transport

Long-term Management Goal: Ensure that the CLTE preserves have suitable nesting substrate, and are managed to mimic natural sand accretion processes as much as possible.

Supported by: MBPNRMP

The dredge islands that now make up the majority of CLTE nesting sites within Mission Bay do not receive natural infusions of sand, and as such do not function as naturally occurring sand dunes. Instead, they often experience a loss of surface sand, and accumulate higher nutrient levels due to the presence of non-native vegetation. Conversion to disturbed grassland begins, creating the need for intensive vegetation removal efforts. The majority of sites have not

received any additional deposits of sand since their creation decades ago. Roughly half of the Stony Point nesting preserve received six inches of sand in 2014, and test plots on North Fiesta Island received 3-6 inches in 2021. On the East Coast, tern sites are typically re-topped with additional sand every 3-7 years (Golder et. al, 2008). While such frequency might not be required at the Mission Bay CLTE sites, research is needed to determine the optimal frequency and recapping every 5-15 years would likely be beneficial for ensuring appropriate substrate type and vegetation cover for the nesting CLTEs. For example, the portion of Stony Point which did receive additional sand has seen a dramatic conversion to nearly all native sand dune vegetation, while the portion that did not receive additional sand requires much more intensive scraping and spraying to keep non-native weeds at bay.

To better understand the value of beach sand replenishment to decrease total and invasive vegetation cover and increase nesting suitability for CLTEs, San Diego Audubon initiated a study exploring the impacts of added sand at the North Fiesta Island nesting site, which will run from 2020-2022. Sand replenishment would also be beneficial as long-term protection of CLTE nesting sites in the face of sea level rise.

Several additional actions could further our understanding of sand transport in the area, and improve substrate for nesting terns.

❖ **Recommendations:**

- Prepare a sand amendment plan for the Mission Bay CLTE preserves by 2037 and ensure that sound science underpins the plans.
 - Analyze grain size, organic content, nutrients, shell hash, and penetrability to inform the need for additional beach sand replenishment in the future.
 - Perform a literature review of how seabird nesting sites are managed in other areas, specifically on man-made islands. On the East Coast, amending dredge sites with additional sand is a common practice, and it typically creates a number of positive benefits, such as limiting vegetation cover and reducing flood risk.
 - Potential sources of sand include the sand treatment area located in the interior of Fiesta Island (although this could also contain invasive seeds), or dredge spoils derived from other coastal dredging work. We should improve collaboration with local and federal agencies to ensure that any potential sources of dredge sand are made available for this work, including contacts with the Sand Compatibility Opportunistic Use Program.
 - The sand amendment plan should look to management actions that would help rare plants such as Nuttall's Acmispon and Coast Woolly Head (*Nemacaulis denudata*) establish populations on the amended sites.
- Maintain and improve dune habitat to reduce erosion and encourage natural sand accretion processes on an annual basis.
 - Where appropriate, encourage the growth of native sand-stabilizing plant species to reduce the impacts of wind action and erosion. Care should be taken to avoid plants

that entrap chicks, such as pink sand verbena (*Abronia umbellata*), red sand verbena (*Abronia maritima*), and beach burr (*Ambrosia chamissonis*).

- Pursue total vegetation cover of 20%. Vegetation clearance can be strategic and less removal can take place in areas of high wind action (i.e. the seaward edge of the site).

3.8. Signage and Nesting Site Protection

Long-term Management Goal: Use signs and publicly available information to educate and inspire the community to care for CLTEs and their nesting sites, and to enforce nesting preserve protections.

Supported by: MBPNRMP, MBP Master Plan, MSCP

Sharing the existence and importance of CLTE nesting sites with the visitors of Mission Bay Regional Park is an important tool for both education and protection. The existing management relationship between the City of San Diego and San Diego Audubon has led to the creation of informative signs designed by local school children, and has allowed for thousands of volunteer experiences at the nesting sites during the restoration season. Many of these signs are posted at CLTE preserves, which add an additional level of community engagement and interpretive value to the City and wildlife agency signs.

❖ Recommendations:

- Provide or contribute to additional outreach and interpretive resources for rangers to use during educational walks or other public events by 2027.
- Increase the reach of SDAS' Sharing our Shores education program by expanding work to more local schools. Install 75 more signs by 2037 at and in close proximity to the nesting sites, including in newly dedicated nesting areas, mudflats, wetlands and other important roosting and foraging areas.
- Ensure the uniform use of City and wildlife agency signage throughout the park by 2037.

3.9. Education and Outreach

Long-term Management Goal: Get broad public support, especially local support, for CLTEs and the ecological value of Mission Bay, increase awareness of the role that the community can play in protecting CLTEs and their nesting and foraging habitat.

Supported by: MBPNRMP

Public support for California least terns and their protection is needed to ensure that the nesting sites are managed and protected from impacts. Education is highlighted in the MBPNRMP as a necessary component of Mission Bay management. Non-profit partners play an important role in safely bringing school students and volunteers into the CLTE programs, and improving public understanding of the birds and their long-term needs. Stewardship opportunities that are science-based are a useful way for the public to interact with these endangered species, and promote the long-term viability of the CLTE program.

❖ **Recommendations:**

- Broaden the support for these birds and these habitats as soon as possible.
- Native American communities should be reconnected to Mission Bay Regional Park through outreach events, community projects and management meetings as soon as possible, by 2025.
- Communities of concern throughout San Diego should be a focus audience, as well as the schools, community groups, and neighbors in the local communities, by 2025.
- Research opportunities with local universities should be highlighted and supported with new academic partnerships established to answer research questions by 2027.
- Create additional educational opportunities via handouts that are available at Park and Rec centers, contribute to community murals that highlight coastal dune species, and more, by 2027.
- Find additional ways to elevate the importance of CLTEs and other endangered species and natural resources in Mission Bay through community science and art projects. This could include the creation of murals, art contests, bio-blitzes, and more, by 2037.

3.10. Reporting and Communication with Other Nesting Sites

Long-term Management Goal: Improve communications between biologists and land managers of all of the southern CA CLTE nesting sites, annually.

Supported by: MBPNRMP, MBP Master Plan, MSCP

The CDFW organizes annual CLTE statewide meetings, which are an opportunity to provide site-specific updates and present relevant research. This could be expanded by creating more frequent regional meetings for more detailed discussions or by streamlining more real-time data exchange to explore trends in nesting, nest abandonment, and issues surrounding predation or foraging.

The Mission Bay biological monitors collect and report nesting success to the wildlife agencies, City staff and San Diego Audubon. This information is then passed on to volunteers and funders. San Diego Audubon and USFWS and other local partners should continue to be active participants in these efforts, sharing and learning from other sites and managers. The last several years have seen an increased level of collaboration between land managers in California and Baja CA, and this should continue into the future. The potential for collaborative work between San Diego and Baja CA sites is especially exciting due to their close proximity and could tie into foraging monitoring.

❖ **Recommendations:**

- Collect, analyze and share information from all the Mission Bay management and regulatory agencies through improved communication and continued management meetings, annually.
- Explore the possibility of more frequent southern CA or San Diego County CLTE meetings, or promote the use of the list serv, by 2027.

4. Site-specific Challenges and Opportunities

4.1. Mariner's Point

Mariner's Point typically hosts the largest number of nesting pairs and produces the majority of Mission Bay's fledglings (and a significant amount of fledglings for the entire state yearly), so it is vital that this area is maintained as high quality CLTE habitat into the future.

There are a number of challenges that this site faces:

- Several species of native vegetation (Nuttall's Lotus and Coast Woolly Head), are protected locally, and so must be thinned out with care.
- Another native species, *Abronia umbellata* or Pink Sand Verbena, creates entrapment hazards to CLTE chicks, especially following rainfall events when the plant appears to be stickier. The seeds of Silver beach burr (*Ambrosia chamissonis*) are also a hazard to the CLTE chicks, and when large shrubs are removed, raking and removal of these seeds should also take place.
- The site is surrounded by high levels of recreational use from boaters, swimmers, kayakers, picnickers, and homeless encampments. Each of these uses can result in their own kind of impacts, including litter, increased numbers of urban predators such as rats, corvids, and gulls, discarded fishing line and lures, illicit entry via the water or land, and the use or presence of fireworks, drones and dogs. The high density of recreational users also complicates predator management and removal.
- There are many nearby perching locations for raptors and other predators, including the buffer fence and berm, trees at the surrounding public park spaces, and tall boat masts.
- The site has not been recapped for decades, and is experiencing some erosion on the eastern side, and a loss of sand from wind action on the western side. Less than ideal substrate also appears to encourage the proliferation of non-native ants, which can be fatal to young chicks.
- Edge effects often drive the birds to nest as far away as possible from the buffer fence and berm, causing overcrowding in the middle of the site and on the southern point.

❖ Recommendations:

- Annually, collaborate with City and MSCP staff to ensure that sensitive plant species can be thinned out as needed to ensure the appropriate vegetation cover and the best possible nesting success of the CLTEs. Permitting may be required, and these plants could potentially be transplanted to other coastal dune habitats or unused CLTE nesting sites.
- Plants that pose entrapment threats should be reduced as much as possible or removed on an annual basis. Removed plants can be translocated to other Mission Bay dune sites.
- On an annual basis, ensure that rat abatement boxes are being properly maintained along the peninsula, and that litter on the ground is picked up regularly. Continue to spray invasive ant colonies during the restoration season, and during the nesting season as needed.

- By 2025, increase the use of bird deterrent strips on potential perching areas.
- By 2025, ensure that maps for drones are updated, with Mariner’s Point off limits.
- By 2027, explore the possibility of removing the berm in the buffer, potentially doubling the size of the nesting site and removing a visual obstruction for the birds.
- By 2027, improve coordination with City staff and SD Police Department to ensure that the area is patrolled during busy beach weekends, when disturbances are most likely. This can also help reduce the impacts of homeless encampments in the area.
- By 2027, install additional buoys to keep boats out of the inner-cove area.
- By 2027, explore the potential of relocating the Mariner’s Point peninsula fire pits to a more accessible location, further from the nesting site.
- By 2027, install fishing line disposal stations at the nearby docks.
- Beach sand replenishment should take place by 2037 to ensure that ideal substrate is maintained, to reduce impacts from non-native ants, and to relieve the heat island effect that is created by darker substrate in certain portions of the site.

❖ **Productivity Goals:**

- Maintain an average of 130 nests and 100 breeding pairs annually, and increase these numbers if possible. The average number of nests and breeding pairs for 2009-2020 was 138 nests and 104 breeding pairs.
- Increase the average fledgling-per-pair ratio to 0.5 by 2035, and 1.0 by 2050. The average for 2009-2020 was 0.39 fledglings per breeding pair.

4.2. Stony Point

Stony Point has some of the most promising CA Least Tern nesting habitat in Mission Bay, but has had very low productivity in recent years, with multiple years where no nests have been established. The area has relatively low cover of invasive plants, due in large part to on-going hand management efforts and the addition of 6 inches of sand to the southern portion of the site in 2014. It is also directly next to the water, and does not see as much disturbance in the form of watercraft as Mariner’s Point. The site has served as a roosting location for adult CLTEs and their fledglings at the end of the nesting season for the last several years. Proposed changes to this portion of Fiesta Island can be found with the recently adopted Fiesta Island Master Plan Update, and include the creation of eelgrass beds (a potential source of foraging resources for CLTEs).

Primary issues at the site consist of:

- The very close proximity of the Hubbs great blue heron rookery means that many of these predators are present on site, especially at the beginning of the nesting season when GBHEs are fledging from the rookery.
- Gophers are also present throughout the site, creating erosion issues and attracting additional attention from herons, egrets and other birds of prey. The erosion is most noticeable along the northern edge near the entry gate, where multiple rat abatement boxes are in danger of falling into the water.

- Occasional gaps in the buffer fence and primary gate and fence allow for the entry of dogs into the nesting site. Some of these gaps are created intentionally by park users.
- There are numerous potential predator perches nearby, including the buffer fence and berm and the trees and equipment at Hubbs and SeaWorld.

❖ **Recommendations:**

- As soon as possible, assess the size of the GBHE rookery, remove non-active nests during the off season, trim back trees as needed, and periodically check the area for any dropped USFWS bands that might imply that the herons have been feeding on CLTE chicks. Explore other potential ways to manage this colony and reduce its impacts on the nesting CLTEs. This expanding population may also be impacting nesting CLTEs at other sites in Mission Bay.
- Annually, when the threats from predators have been assessed and reduced, increase the use of attractants such as decoys and acoustics in order to encourage nesting here.
- Annually, limit disturbances from fireworks, dogs, boats and other recreational users and the nearby SeaWorld facility on an annual basis. This includes exploring realistic options to replace Pyrotechnics with something more environmentally benign.
- Continue rat abatement and ant spraying activities annually, and carry out gopher removal annually, as needed.
- Continue to monitor the population of Nuttall’s Lotus and Coast Woolly Head that has become established in the southern portion of the site on an annual basis. The NULO population is recorded with the SDMMMP.
- By 2025, install more educational signage on fencing around the nesting site in order to educate park users and dog owners about the area.
- By 2025, ensure that maps for drones are updated, with Stony Point off limits.
- By 2027, add additional sand to the northern portion of the site.
- By 2037, reduce the visual obstacle of the berm.

❖ **Productivity Goals:**

- Increase the number of nests and breeding pairs to an average of 15 nests and 15 breeding pairs annually by 2025, and 30 nests and 30 breeding pairs by 2030. The average annual number of nests and breeding pairs for 2009-2020 was 12 nests and 10 breeding pairs.
- Increase the average fledgling-per-pair ratio to 0.5 by 2035. The average for 2009-2020 was 0.12 fledglings per breeding pair.

4.3. North Fiesta Island

Despite being Mission Bay’s largest actively managed CLTE nesting site, this location has failed to produce any fledglings for the last several years, and there are significant impediments to the successful management of this area for optimal nesting success. It is worth noting that the buffer area immediately adjacent to the nesting site has had observations of other sensitive species, including Burrowing Owls (*Athene cunicularia*), White-tailed Kites (*Elanus leucurus*), and San Diegan Legless Lizard (*Anniella stebbinsi*).

In November 2021, the City adopted the Fiesta Island amendment to the Mission Bay Park Master Plan. Several management and regulatory agencies and groups supported site modifications for this reserve, including moving the dedicated nesting area closer to the shoreline to encourage foraging behavior by CTLEs, and making the entire northern end of the island inaccessible to the public during the nesting season, as recommended by the Coastal Commission. We are supportive of these adopted changes, and encourage the City to create a timely path forward to bringing this project about. The plan also included the creation of additional acres of coastal wetlands, which will improve foraging resources for CLTEs using this nesting site. These restored wetlands may also attract potential CLTE predators such as northern harriers, great blue herons, and peregrine falcons.

Primary issues at the site consist of:

- The large area of the site and the surrounding habitat of tall, invasive plants makes fully eradicating non-native plants and their seed banks extremely difficult.
- There are several perching, nesting and loafing areas for predators such as birds of prey, rodents, snakes, raccoons, possums, and more. These include non-native trees and shrubs in the buffer area and the buffer and exterior fence.
- The area often experiences flyovers by drones, and illegal dumping often takes place at the site entrance. The site also sees an even higher level of vandalism than other parts of the park, including purposeful damage to fencing and gates.

❖ **Recommendations:**

- Work with regulatory and management agencies to bring about the North Fiesta Island site modifications, including beginning the project-specific planning needed, by 2025.
- Annually if possible, the current site might also be improved with more frequent scraping followed immediately by beach sand replenishment.
- Address the use of drones, paragliders and kite surfers, which have the potential to haze off nesting birds or to potentially injure a bird in flight, by 2025. As drones continue to become more popular, a uniform position regarding their use in Mission Bay (and in conservation areas) may become appropriate. By 2025, ensure that maps for drones are updated, with North Fiesta Island off limits.
- By 2027, ensure that changes to the North Fiesta Island locations are phased, with new preserve space being created and adequately managed and monitored before removing the existing tern preserve. Ensure that the newly created nesting site and surrounding wetlands are not impacted by recreational watercraft, and monitor the arrival of any novel predators that this habitat creation may bring. Until this new nesting site is created, continue to maintain the current site, with appropriate vegetation management, anti-perching mechanisms, seasonal buffer closures, predator control and signage.
- Several adult osprey (*Pandion haliaetus*) have been seen using the northern portion of the Island for foraging and resting. The creation of a nesting platform could encourage them to nest here, which could also serve to keep away other raptors that predate upon

CLTEs. Any installation of osprey nesting platforms should consider how these could also encourage other predators to use the perches.

❖ **Productivity Goals:**

- Increase the number of nests and breeding pairs to an average of 10 nests and 10 breeding pairs annually by 2025, and 15 nests and 15 breeding pairs by 2035. The average number of nests and breeding pairs for 2009-2020 was 9 nests and 7 breeding pairs.
- Increase the average fledgling-per-pair ratio to 0.5 by 2035. The average for 2009-2020 was 0.18 fledglings per breeding pair.

4.4. FAA Island

As the nesting area with the longest consistent use in Mission Bay, it is vital that this area is maintained in a way that it continues to provide high quality CLTE habitat. This off-limits island also offers high quality habitat that is not as subject to human disturbance as some of the other nesting sites within this urban park, but there are still numerous management challenges.

Primary issues at the site include:

- Complications surrounding inter-agency agreements between the Federal Aviation Administration (the leasee) and the US Fish and Wildlife Service (the contractor) can result in delays in carrying out needed management efforts such as pre-emergent herbicide applications.
- The site has an established seed bank of non-native plants, many of whom form thick ground cover and reduce suitability for nesting CLTEs.
- The site is seeing a high rate of erosion, which is anticipated to worsen due to sea level rise and king tides. The substrate on the island itself is harder than is preferable, contributing to non-native vegetation cover as well as creating hotter conditions for CLTE chicks.
- Boaters, kayakers and other watercrafts often move at high speeds next to the island, potentially hitting or otherwise impacting adult CLTEs and fledglings. This worsens during holiday weekends and other busy summer events.
- Park users may also disregard signage and disembark on the dock or the island itself.
- Additional disturbance can also take place when FAA employees gather on the island during the nesting season.
- The island receives only a moderate amount of coverage by predator control staff, and CLTE nests, chicks and fledglings are extremely vulnerable to predation events.

❖ **Recommendations:**

- Annually, maintain 3-year USFWS funding contracts for management and predator control, or use longer funding timeframes.

- Carry out an aggressive schedule of weeding and pre-emergent application in late winter/early spring every year to beat back the non-native seed bank on an annual basis.
- Manage the vegetation which creates entrapment hazards to CLTE chicks, annually.
- Annually, monitor any boating events that come in close proximity to the island during the nesting season.
- Improve coordination with predator control staff to ensure that the needed permits are in place for removing predators such as gulls, crows, ravens, herons and birds of prey, annually. This should include obtaining a permit to remove the nest of Canada geese (*Branta canadensis*), which established a nest here in 2021 and 2022.
- Annually, predator control staff should also explore additional ways to improve predator management in this difficult to reach location, including using cameras, setting out effigies, and visiting the site more frequently (while preventing disturbance to the nesting terns).
- Continue to coordinate FAA staff work on the island in conjunction with USFWS staff to ensure that the island is maintained annually, and that FAA staff take steps to reduce disturbance during the nesting season.
- Continue to monitor and protect sensitive sand dune species, including NULO and Coast Woolly Head on an annual basis.
- Address intermittent but disruptive recreational use by landing watercraft and recreational users that get too close to the shoreline through improved signs and coordination with City of San Diego Lifeguards by 2025. Lifeguards should be notified about the nesting season every year, and reminded about the need to keep park users off of the island in the days leading up to busy holiday weekends.
- Add sand to counter the loss of sand from wind and water erosion that is creating harder substrate that is more difficult for birds to create scrapes in by 2027. Ensure that the granular size of the sand is appropriate, as fine-grained sand does not appear to be as suitable for CLTE nesting as coarser sand.
- By 2027, address the erosion of the shoreline, which has some positive effects by improving access to the water for fledgling CLTEs but is also shrinking the size of the nesting preserve.
- By 2027, install additional signage on site to notify the public that the area is off limits, including on the dock.

❖ **Productivity Goals:**

- Increase the number of nests and breeding pairs to 50 nests and 40 breeding pairs by 2025, and 60 nests and 50 breeding pairs by 2035. The average number of nests and breeding pairs for 2009-2020 was 41 nests and 31 breeding pairs.
- Increase the average fledgling-per-pair ratio to 0.5 by 2035. The average for 2009-2020 was 0.21 fledglings per breeding pair.

5. **Background information: Supplemental Section**
 5.1. **Location: Mission Bay, San Diego, California**

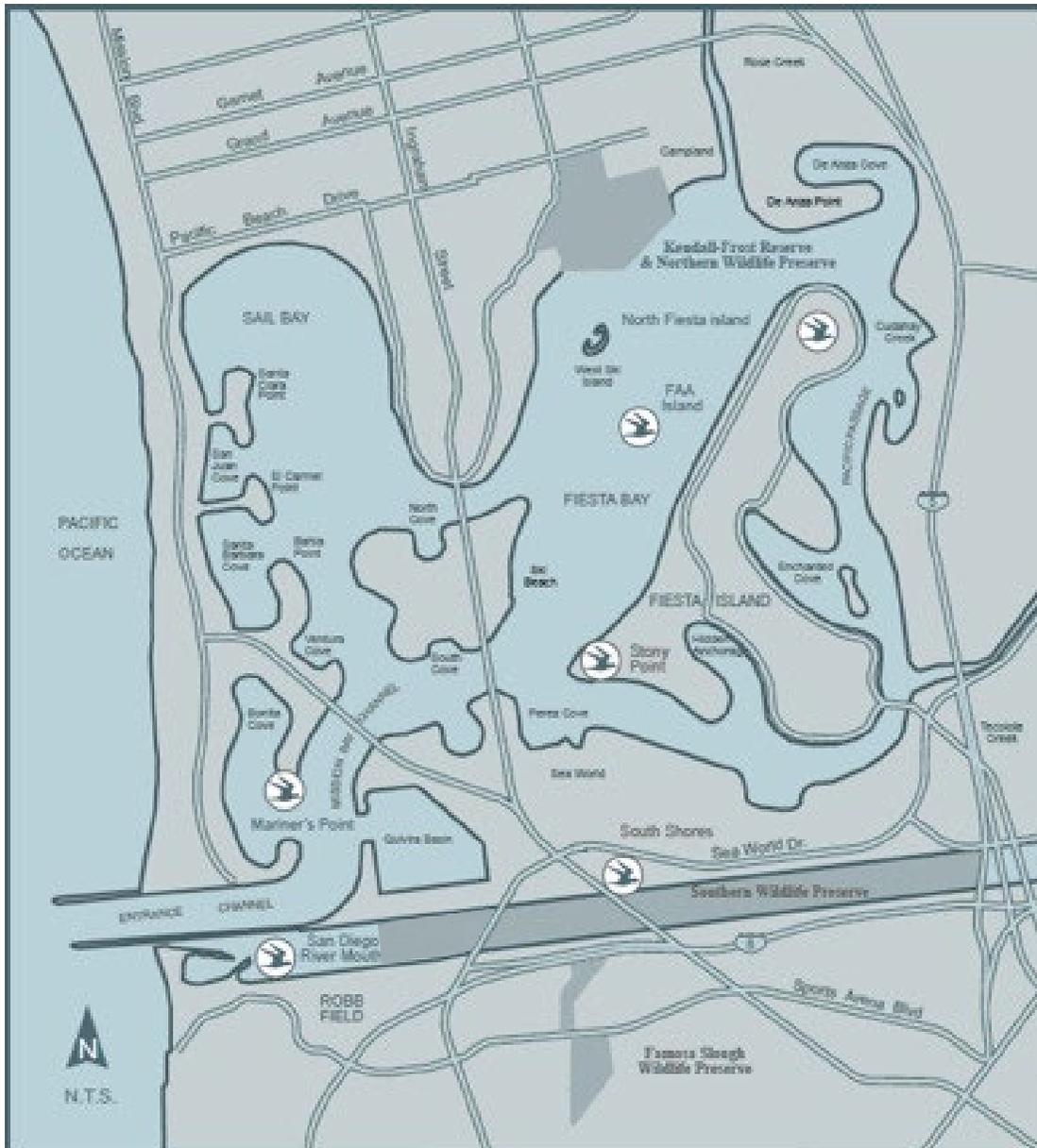


Fig. 5-1: CLTE nesting sites within Mission Bay, San Diego, CA.

Mission Bay is a highly-altered estuarine habitat complex that is currently developed primarily for recreation, with historic tidal salt marsh, mudflat, and open water habitats now replaced by man-made islands and a dredged bay (USFWS 1980). Once a 4,000+ acre wetland system, Indigenous communities have lived alongside Mission Bay since time immemorial (City of San Diego 1990). Archeological and oral history of the Kumeyaay (Ipai and Tipai people) shows they lived near and interacted with Mission Bay in several different locations. When Spanish

explorers arrived, they began referring to the area as Bahia Falsa (False Bay) in the 1800s due to the frequency with which this vast “swampland” confused ships traveling south to the larger San Diego Bay (SDHS 1955). The vast majority of natural habitats in the bay were destroyed following large-scale dredging by the Army Corps of Engineers in the post-World War II years and dredge spoils from this process were used to create the islands and peninsulas seen today (Rick 2002, San Diego Audubon Society 2018). Despite this alteration, Mission Bay retains a wide diversity of habitats, including large eelgrass beds that support fish, invertebrates and marine mammals, remnant coastal dunes which are home to endangered plants and animals, and intertidal and salt marsh areas which buffer our coastline and improve water quality. The Bay provides seasonal and year-round habitat to thousands of waterfowl, shorebirds, and waders. This is especially apparent during migration and winter seasons, when thousands of shorebirds utilize the bay (San Diego Audubon 2014).

5.2. CA least terns

5.2.1. Life History

The California least tern (*Sternula antillarum browni*) is a subspecies of least tern that nests on coastal sand dunes along the west coast of North America, with a breeding range that extends from Baja California, Mexico, north to the San Francisco Bay area (USFWS 1980). From mid-April to mid-September, CLTEs nest at over 40 recorded sites, with the majority of the U.S. sites monitored to some extent. Recent years have also seen an expansion in cross-border collaboration, which allows for a better understanding of their nesting trends in Baja CA. Less is known about their wintering behavior, but it is believed that they spend the non-breeding season foraging off of the west coast of Central and South America (Massey 1977). The birds are long-lived, with the oldest known specimen recovered after 24 years (Brian Foster 2013, pers. comm., 13 July).

They typically begin breeding at 3-6 years old, and are capable of reaching their mid-twenties, though the average age of the population is 11-12 years (Tom Ryan, pers. comm., March 2018). They can be identified from other tern species by their small size (9 inches in length), as well as their black cap and white forehead, and bright yellow bill and feet. Nesting sites are typically in coastal areas with sandy soil and little to no vegetation, alongside the ocean, lagoons, bays, rivers and other coastal inlets. Their nests are shallow scrapes initiated directly on the ground, often lined with shells and other debris (Massey 1977). Nest size averages 1-2 eggs, though clutches can reach 3-4. These are incubated by the parents for roughly three weeks, after which the chicks begin to move around the site within a few days, and fledge by 21 days (U.S. Fish and Wildlife Service 1985).

Successful nesting areas typically have low vegetative cover, which allows the buff-colored eggs and chicks to camouflage in the surrounding sand, reducing mortality from predators. Some vegetation is a benefit, however, as it provides additional cover from predators and some relief from the heat (Patton, 2017). Proximity to foraging sites is essential, as they plunge-dive for small fish such as northern anchovy, young-of-the-year rockfish, and silversides. As single bill

load feeders, they require small, nutrient dense forage fish to adequately provision their chicks, who swallow the fish whole.

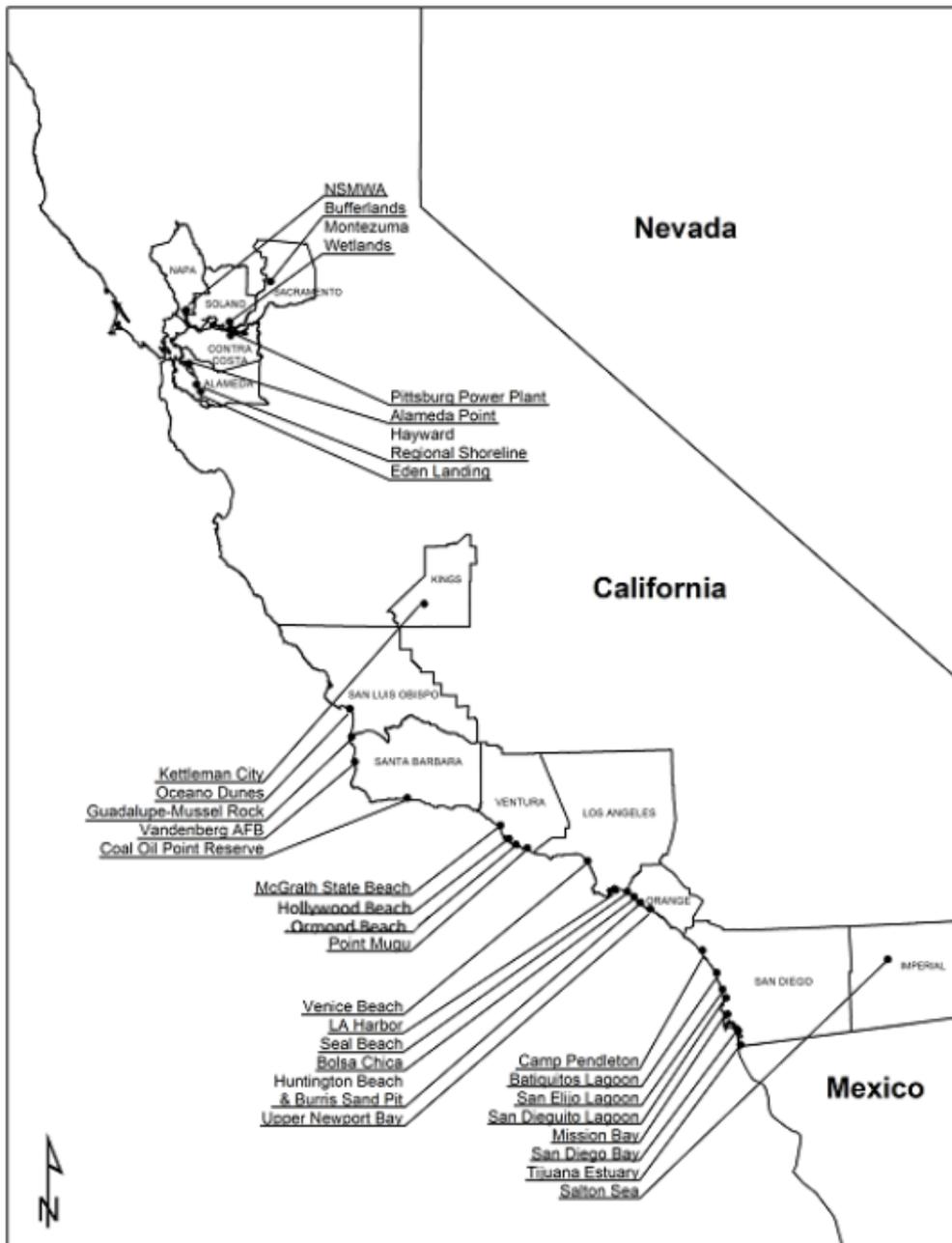


Fig. 5-2: CLTE nesting sites, 2015 CDFW Statewide Report.

5.2.2. Listing Status: Federal, State and Local

The California least tern was listed as endangered by the U.S. Secretary of the Interior in 1970 and the California Fish and Game Commission in 1971 (U.S. Fish and Wildlife Service 1985). This listing prompted annual monitoring efforts to estimate the breeding population size, and kicked

off active protection and restoration of their remaining nesting sites throughout the state. Several five-year reviews of the species have recommended down-listing, the most recent being in 2018. This recommendation has been rejected every time, as the species has not reached many of the recommended milestones which would allow for their de-listing or down-listing. They have also continued to experience emerging threats related to food availability and predation by urban predators. CLTEs are listed as a covered species in both the San Diego Multiple Species Program (MSCP) and the San Diego Habitat Conservation Program (MHCP) plans. Additionally, the regional Management and Monitoring Strategic Plan for Conserved Lands in Western San Diego County (MSP) categorizes this species as an “SO” or significant occurrence species, as a significant proportion of the population is at risk of loss. Moreover, the MSCP states that “management of its coastal habitat alone will not ensure its persistence,” implying that this species relies on consistent, active management of other threats such as predators (San Diego Management and Monitoring Program and The Nature Conservancy 2017).

5.2.3. Range-wide Population Trends

The species saw a significant recovery in the late 1970s, roughly a decade after its initial state listing as a Fully Protected Species in the 1960s, and subsequent State and Federal listing under the respective Endangered Species Acts. The population increased from roughly 600 nesting pairs to 4,000+ over the following three decades. In addition, the number of protected nesting colonies nearly doubled, with 23 in 1976 and 42 in 2016, allowing for the birds to disperse further throughout their range. Initially, this population increase was steady and appears to have been connected to the multiple benefits that the species experienced post-listing, including nesting site management and protection, fencing, increased levels of monitoring, and predator control.

The population peaked in the mid-2000s, before seeing a reversal in this upward trend, with both the adult population and nesting productivity now once again in decline. There are believed to be numerous reasons driving this, including but not limited to increased predator pressure (especially as urban predator populations increase and become more familiar with the location and timing of nesting), foraging issues related to climate change impacts, continued habitat degradation and fragmentation, and impacts to foraging, loafing and wintering areas. More research is needed on each of these topics to better understand their cause and potential management responses.

This downward trend has worsened over the last several years. In 2021, there was an estimated 3,512-4,364 nesting pairs that produced an estimated 800 fledglings, a significant decrease from the height of their recovery in 2009, when the adult population was estimated at 7,130-7,352 breeding pairs, with 1,734- 2,132 fledglings produced (CDFW 2016). Breeding productivity has

been precariously low over the last decade, with a fledgling-per-pair (FPP) ratio of 0.5 or less for the majority of the nesting sites.

Statewide Breeding Population

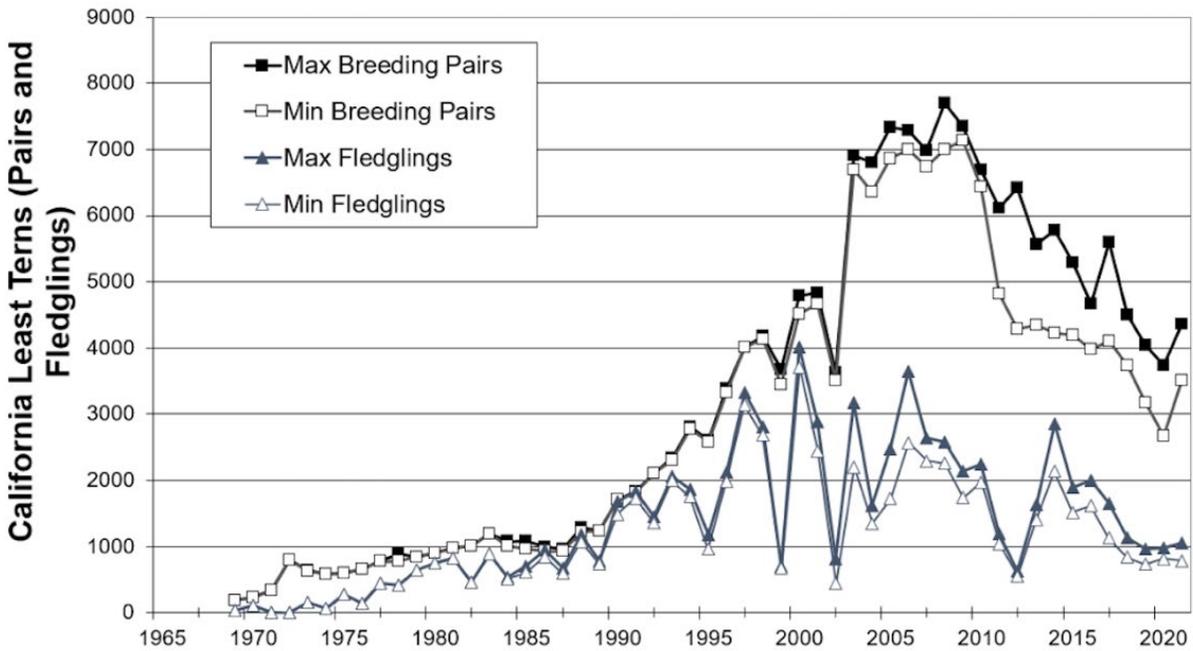


Fig. 5-3: Breeding pairs and fledglings, 1969-2021, 2022 Statewide meeting.

5.2.4. Regional Population Trends

In San Diego County, the nesting population of CLTEs has increased from an estimated 500 pairs in the late 1970s to between 2,409-2,869 pairs in 2016 (2016 Statewide report). Recent declines in the size of historically large colonies, such as Marine Corps Base Camp Pendleton and Naval Base Coronado, have made Mission Bay a more important player in the regional and state-wide population. There are 18-20 active nesting locations in San Diego County, but few of these are natural coastal sand dunes. The majority are dredge fill islands and other highly modified coastal environments. San Diego County is typically home to upwards of 60% of the total nesting population of the species, making the continued success of nesting sites in our area extremely important for the recovery of the species.

Unfortunately, the southern California sites have seen a significant and continuing decline in fledgling-per-pair ratio (FPP). An ideal FPP would be close to or exceeding 1.0, meaning that every breeding pair was producing at least one fledgling. San Diego County has been averaging

much lower than that for the last decade (see Fig. 5-4), which is preventing the population from expanding, and could result in a reduction or population crash.

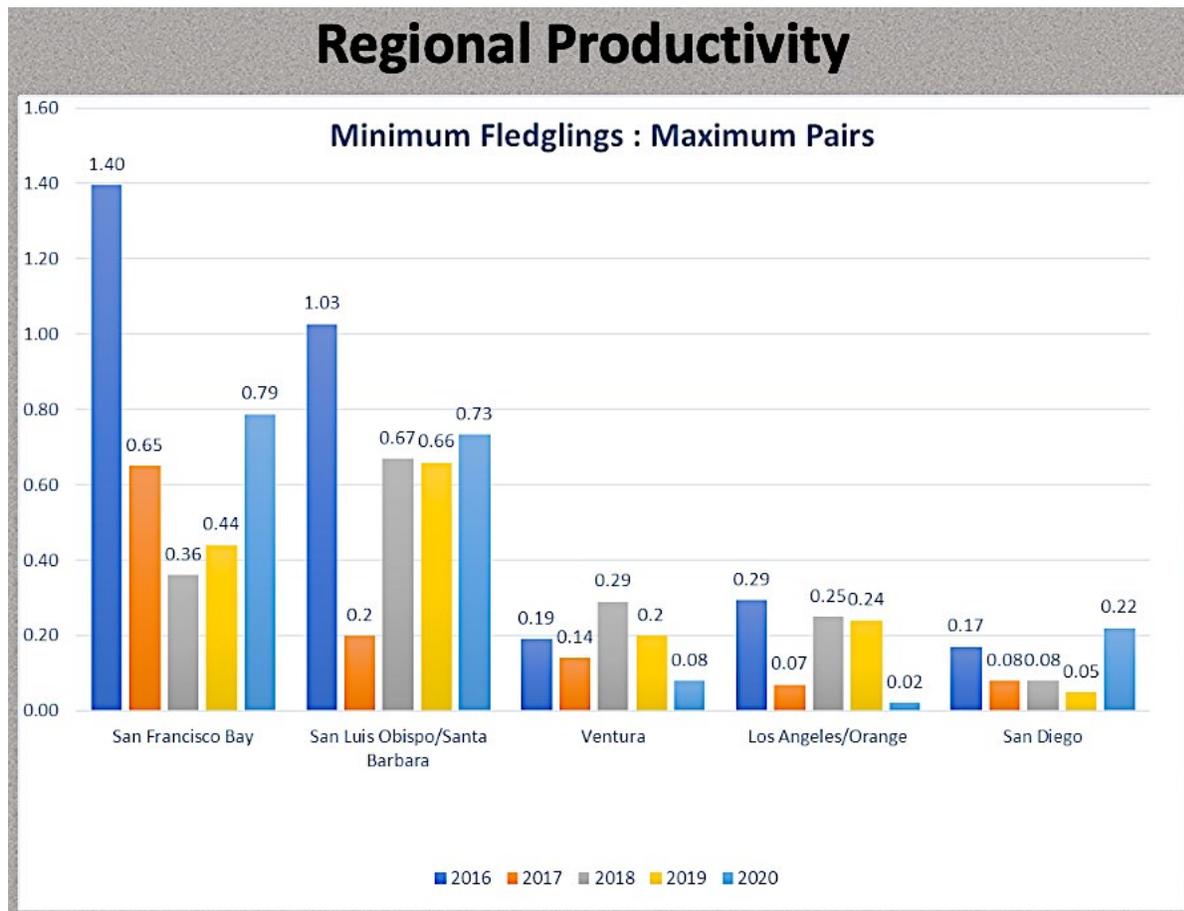


Fig: 5-4: Regional productivity (fledgling per pair ratio) for breeding areas, 2016-2020. 2020 Statewide meeting.

5.2.5. Range-wide Threats

The species has continued to feel the impacts of a number of serious threats. This includes a highly limited nesting range, disturbances due to human activities, physical changes to nesting habitat that reduce the amount of foredune unimpacted by tidal action, foraging issues related to climate change, impacts of invasive species, and an increasing predator population, both native and non-native, which can drive high levels of predation of eggs, chicks, fledglings and adults (United States Fish and Wildlife Services 1985). All of these pressures combined have resulted in the species being considered conservation-reliant due to its dependence on active and intensive conservation management to ensure its continued existence.

Nesting productivity has remained low throughout their range, due to a combination of nest abandonment (either prior to or following hatching), as well as elevated levels of predation.

Abandonment can be driven by a number of factors, including but not limited to predator pressure, lack of adequate foraging resources, or human caused disturbances (Frost 2016). Over the last several years, there has been a worrying spike in the abandonment of both chicks and nests occurring in late June through early July, oftentimes overlapping with sharp increases in ocean surface temperatures.

Predation is another major threat to the continued recovery of the species, both in terms of direct take of both adult terns and their young, and the indirect impacts via disturbances that predators can cause. Flushing by adult terns in reaction to a predator can impact their ability to properly incubate eggs and shade chicks and fledglings from intense heat, and leave the nests more exposed to predation events.

5.2.6. Regional Threats

As stated earlier, nesting productivity has been most depressed in the southern CA colonies. Climate change and increasing predator pressure appear to be the primary causes, although more information is needed about the cumulative effects of both.

The most extreme increases in ocean surface temperatures have occurred in the southern extent of the CLTE nesting range, and experts in the field believe that warmer ocean conditions may be impacting the spawning or distribution of the forage fish that CLTEs rely on. Changes in the diet of CLTEs throughout their southern range also points to foraging issues, with less nutritionally valuable resources such as fish larvae making up a larger proportion of their diet rather than their preferred prey of young northern anchovy (*Engraulis mordax*) and rockfish (*Sebastes* spp.). Foraging studies performed by the Navy have found that chicks fed anchovy (which has 25% higher energy content when compared to other potential prey species) grow significantly faster than chicks fed topsmelt. While more research is needed to better understand the link between ocean surface temperatures, forage fish availability, and CLTE nesting productivity, the continued warming of the ocean appears to be creating an additional stressor for the species. The last several years have also seen more frequent and extended red tide events, which often impact foraging for seabirds such as the CLTE.

Nest abandonment is also exacerbated in the southern CA region, and it is unknown whether that is due to foraging issues or spurred by the presence of high numbers of urban predators. While there is year-to-year variation, non-predation mortality of chicks (due to starvation or nest abandonment) is typically highest in San Diego County when compared to the rest of their range.

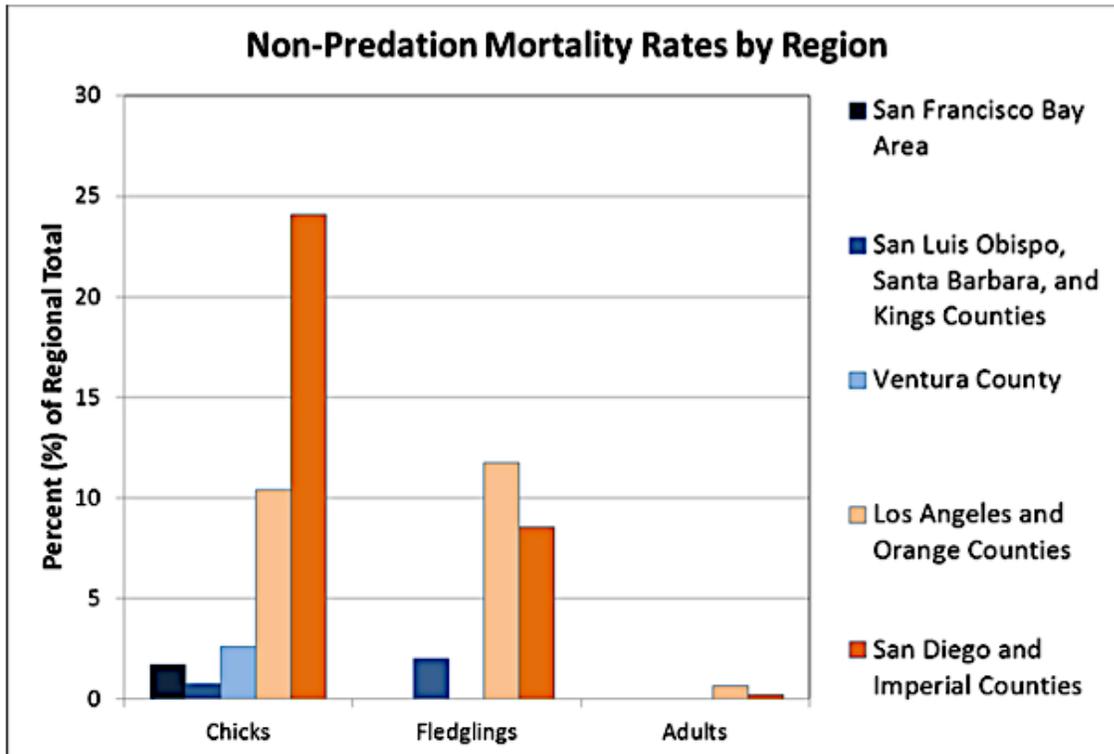


Fig 5-5: Non-predation chick, fledgling and adult mortality rates by region in 2015. 2015 USFWS report.

5.3. Recovery Goals - Guiding Documents

Sections of several critical documents are included here as the foundational guides to achieving species recovery. The full citations for these documents are included in the Literature Cited section of this report.

5.3.1. US Fish and Wildlife CA Least Tern Recovery Plan

The Revised California Least Tern Recovery Plan (U.S. Fish and Wildlife Service 1985) has the following requirements outlined for the de-listing or down-listing of the species (emphasis added):

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

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

While the minimum of 1,200 breeding pairs has been met every year since 1988, none of the subsequent years have had a statewide fledgling per pair (FPP) ratio of at least 1.0. From 1988-2016, the average minimum fledgling-to- maximum pair ratio was 0.45, and the central coastal areas were the only locations that met the recovery criteria of at least 1.0 FPP (2016 USFWS report).

5.3.2. Mission Bay Natural Resource Management Plan

The 1990 Mission Bay Natural Resource Management Plan (MBNRMP) identifies the protection, restoration and conservation of CLTE nest sites in MB as a key aspect of natural resource management in the bay and a responsibility of the City. The MBNRMP addresses many issues, and is a useful, but dated, plan that seeks to balance the recreational and commercial aspects of the Bay with its great natural resource value. The plan raises water quality, disturbance by cats and dogs, predation, sedimentation, piecemeal planning and sea level rise, among a host of others, as problems that need a comprehensive and substantial resolution to maintain and improve the natural resource value of the Bay. The MBNRMP references seven nesting areas – Mariner’s Point, Stony Point, FAA Island, North Fiesta Island, Cloverleaf, South Shores, and Crown Point Shores (see **Fig. 5-6**). It also includes recommendations for modifications for several of these areas, including:

- **Crown Point Shores:** if no nesting has occurred here by September 1990, the area would be made available to salt marsh restoration (pg. 42).
- **Cloverleaf:** Although this is deemed a permanent nesting site, it has not been used by CLTEs since 1982. Its location (surrounded by high traffic roads), small size (less than an acre), and lack of ideal substrate make it an unlikely candidate for nesting in the future. The MBNRMP recommends releasing it from a permanent nesting site designation and returning it to park use, such as landscaping, but mitigating this loss would require the approval of a replacement site. Alternatively, one of the other existing permanent least tern nesting sites could be expanded by the approximate size of the Cloverleaf site. Suggested areas for expansion are SP and NFI.
- If new CLTE nesting areas are needed, suggested options include West Ski Island, part of the new wetland preserve proposed on Fiesta Island, or other coastal strand habitat where co-occurring species such as Nuttall’s Lotus are found.

Other CLTE management guidelines are as follows:

- Coordination with resource agencies and regional experts, including the USFWS, CDFW, the CA Coastal Commission, the U.S. Army Corps of Engineers, and City of San Diego Park and Recreation Department, ideally before the nesting season begins each year.
- Maintenance and installation of signs, gates and fences.

- Removal of vegetation, grading of site and addition of shells/sandy substrate as needed.
- Placement of chick protection devices such as roofing tiles and chick fencing.
- Placement of least tern decoys, if deemed necessary.
- Implementation of predator control.
- Provision of biological monitor(s) for the duration of the nesting season.
- Notification of various City departments (Lifeguard Services, Police Department) on the need to enforce keeping intruders off of CLTE sites.
- Standard informational, educational, and boundary signs will be developed for CLTE sites. These will be strategically placed for maximum benefit and designed or placed to avoid use by foraging raptors.
- A California least tern foraging study to be conducted annually from 1989-1991.

5.3.3. San Diego Multiple Species Conservation Program

The Multiple Species Conservation Program: City of San Diego Subarea Plan (MSCP SAP) is a contractual, implementing agreement between the City and wildlife agencies. The MSCP SAP was pursuant to the general outline developed by wildlife agencies to meet the requirements of the California Natural Communities Conservation Planning (NCCP) Act of 1992. The MSCP SAP forms the basis for the implementing agreement which is the contract between the City and the wildlife agencies that ensures implementation of the MSCP SAP and thereby allows the City to issue take permits at the local level.

CLTE is a covered species in the plan, with the City protecting covered species to the extent feasible. The MSCP SAP Appendix A and MSCP Final Plan include detailed Area Specific Management Directives which should be referred back to when considering management at the Mission Bay sites. These should, at a minimum, ensure the “protection of nesting sites from human disturbance during the reproductive season, predator control, and specific measures to protect against detrimental edge effects to this species” (MSCP SAP Appendix A).

The ultimate goal of including CA least terns in MSCP is to “protect, enhance, and restore occupied and historically occupied habitat to create resilient, self-sustaining populations that provide for persistence over the long term (>100 years)” ((San Diego Management and Monitoring Program and The Nature Conservancy 2017). Management approaches include: ensure predator control at breeding colonies; perform routine annual monitoring following CDFW monitoring protocols; inspect habitat and document management needs, and implement routine management of habitat as determined during monitoring of tern nesting sites.

The inclusion of this species in the MSCP creates local funding opportunities. In San Diego, California Least Terns are specifically mentioned in Otay River Valley, Tijuana River Valley, and other urban habitat areas (which is the section that includes Mission Bay Regional Park). A North County Multiple Species Conservation Plan is a revision in process, and is being worked on by the County and north county municipalities. Very little coastal habitat would be covered by this plan, but the status of CLTEs in that plan should be monitored.

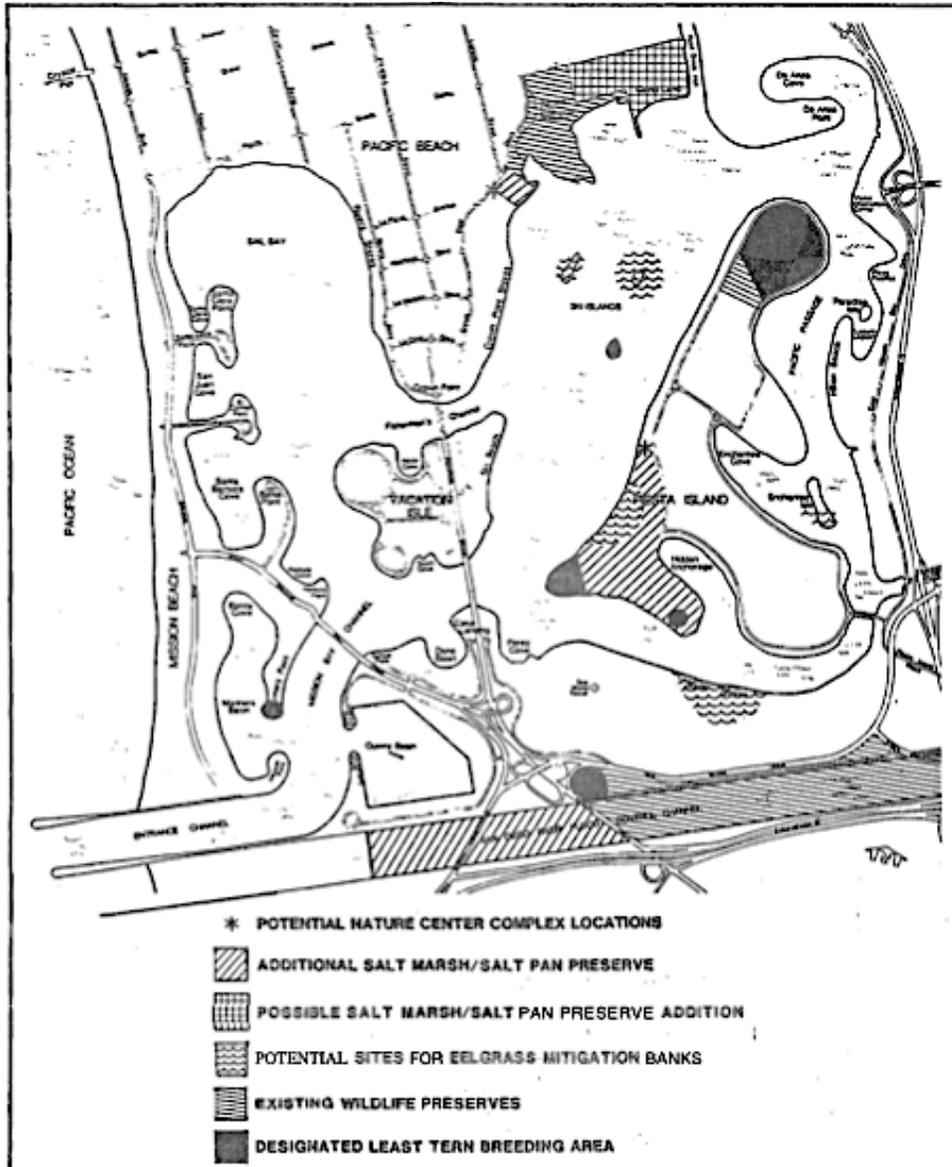


Fig.5-6: Designated CLTE nesting sites, Mission Bay Park Natural Resource Management Plan, 1990.

5.3.4 Mission Bay Important Bird Area Conservation Action Plan

From 2011-2014, San Diego Audubon Society carried out a habitat assessment of Mission Bay Park following the Important Bird Area (IBA) Assessment protocol (San Diego Audubon Society 2014). Conservation planning occurred in collaboration with a number of partners including Audubon California, SeaWorld San Diego, the California Native Plant Society San Diego Chapter, the San Diego River Park Foundation, the City of San Diego, the California Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, and several independent biologists.

As a result of this process, Mission Bay, including the Northern and Southern Wildlife Preserves and the Famosa Slough, was designated an Important Bird Area of “Global Significance” because the local area supports >1% of the global population of an endangered species (CLTE), eight other sensitive species (Brant, Western Snowy Plover, Light-footed Ridgway’s Rail, Long-billed Curlew, Loggerhead Shrike, Clark’s Marsh Wren, Belding’s Savannah Sparrow and Large-billed Savannah Sparrow), and sensitive habitat (salt marsh, eel grass, alkali flats, and exposed shoreline) (San Diego Audubon Society 2014).

San Diego’s internal Mission Bay Conservation Action Plan has helped to guide the organization’s conservation efforts in Mission Bay since 2014. The planning process identified conservation targets in the Mission Bay IBA, the key ecological attributes of each target, and their associated threats. Seven initial conservation targets were selected, including the California least tern, and a working group was formed for this species. While this working group has not met for several years, it is our hope that it can be reconvened for revisiting any edits to this Long-term Management Plan, or to address other emerging threats or opportunities in the Mission Bay area.

Major threats were identified, including: invasive plant species, light and noise pollution, excessive native vegetation cover, predation, boat traffic, limited/fragmented habitat, and impaired sand transport. Specific actions were also suggested to tackle these threats; see the Appendix for more information.

5.4 CA least terns in Mission Bay

5.4.1 Nesting Statistics and Locations: Historic and Modern

Despite existing in a highly modified state after decades of dredging, development and intensive recreational use, Mission Bay is a key nesting area for this species, as indicated by its mention in the US Fish and Wildlife CA Least Tern Recovery Plan. While the numbers have fluctuated from year to year, breeding pairs have been observed here reliably since the US Fish and Wildlife Service began recording observations in 1969.

The MBPNRMP has some early information on CLTE nesting in Mission Bay, stating that the least terns used eleven different sites in Mission Bay Park for nesting. The MBPNRMP also emphasizes the ongoing importance of FAA Island, and the early use of Mariner’s Point, stating that CLTEs have nested every year on FAA Island since the 1980s and beginning on Mariner’s Point in 1989. In 1988, 50 fledglings produced from 79 nests were found on FAA Island. In 1989, 30 fledglings produced from 125 nests were found on FAA Island and no fledglings were found from the 4 nests on Mariner’s Point (Mission Bay Park Natural Resource Management Plan 1990). The MBPNMP also states that the Cloverleaf nesting site was used by terns in 1982.

If this plan is to be expanded in the future, this section could also include:

- ❖ First records of CLTEs nesting in Mission Bay
- ❖ Timeline of when the currently used sites become active
- ❖ More information about established but not used nesting sites

- ❖ Summary chart of number of birds through the years
- ❖ Graphs of hatching rate, abandonment, number of nests, FFP for the sites

5.4.2 Biological Monitoring Summary Reports

The Mission Bay sites have been surveyed by paid biological monitors for decades, who produce an annual nesting report for wildlife agency staff and other partners. We have integrated the recommendations of the 2019 and 2020 reports throughout this document, and the full reports from 2020 and 2021 will be made available in the Appendix.

6 Needs for the Future

6.1 Long-Term Funding for Restoration Work

Ensuring the continued funding of the annual restoration of the nesting sites, as well as nesting season biological monitoring and predator control, is essential for supporting this species in Mission Bay. Currently, these services are funded in the following ways:

- Annual restoration of the nesting sites: funding provided to SD Audubon via rounds of TransNet EMP funds and the Conrad Prebys Foundation, and an inter-agency agreement with the USFWS and Federal Aviation Administration.
- Biological monitoring: contracted out by City of San Diego Park and Recreation Department via the City of San Diego General Fund.
- Predator control: contracted out by City of San Diego Park and Recreation Department via the City of San Diego General Fund.

The Mission Bay Natural Resource Management Plan goes into depth on the potential for mitigation-funded projects. It also clearly states that the City of San Diego Parks and Recreation Department is responsible for the implementation of the components of the natural resource management plan. To fund the management needed for CLTEs, the MBPNRMP suggests the City's General Fund and an intern program, as well as highlighting some grant opportunities for other components of the plan. Grant funding that provides long-term stability to a project is rare, and an annual inclusion in the City of San Diego Park and Recreation Department budget could provide the proof of investment and match to leverage other grants.

Potential short-term funding sources include:

- California Department of Fish and Wildlife Endangered Species Conservation and Recovery Program (section 6 funding) could be used if the project is targeted recovery actions for an endangered species.
- Multiple Species Conservation Program funds could be created by an agency or voter initiative.
- National Fish and Wildlife Foundation has grant opportunities for wildlife and habitat conservation.
- The National Coastal Wetlands Conservation grant program could be used if CLTE habitat protection was tied into wetlands restoration, as is the case on Fiesta Island.

- The SANDAG TransNet Environmental Management Program has funded much of San Diego Audubon’s work for CLTEs for over a decade.
- Sonoran Joint Venture funds the investigation and conservation of birds in this region.

Funding should also be pursued for individual pieces of this Long-term Management Plan, including sand amendments potentially as a result of dredging projects nearby, educational materials for local boat and jet ski rental businesses about where users can and cannot disembark, and educational resources where great wildlife viewing opportunities exist in Mission Bay.

6.2 Research Needs

There are still many gaps in our understanding of CLTEs and the other organisms that rely on coastal dune ecosystems, or what remains of them. Here we list several gaps that we know of that would inform CLTE management. A literature review of the recovery of similar species, including the Interior Least Tern (which was recently delisted by the USFWS) is also recommended.

- **Foraging/Diet Studies**
 - Diet study of Mission Bay CLTEs.
 - Impact of climate change and warmer ocean temperatures on forage fish population size and location.
- **Population dynamics/banding studies**
 - More information on Baja California populations and how they interact with the birds that nest in MB.
 - More information on their wintering range and threats in these areas.
 - Additional analysis of nesting activity and productivity of CLTEs in MB.
- **Nesting Reserve Design**
 - Beach sand replenishment protocols.
 - Vegetation cover and methods for managing total and non-native cover.
- **Protection of foraging and roosting areas**
 - Adult birds and fledglings also rely on protected areas for foraging and roosting. Prior to the start of the nesting season, nocturnal roosts are essential to migrating adults, as are spaces for adults and their new fledglings to rest at the end of the nesting season. Little is known of the areas that the Mission Bay birds rely on before and after nesting.
- **Attractants for newly established nesting sites**
 - Build off of current research by the San Diego Zoo to understand acoustic attractants.
 - Updated protocols of decoy use in established versus novel nesting sites.
- **Density dependent stressors**
 - Should we prioritize more, smaller sites or fewer, larger sites?
 - How does this interact with the increased pressure of urban predators and foraging?

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8 Appendices

Appendix A: Approved Plan for the North Subarea, Fiesta Island Master Plan Update, November 2021



Appendix B: Excerpt from Mission Bay Important Bird Area: Conservation Planning and Action Steps

Target 2: California Least Tern



Photo by S. Nelson-Embry

Working Group Participants:

Roxy Carter¹, Kevin Clark^{2,3}, Douglas Deutschman⁴, Nancy Frost⁵, Jennifer Jackson⁵, Ginger Johnson⁵, Isabelle Kay⁶, Rebecca Lewison⁴, Betsy Miller⁷, Yvonne Moore⁸, Jim Peugh^{1,10}, Chris Redfern¹, Rebecca Schwartz¹, Catherine Tredick⁴, Sandy Vissman⁹

¹San Diego Audubon Society, ²San Diego Natural History Museum, ³California Native Plant Society, ⁴San Diego State University- Institute for Ecological Monitoring and Management, ⁵California Department of Fish and Wildlife, ⁶University of California San Diego- Natural Reserve System, ⁷City of San Diego, ⁸San Diego Management and Monitoring Program, ⁹United States Fish and Wildlife Service, ¹⁰Friends of Famosa Slough

Description of Target:

The California Least Tern (*Sterna antillarum browni*) is a federally- and state-listed endangered species and a covered species under the Migratory Bird Treaty Act. While exact wintering locations remain unknown, CLTE breed during the summer on open sandy beaches/coastal dunes from Southern California to the San Francisco Bay. Their current population estimate ranges between 4,293-6,421 breeding pairs in 2012 (Frost 2013), compared with a low of 582 breeding pairs in 1974 (USFWS 1980). The smallest of the terns, CLTE are narrow and approximately 10 inches long. They have gray wings, a broad forked tail, a white body, and a black-capped head. CLTE feed on small pelagic fishes from lagoon and near-shore open ocean environments. They do not build nests, but rather create simple scrapes in unvegetated sand, gravel, or shell hash in which they lay eggs.

Key Ecological Attributes, Indicators, and Statuses:

KEA	Indicators	Current Status	2015 Goal
Food availability	Nest attendance	Unknown (project?)	n/a
	Number of nesting pairs	Poor	Fair
Population composition	Number of fledglings	Poor	Fair
	Fledgling per pair ratio	Very Poor	Poor
High resiliency to predation	Number of predator observations per hours	Unknown (project?)	n/a
	Percent of nests abandoned*	Poor	Fair
	Percent of eggs/chicks/fledglings depredated	Unknown (project?)	n/a
		<i>FAA[§] SP NFI MP DB</i>	<i>FAA SP NFI MP DB</i>
Suitable nesting habitat [†]	Vegetation height	G F P G E	G F P G E
	Vegetation percent cover	G F P F E	G F P G E
	Percent native vs non-native vegetation	F F P G E	G F P G E
	Sand/soil characterization	F P P F G	F P P F G

*This indicator is indicative of three KEAs "food availability", "high resiliency to predation", and "suitable nesting habitat", but has been aligned with the KEA for which it is most informative.

[†] CLTE habitat in Mission Bay Park has been split up into five nesting sites for this KEA, with acronyms as follows: FAA- FAA Island, SP- Stony Point, NFI- North Fiesta Island, MP- Mariner's Point, DB- Dog Beach.

[§]Though true for all sites to a certain extent, the current status of FAA Island suitable nesting habitat is entirely contingent on continued vegetation maintenance efforts.

Major Threats:

High

- Heavy foot traffic
- Invasive plant species
- Light and noise pollutions
- Excessive native vegetation cover
- Predation

Medium

- Boat traffic
- Limited/fragmented habitat
- Impaired sand transport

Action Steps:

1. Establish volunteer predator/colony monitoring program at CLTE nesting sites to increase immediacy and effectiveness of USDA predator control efforts, opportunistically describe fledgling foraging activity (How far from the colony do

- the fledglings forage?), and take censuses of the colony (count all individuals between CDFW monitoring).
2. Implement camera-based predator monitoring protocol at CLTE nesting sites to increase understanding of predatory/prey relationships (e.g., species and timing of predators).
 3. Document vegetation height, cover, and the relative percentage of invasive vs native plant species at CLTE nesting sites to determine whether vegetation at nesting sites are maintained at suitable characteristics.
 4. Examine effects of nightly and holiday fireworks shows on activity at CLTE nesting sites within Mission Bay Park (MBP).
 5. Examine effects of boating activity (including personal water craft/jet skis) on activity at CLTE nesting sites within MBP.
 6. Characterize soil at CLTE nesting sites with respect to grain size, organic content, nutrients, shell hash, and penetrability.
 7. Conduct historical analysis of nesting activity and productivity of CLTE in MBP specifically and within a range-wide context.