

Annual Management Plans for California least tern nesting sites in Mission Bay, San Diego



San Diego Audubon Society
August 2020

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The following document outlines an Annual Management Plan for the actively managed Mission Bay California least tern (CLTE) nesting sites, as drafted by San Diego Audubon. This plan is the crystallization of decades of on-the-ground restoration and conservation efforts carried out by San Diego Audubon and partners, as well as feedback from a series of coordination meetings with local and regional CA least tern experts, federal and state agencies, and relevant land managers. Funding for this Annual Management Plan was provided by the San Diego Association of Governments’ TransNet Environmental Mitigation Program (SANDAG). Inquiries may be directed to Andrew Meyer, Director of Conservation (meyer@sandiegoaudubon.org), or Megan Flaherty, Restoration Program Manager (flaherty@sandiegoaudubon.org).

Acknowledgements

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Chris Redfern, San Diego Audubon Society
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 Richard Dhu, City Park and Recreation Department, Mission Bay Ranger
 Sandy Vissman, US Fish and Wildlife Service
 Travis Kemnitz, San Diego Audubon Society
 Virginia Johnson, California Department of Fish and Wildlife—Biological Monitor

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Management Plan Goals: Create written land manager guidelines for maintaining Mission Bay’s California least tern nesting sites over the course of the entire year (the restoration and nesting season). This includes vegetation management, herbicide applications, maintenance of site infrastructure, coordinating with collaborating organizations and responsible land managers, and programmatic details on the community-led restoration and stewardship efforts that make this work possible.

Mission Bay California Least Tern Colony Goals: Adaptively manage the Mission Bay Least Tern nesting sites in a manner that **provides quality least tern nesting habitat** while fostering **native plant species biodiversity when appropriate**, with long-term goals of **reducing management cost and effort, improving nesting success, and creating a more self-sustaining coastal dune habitat**.

Project Objectives:

- Ensure that funding is secured to enable all of the work detailed in this plan
 - Reduce and maintain **non-native vegetation cover to less than 20% of total vegetation**
 - Reduce and maintain **total vegetation cover to 20% or below**
 - Ensure the timely and consistent application of herbicides, as needed
 - Ensure the proper maintenance of site infrastructure such as exterior and interior fencing, signage, etc.
 - Engage with the public, including disadvantaged communities, to offer opportunities to help CA least terns and create additional stewards for coastal dune habitats and CA least terns in Mission Bay.
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Bay-Wide Management Actions: The protocols below are applicable to all of the actively managed Mission Bay CA least tern nesting sites; see Appendix A for a map of these locations. At each of these sites, a first and critical step is to ensure adequate funding to accomplish the necessary management actions. Funding needs to be secured to enable the site restoration work, as well as nesting season tasks such as predator control and biological monitoring. The longer the funding is secured for, the more secure and cost effective the project will be, as this will allow San Diego Audubon and management partners to build and preserve institutional knowledge, and to carry out longer term management actions.

Restoration Season: Mid-September through mid-April

The restoration season takes place from September 15th through April 15th of each year, and the following actions apply to all four current nesting sites.

- Blue: Fall activities
- Green: Winter activities
- Red: Final restoration activities
- Yellow: Ongoing tasks

Time of Year	Management Action	Responsible Party	Coordinated with	Comments/Details
Early to Mid-September	Nest Mapping	SDAS staff, City of San Diego	City of San Diego Parks and Recreation ¹ ; Biological monitors ²	Capture GIS information on the location of the nests at all sites. Pre-mapping preparations include flagging nests (especially at Mariner's Point, where nests are typically most abundant) and confirming with California Department of Fish and Wildlife staff that we can enter the sites (if it is before the official end of the nesting season, Sept. 15 th).
Second or third week of September	Fall Vegetation Monitoring	SDAS staff	SDAS volunteers, Mission Bay Park Rangers ³	Pre-monitoring prep includes recruiting volunteer helpers and gathering supplies. See Appendices B-H for vegetation monitoring protocols, maps and data sheets for Stony Point, Mariner's Point and North Fiesta Island, and see Appendix I for photo monitoring protocols for FAA Island.
Second or third week of September	Collect Gear from the Field	SDAS staff	Mission Bay Park Rangers	Gather all tern decoys, assess the need to repaint/replace these, and store in the SDAS office. New tern decoys can be purchased from Mad River Decoys ; contact Don Lyons, Audubon Seabird Restoration Director. Flip roofing tiles to prevent spiders from depositing eggs. Remove TernWatcher numerical locks from buffer gates. Remove TernWatcher logbooks from strongboxes in buffer areas.
Mid-September to early November	Establish and Share Restoration Season Work Schedule	SDAS staff	Mission Bay Park Rangers for Stony Point, Mariner's Point, North Fiesta Island; US Fish and Wildlife ⁴ for FAA Island	Average 1-2 weekend events per month for late September through January. Update a Restoration Season flyer. Share the events by: <ul style="list-style-type: none"> • posting on SDAS website calendar, • posting on partner sites, • sending out an SDAS e-blast to announce the start of the restoration season, • sending announcements to partners, • ensure that the rangers and USFWWS/FAA staff know of these dates.

Time of Year	Management Action	Responsible Party	Coordinated with	Comments/Details
Late September through early November	Post-season Coordination Meeting	SDAS organizes	Mission Bay Park Rangers, Biological Monitors, US Fish and Wildlife, California Department of Fish and Wildlife ⁵ , US Department of Agriculture Predator Control Specialist ⁶	Topics include overview of the nesting season, novel or noteworthy issues (human disturbance, fledgling/nesting trends, predation) and needs for the upcoming restoration season.
Winter dates: December through February	Establish and Share Restoration Season Work Schedule	SDAS staff	Mission Bay Park Rangers for Stony Point, Mariner's Point, North Fiesta Island; US Fish and Wildlife Service for FAA Island	Average 3-4 weekend events per month for February – early April. Share with partners and new audiences to encourage event participation.
Application posted Nov-Dec; Training late January	Conservation Team Leader (CTL) program	SDAS staff	Various community partners	Recruit and train the next cohort of Conservation Team Leaders, volunteers which aid in leading public habitat restoration events. Engage new audiences whenever possible.
March	Pre-Season Coordination Meeting	SDAS staff organizes	Mission Bay Park Rangers, Biological Monitors, US Fish and Wildlife Service, California Department of Fish and Wildlife, US Department of Agriculture Predator Control Specialist	Discussions include an update on the restoration season, outstanding action items (especially things with longer turn-around times like major fence repair), ensuring that predator control and monitoring contracts are in place.
Early April through mid-April	Complete On-Site Restoration	SDAS staff	Mission Bay Park Rangers	Complete by April 8 th if possible, but no later than April 15 th . Final tasks include: <ul style="list-style-type: none"> • ensuring all chick fencing is repaired • placing decoys (be sure to map where they are placed) • flipping over and placing chick shelters • putting out TernWatcher locks and logbooks • replacing signs and • replacing PVC grid, potentially with tiles, if needed.

Time of Year	Management Action	Responsible Party	Coordinated with	Comments/Details
Early April to April 15 th	Spring vegetation monitoring	SDAS staff	Mission Bay Park Rangers; Nuttall's Lotus monitoring is coordinated with San Diego Park and Recreation staff ¹ and MSCP Biologists ⁷	Following the same protocols as the fall vegetation monitoring, this takes place the first and/or second week of April. Rare Plant monitoring should also occur for Nuttall's Lotus occurrences (Stony Point and Mariner's Point).
Entire Restoration Season	Site assessments	SDAS staff	Access to Stony Point, Mariner's Point and North Fiesta Island is coordinated with Mission Bay Park Rangers; access to FAA Island coordinated with US Fish and Wildlife Service	Assess site changes over the course of the restoration season, i.e. fencing that needs repair, Nixalite repair/replacement, location and density of invasive vegetation, any need for pre-emergent spraying, etc. Conduct assessment of total invasive cover and total vegetation cover via visual and photo surveying and analysis of vegetation surveying data. If scraping or herbicide applications are needed for Stony Point, Mariner's Point or North Fiesta Island, coordinate with the Mission Bay Rangers. Work on FAA Island will be coordinated through US Fish and Wildlife contacts and contractors. Check the status of signs that mark the location of nesting sites, including SDAS-created Sharing our Shores signs, and replace if needed. Presence of rats or ants should be reported to the Mission Bay Rangers on a regular basis.
Entire Restoration Season	Organize Restoration Data, Analyze Vegetation Data	SDAS staff	Mission Bay Park Rangers, Biological Monitors, US Department of Agriculture Predator Control Specialist, US Geological Survey ⁸	Collect and share information useful to multiple partners, including grant funders, biological monitors and federal, state and City partners, for reporting on restoration efforts and nesting success. With the help of partners at US Geological Survey, analyze vegetation data to ensure that veg. cover is no more than 20%, and that total invasive cover is no more than 20%.
Entire Restoration Season	Gear Maintenance	SDAS staff	Mission Bay Park Rangers	Maintain supplies and SD Audubon vehicle as needed. Send waivers from volunteer events to the rangers.
Entire Restoration Season	Ensure funding for next season's work	SDAS staff	All parties, as necessary	Communicate with partners and funders about upcoming needs and potential sources of funding.

Nesting Season: Mid-April through mid-September The nesting season is from April 15th through September 15th of each year, and the following actions apply to all four nesting locations.

Time of Year	Management Action	Responsible Party	Coordinated with	Comments/Details
Mid-April to Mid-September	Biological Monitoring of CLTEs	Biological monitors	SDAS, Mission Bay Park Rangers, Biological Monitors	Carry out monitoring shifts at all nesting locations, reporting on the presence and abundance of adults, nests, eggs, chicks and fledglings, as well as predation events, as mandated by yearly contracts.
Mid-April to Mid-September	Data Organizing and Analysis	SDAS staff		Continue to analyze vegetation and TernWatcher data, passing this on to Predator Control as is helpful.
Training: April through early May Volunteer Coordination: Throughout nesting season	TernWatcher program: training and volunteer coordination	SDAS staff	US Department of Agriculture Predator Control, Biological Monitors, Mission Bay Park Rangers	Update field protocols and maps, with input from partners. Invite the in-the-field partners (Drew, Jennifer and other monitors) to the trainings, gather and update materials, rent out binoculars. Make sure that all in-field items are in place and secure. Respond to TernWatcher concerns, send nesting updates to restoration volunteers from and thank them for their help.
Mid-April to Mid-September	Gear Maintenance	SDAS staff		Prepare field gear for the following restoration season. Continue to track management items in site-specific memos with partners.

Mariner's Point Management Actions

[3300 Mariner's Way, San Diego CA 92109](#)

Site-specific objectives:

- Maintain consistent, and potentially increasing, number of **California least terns utilizing this location, by restoring habitat, removing vegetation, preventing human disturbance and supporting effective predator control.**
- Although lower priority than tern nesting needs, work to create co-benefits for rare sand dune plants that occur in this area. Rare plants will be supported if their presence is compatible with successful least tern nesting.
- Continue to **refine data collection and analysis, to ensure that we are reaching our goals of <20% invasive cover and <20% total vegetation cover.**
- Carry out sand amendment as appropriate.
- Increase public engagement opportunities as appropriate.

Timeline and Management Tasks:

Restoration Season: Mid-September through mid-April

The following timeline is grouped by time of year.

Blue: Fall activities

Green: Winter activities

Time of Year	Management Action	Responsible Party	Coordinated with	Comments/Details
Mid-September	Site Assessment, early weeding	SDAS staff	SDAS volunteers, Mission Bay Park Rangers	Assess the site for weeding needs, and carry out at least one work event during this time, aimed specifically at removing the early emerging weeds. This is typically telegraph weed (<i>Heterotheca grandiflora</i>). Some native plants that have been shown to entrap least tern chicks should be controlled, including Pink Sand Verbena (<i>Abronia umbellata</i>), and Coast Woolly Head (<i>Nemacaulis denudata</i>).
Early October through December	Nuttall's Lotus (<i>Acemispn prostratus</i>) Translocation	SDAS staff	City of San Diego Parks and Recreation, MSCP Biologist	If appropriate, collect Nuttall's Lotus (NULO) seeds from Mariner's Point, following the best management practices as set out by the SANDAG's Management Strategic Plan for Seed Collection, Banking, and Bulking. Coordination with the City to ensure compliance with potential permitting needs should also take place.
Mid-Nov to late Dec	Site Assessment	SDAS staff	Mission Bay Park Rangers	Carry out periodic site visits to assess maintenance needs.
Mid-November to late December	Set Late Winter/Spring Work Schedule	SDAS staff	Mission Bay Park Rangers	Depending on needs identified during site assessments, set the dates for the late winter restoration events (January through February). Focus on removing non-native plants such as filaree (<i>Erodium cicutarium</i>) and non-native grasses, as well as thinning out more problematic native plants. These dates should be shared with the Mission Bay Rangers, who will coordinate ordering dumpsters and ensuring that the sites are safe and accessible on the provided dates. Any potential predators (Great Egrets, Great Blue Herons, corvids, gulls, etc.) should be flushed whenever seen.
January to February	Late Fall Restoration Events and Site Assessments	SDAS staff	Mission Bay Park Rangers	Aim to have 2-3 work parties during this time. Years of increased rainfall and higher invasive plant growth may necessitate more events. While in the field, gauge the need for work events in March through early April. Order spot spraying (if needed) – this will likely be along the western edge, which has harder substrate. The western edge and southern point are also good examples of where sand amendment would be helpful.

Time of Year	Management Action	Responsible Party	Coordinated with	Comments/Details
January to February	Late Fall Restoration Events and Site Assessments	SDAS staff	Mission Bay Park Rangers	Aim to have 2-3 work parties at Mariner's Point during this time. Years of increased rainfall and higher invasive plant growth may necessitate more events. While in the field, gauge the need for work events in March through early April. Order spot spraying (if needed) – this will likely be along the western edge, which has harder substrate and more intense weed growth. If spot spraying is carried out, be sure to avoid work parties in this area for 30 days. The western edge and southern point are also good examples of where sand amendment would be helpful.
March through mid-April	Early Spring Restoration Events	SDAS staff	Mission Bay Park Rangers	Aim to have 3-4 work parties at Mariner's Point during this time, with the goal of less than 20% vegetation cover. Order additional rounds of spot spraying if needed. The final two work parties should focus on creating circles of cleared space (using tiles as markers), where everything but Nuttall's and Woolly Head are pulled in a 10 ft. diameter circle. Woolly Head has entrapped chicks before, so some removal may be needed.

Stony Point Management Actions

[1600 Fiesta Island Road, Mission Bay, San Diego 92109](#)

Site-specific objectives:

- Maintain, and potentially increase, number of **California least terns utilizing this location, by restoring habitat, removing vegetation, preventing human disturbance and supporting effective predator control.**
- Work with local partners to decrease number of predators on site (Great Blue Herons, Great Egrets) during both the nesting and non-nesting season.
- Although lower priority than least tern nesting needs, maintain a stable and potentially increasing population of Nuttall's Lotus.
- Continue to **refine data collection and analysis, to ensure that we are reaching our goals of <20% invasive cover and <20% total vegetation cover.**
- Carry out sand amendment as appropriate.
- Increase public engagement opportunities as appropriate.

Timeline and Management Tasks:

Restoration Season: Mid-September through mid-April

The following timeline is grouped by time of year.

Blue: Fall activities

Green: Winter activities

Time of Year	Management Action	Responsible Party	Coordinated with	Comments/Details
Mid-September	Site Assessment, early weeding	SDAS staff	SDAS volunteers, Mission Bay Park Rangers	Assess the site for weeding needs, and carry out at least one work event during this time, aimed specifically at removing the early emerging weeds. This is typically Russian thistle (<i>Salsola tragus</i>), European sea rocket (<i>Cakile maritima</i>), and cocklebur (<i>Xanthium</i> spp.)
Early October through December	Nuttall's Lotus (<i>Acemispn prostratus</i>) Translocation	SDAS staff	City of San Diego Parks and Recreation, MSCP Biologists	If deemed appropriate, deposit the Nuttall's Lotus (NULO) seeds that were collected at Mariner's Point, following the best management practices as set out by the SANDAG's Management Strategic Plan for Seed Collection, Banking, and Bulking. Coordination with the City to ensure compliance with potential permitting needs should also take place. Thorough records should be taken about the location and weight of seeds dispersed, and the dispersal area should be monitored throughout the restoration season.
Mid-November to late December	Site Assessment, Herbicide Orders	SDAS staff	Mission Bay Park Rangers	Place orders for pre-emergent herbicides, focusing on areas of high-density non-native growth (typically the northern end of the site). Monitor the area for weeding needs such as filaree and yellow sweet clover (<i>Melilotus officinalis</i>).
Mid-November to late December	Set Late Winter/early Spring Work Schedule	SDAS staff	Mission Bay Park Rangers	Aim to have 2-3 work parties during this time. Years of increased rainfall and higher invasive plant growth may necessitate more events. These dates should be shared with the rangers, who will coordinate ordering dumpsters and ensure that the sites are safe and accessible on the provided dates.
January to February	Late Winter Restoration Events and Site Assessments	SDAS staff	Mission Bay Park Rangers	Weeding during this time will focus on removing non-native plants; native plants will be thinned out during the last leg of the restoration season (March through early April). While in the field, gauge the need for work events in March through early April. Order spot spraying and additional rounds of pre-emergent if needed – this will likely be on the northern end of the site, and along the perimeter fence line.
March through mid-April	Early Spring Restoration Events	SDAS staff	Mission Bay Park Rangers	Aim to have 3-4 work parties at Stony Point during this time, with tasks expanding to include thinning out of native plants. Be careful of disturbing breeding animals during these events – warrens of rabbits have been found at this site.

North Fiesta Island Management Actions

[493 Fiesta Island Road, Mission Bay, San Diego 92109](#)

Site-specific objectives:

- Maintain, and potentially increase, number of **California least terns utilizing this location, by restoring habitat, removing vegetation, preventing human disturbance and supporting effective predator control.**
- Work with local partners to decrease number of predators on site and within buffer (Great Blue Herons, Great Egrets, perching raptors) during both the nesting and non-nesting season.
- Although lower priority than tern nesting needs, support diversity of native plants and potentially reintroduce Nuttall's Lotus.
- Continue to **refine data collection and analysis, to ensure that we are reaching our goals of <20% invasive cover and <20% total vegetation cover.**
- Carry out sand amendment as appropriate.

Timeline and Management Tasks:

Restoration Season: Mid-September through mid-April

The following timeline is grouped by time of year.

Blue: Fall activities

Green: Winter activities

Time of Year	Management Action	Responsible Party	Coordinated with	Comments/Details
Mid-November to late December	Site Assessments, Herbicide Orders	SDAS staff	Mission Bay Park Rangers	Assess the site for weeding and/or scraping and herbicide needs. Place orders for scraping and pre-emergent herbicides, as needed. While efforts have been made to avoid scraping to discourage non-native plant growth, if the site is too overgrown or volunteer capacity is reduced, it could be needed. If scraping is needed, leave a few sections of native plants throughout, in an effort to create a more heterogeneous site. If scraped, follow up with pre-emergent herbicides immediately.
Mid-November to late December	Set Late Winter/early Spring Work Schedule	SDAS staff	Mission Bay Park Rangers	Depending on needs identified during site assessments, set the dates for the late winter restoration events (January through February). Aim to have 2-3 work parties during this time. Years of increased rainfall and higher invasive plant growth may necessitate more events. These dates should be shared with the rangers, who will coordinate ordering dumpsters and ensuring that the sites are safe and accessible on the provided dates.

Time of Year	Management Action	Responsible Party	Coordinated with	Comments/Details
January to February	Late Winter Restoration Events and Site Assessments	SDAS staff	Mission Bay Park Rangers	Native plants should be thinned out in the non-scraped areas, and any emergent non-native plants should be removed. While in the field, gauge the need for work events in March through early April. Order spot spraying and additional rounds of pre-emergent if needed – this will likely be in areas of past mechanized scraping. If spot spraying is carried out, be sure to avoid work parties in this area for 30 days.
March through mid-April	Early Spring Restoration Events	SDAS staff	Mission Bay Park Rangers	Aim to have 3-4 work parties at North Fiesta Island during this time, if time allows. An additional round of mechanized scraping may be needed, which should be followed up with more pre-emergent herbicides.

FAA Island, Mission Bay

[Mission Bay, San Diego CA 92109](#)

Site-specific objectives:

- Maintain, and potentially increase, number of **California least terns utilizing this location, by restoring habitat, removing vegetation, preventing human disturbance and supporting effective predator control.**
- Work with partners to decrease number of predators on site (Great Blue Herons, Great Egrets, perching raptors) during both the nesting and non-nesting season.
- Work with relevant contacts to minimize human disturbance via boaters, kayakers, stand up paddle-boarders and other recreational users.
- Although lower priority than tern nesting needs, increase the diversity of native plants, protect existing Coast Woolly Head (*Nemacaulis denudata*) occurrences, and potentially reintroduce Nuttall's Lotus.
- Continue to **refine data collection and analysis, to ensure that we are reaching our goals of <20% invasive cover and <20% total vegetation cover.**
- Carry out sand amendment as appropriate.

Timeline and Management Tasks:

Restoration Season: Mid-September through mid-April

The following timeline is grouped by time of year.

Blue: Fall activities

Green: Winter activities

Time of Year	Management Action	Responsible Party	Coordinated with	Comments/Details
Mid-September	Site Assessment, early weeding	SDAS staff, contractors	Access to FAA Island will be coordinated with US Fish and Wildlife Service	Assess the site for weeding needs, and carry out at least one work event during this time, aimed specifically at removing the early emerging weeds. This is typically Russian thistle, horseweed (<i>Conyza canadensis</i>) and telegraph weed. Capture photo monitoring data at beginning, middle and end of restoration season, using photo points shown in Appendix I.
Mid-November to late December	Site Assessments, Herbicide Orders	SDAS staff, contractors	With contracted herbicide applicators ⁹	Place orders for pre-emergent herbicides, focusing on areas of high-density non-native growth, and avoiding rare natives like Coast Woolly Head. Continue to monitor the area for weeding needs. Any potential predators (Great Egrets, Great Blue Herons, corvids, gulls) should be flushed whenever seen.
Mid-November to late December	Set Late Winter/early Spring Work Schedule	SDAS staff	US Fish and Wildlife Service	Set the dates for the late winter restoration events (Jan-Feb), ideally 1-2 work parties. Years of increased rainfall and higher invasive plant growth may necessitate more events. Notify the rangers and lifeguards, so that they are aware of activity on and nearby the island.
January to February	Late Winter Restoration Events and Site Assessments	SDAS staff	US Fish and Wildlife Service	Weeding during this time will focus on removing non-native plants; native plants will be thinned out during the last leg of the restoration season (March through early April). While in the field, gauge the need for work events in March through early April. Order spot spraying and additional rounds of pre-emergent if needed. If spot spraying is carried out, be sure to avoid work parties in this area for 30 days.
March through mid-April	Early Spring Restoration Events	SDAS staff	US Fish and Wildlife Service	Aim to have 2-3 work parties at FAA Island during this time, with tasks expanding to include thinning out of native plants (still avoiding rare natives).

Agency Contacts

Below are listed the current contacts for the various agencies, departments and individuals that the aforementioned management actions are coordinated with, listed in the order that they are mentioned. This information should be updated periodically.

1. City of San Diego Parks and Recreation: Sara Allen, email smallen@sandiego.gov, office phone: 619-685-1308
2. Biological Monitor: Jennifer Jackson, email jacksonjen347@gmail.com, cell: 619-598-8737
3. Mission Bay Park Rangers –
 - a. Head ranger: Karolynn Estrada, email CMestrada@sandiego.gov, work cell: 858-581-7614
 - b. CA least tern Ranger: Richard Dhu, email rdhu@sandiego.gov, work cell: 619-218-6105
4. US Fish and Wildlife CA: Sandy Vissman, email sandy_vissman@fws.gov, office phone: 760-431-9440
5. California Department of Fish and Wildlife: Hans Sin, email Hans.Sin@wildlife.ca.gov, office phone: 858-467-4217
6. US Department of Agriculture Predator Control Specialist: John Turman, john.w.turman@usda.gov
7. Multiple Species Conservation Plan Biologist: Jessie Vinje, email jessie.vinje@consbio.org, office phone: 760-445-3684
8. US Geological Survey contact is Kris Preston, email kpreston@usgs.gov, office phone: 619-225-6438
9. Potential FAA herbicide applicators: Mike Kelly has done this work for many years, also have contracted with [Black Sage Environmental](#) 619-876-0745

Appendices

Appendix A: Map of actively managed CA least tern nesting sites in Mission Bay



Appendix B: Transect Data Sheet, for use at Mariner's Point, Stony Point and North Fiesta Island

TRANSECT DATA SHEET

Site
Date
Transect Code
Field Crew

	Ground cover: S, L, R	Height: 0, 1, 2, 3	Species Code(s)
1.00			
1.25			
1.50			
1.75			
2.00			
2.25			
2.50			
2.75			
3.00			
3.25			
3.50			
3.75			
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8.50			
8.75			
9.00			
9.25			
9.50			
9.75			
10.00			
10.25			
10.50			
10.75			
11.00			

Appendix C: Quadrat Data Sheet, for use at Mariner's Point, Stony Point and North Fiesta Island

QUADRAT DATA SHEET

Site
Date
Field Crew

Plot Code:			
Relative % cover	1	2	3
Vegetation			
Sand/shell			
Litter			
Rock			
Rare Species Present in Quadrat			

Categories:
0 = 0%
1 = 1-10%
2 = 11-25%
3 = 26-50%
4 = 51-75%
5 = 76-100%

Plot Code:			
Relative % cover	1	2	3
Vegetation			
Sand/shell			
Litter			
Rock			
Rare Species Present in Quadrat			

Categories:
0 = 0%
1 = 1-10%
2 = 11-25%
3 = 26-50%
4 = 51-75%
5 = 76-100%

Appendix D: Vegetation monitoring protocols for Mariner's Point, Stony Point and North Fiesta Island

- Using the data sheets provided in Appendix B and C, carry out transect and quadrat surveys at the permanent monitoring points. Each transect will have a code (i.e. SW_B2), which notes where the transect line starts (i.e. PVC pole B2) and the direction of the transect line (i.e. South West). These are marked by arrows on each map; see Appendices F-I.
- Gather supplies: Measuring tapes for creating the transect lines, quadrat squares, transect sticks, site maps, plant identification guides, species code sheet, sharpies and Ziploc bags for collecting samples of unknown plant species.

1.) Transects

- a. Run measuring tape from the first PVC pipe to the second PVC pipe along the transect. Beginning at the first PVC pipe, place the transect stick as close as possible against the measuring tape at every 0.25-meter delineation (starting at 1 meter). Continue for 10 meters (i.e. end at 11-meter marker).
- b. In the area that falls directly beneath the transect stick, estimate type of ground cover (Sand = S, Litter = L, Rock = R).
 - i. Litter includes dead plant matter. Sand includes shell materials. Rock only applies if the rock is so large that it cannot be moved with your foot.
 - ii. *Record the ground cover type that covers the largest portion of the area beneath the transect stick.*
- c. Identify the tallest piece of vegetation that touches the transect stick.
 - i. No vegetation = Height class 0.
 - ii. Beneath the first red line, or less than 10 cm = Height class 1.
 - iii. On or over the first red line, or more than 10 cm, but less than 20 cm = Height class 2.
 - iv. On or over the second red line, or more than 20 cm = Height class 3.
 - v. Vegetation taller than this is still categorized as Height class 3.
- d. Record the species of the vegetation that is directly touching the transect stick, using the species codes.
 - i. If more than one type of vegetation is touching the transect stick, record the species codes of all but the height class of only the tallest vegetation.

2.) Quadrats

- a. Place the quadrat square on the ground, running directly against the left side of the transect line, starting at the 1-meter marker.
- b. Estimate relative percentage cover of each ground cover type (Vegetation, Sand/Shell, Litter and Rock) using the categories listed on the data sheet.
- c. Add together the relative percentage cover for each ground cover class, ensuring that *the tail ends (i.e. smallest possible value) of all of the percentage cover classes for each quadrat do not exceed 100 and the highest possible value of all of the percentage cover classes for each quadrat are at least 100.*
- d. Record any species not captured along transect line. Repeat on the right side at 5-m and the left side at 10-m.

Appendix E: Vegetation monitoring species codes for Mariner's Point, Stony Point and North Fiesta Island

SDAS Mission Bay Vegetation Monitoring Species Codes

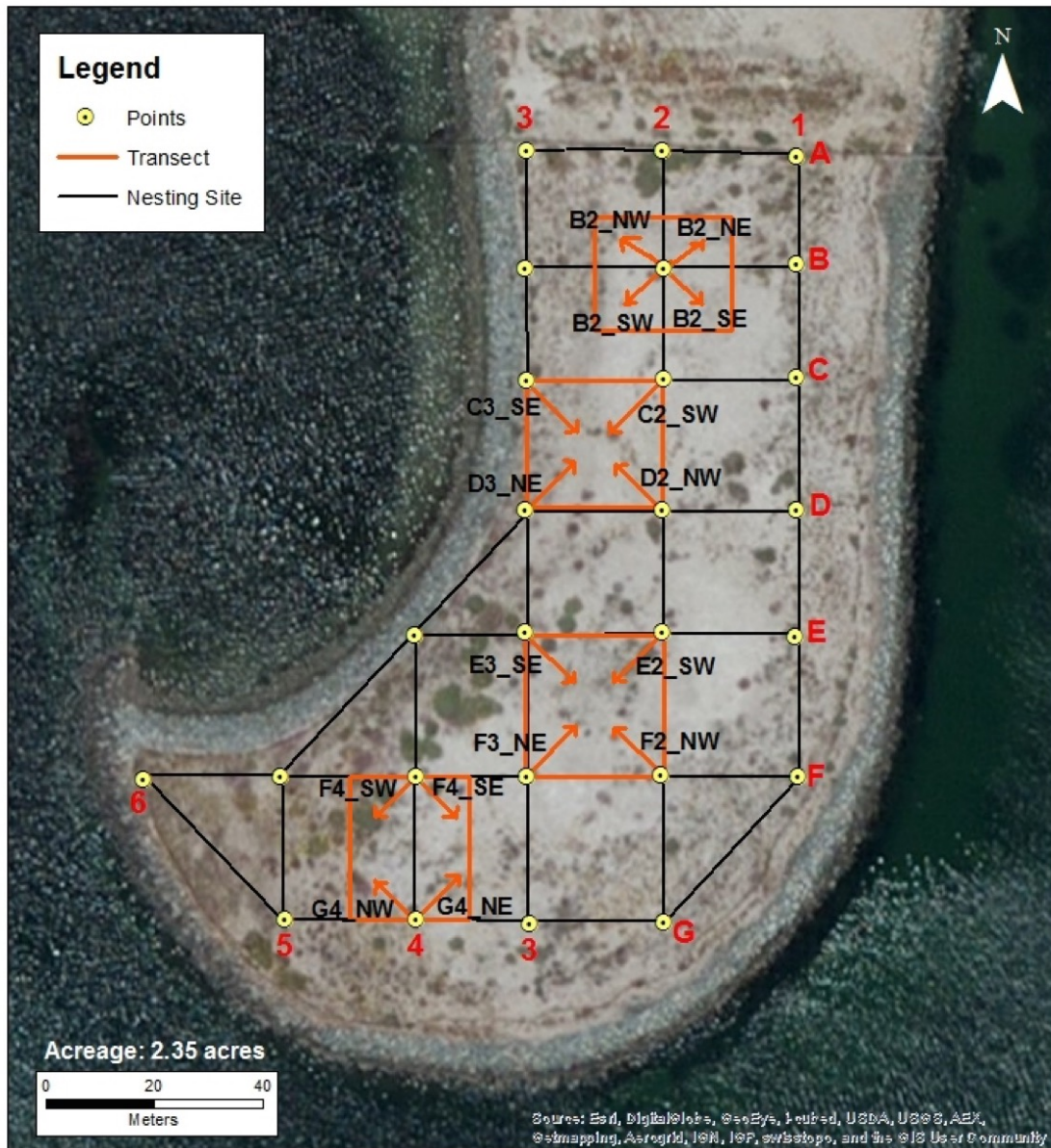
Common Name	Scientific Name	Code
Beach evening primrose	<i>Camissoniopsis cheranthifolia x bistorta</i>	camiss (cambis and camche have also been used)
Coast wholly head	<i>Nemacaulis denudata</i>	nemden
Lewis's evening primrose	<i>Camissoniopsis lewisii</i>	camlew
Nuttall's Lotus	<i>Acmispon prostratus</i>	acmpro
Pink sand verbena	<i>Abronia umbellata</i>	abrumb
Salt heliotrope	<i>Heliotropium curassavicum</i>	helcur
Silver beach bur	<i>Ambrosia chamissonis</i>	ambcha
Sueda/CA sea blite	<i>Sueda taxifolia</i>	suatax
Jimson weed*	<i>Datura stramonium</i>	datstr
San Diego wreath-plant*	<i>Stephanomeria diegensis (or spp.)</i>	stedie

NON NATIVE/INVASIVE

Arizona brome grass	<i>Bromus arizonicus</i>	broari
Bur clover	<i>Medicago polymorpha</i>	medpol
Cheeseweed	<i>Malva parviflora</i>	malpar
Cockle bur	<i>Xanthium strumarium</i>	xanstr
Crete weed	<i>Hedypnois cretica</i>	hedcre
Crown daisy/garland crysanthemum	<i>Glebionis coronaria</i>	glecor
Crystalline iceplant	<i>Mesembryanthemum crystallinum</i>	mescry
Devil's thorn	<i>Emex spinosa</i>	emespi
European sea rocket	<i>Cakile maritima</i>	cakmar
Filaree (redstem) – small and lacy	<i>Erodium cicutarium</i>	erocic
Filaree (whitestem) – bigger leaves	<i>Erodium moschatum</i>	eromos
Five hook bassia	<i>Bassia hyssopifolia</i>	bashys
Hawk's beard	<i>Crepis spp.</i>	crepis
Horse weed	<i>Conyza canadensis</i>	concan
Hottentot fig iceplant	<i>Carpobrotus edulis</i>	caredu
Pepper grass	<i>Lepidium spp.</i>	lepidi
Puncturevine	<i>Tribulus terrestris</i>	triter
Pygmy weed	<i>Crassula connata</i>	cracon
Ripgut grass	<i>Bromus diandrus</i>	brodia
Sahara mustard	<i>Brassica tournefortii</i>	bratou
Salt bush	<i>Atriplex spp.</i>	atripl
Scarlet pimpernel	<i>Anagallis arvensis</i>	anaarv
Slender leaved ice plant	<i>Mesembryanthemum nodiflorum</i>	mesnod
Spiny thistle	<i>Sonchus asper</i>	sonasp
Stinging nettle	<i>Urtica dioica</i>	urtdio
Telegraph weed	<i>Heterotheca grandiflora</i>	hetgra
Tumbleweed/Russian thistle	<i>Salsola tragus</i>	saltra
Tumbleweed/Barb wire thistle	<i>Salsola gobicola</i>	salgob
Yellow sweet clover	<i>Melilotus officinalis</i>	meloff
Sow thistle	<i>Sonchus oleraceus</i>	sonole
Puncture vine	<i>Tribulus terrestris</i>	triter
Pigweed	<i>Chenopodium spp.</i>	chespp

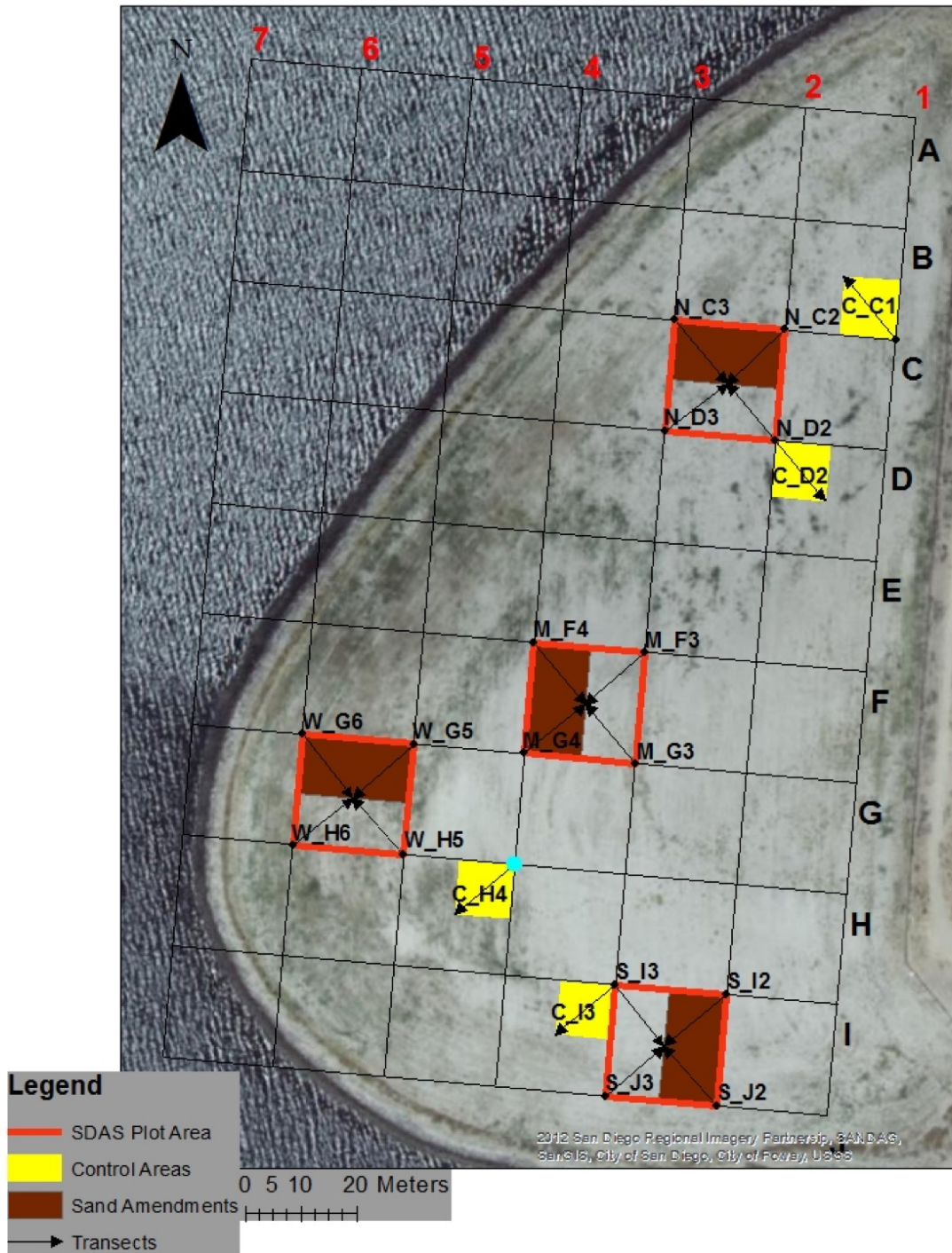
Appendix F: Vegetation monitoring map for Mariner's Point

Mariner's Point



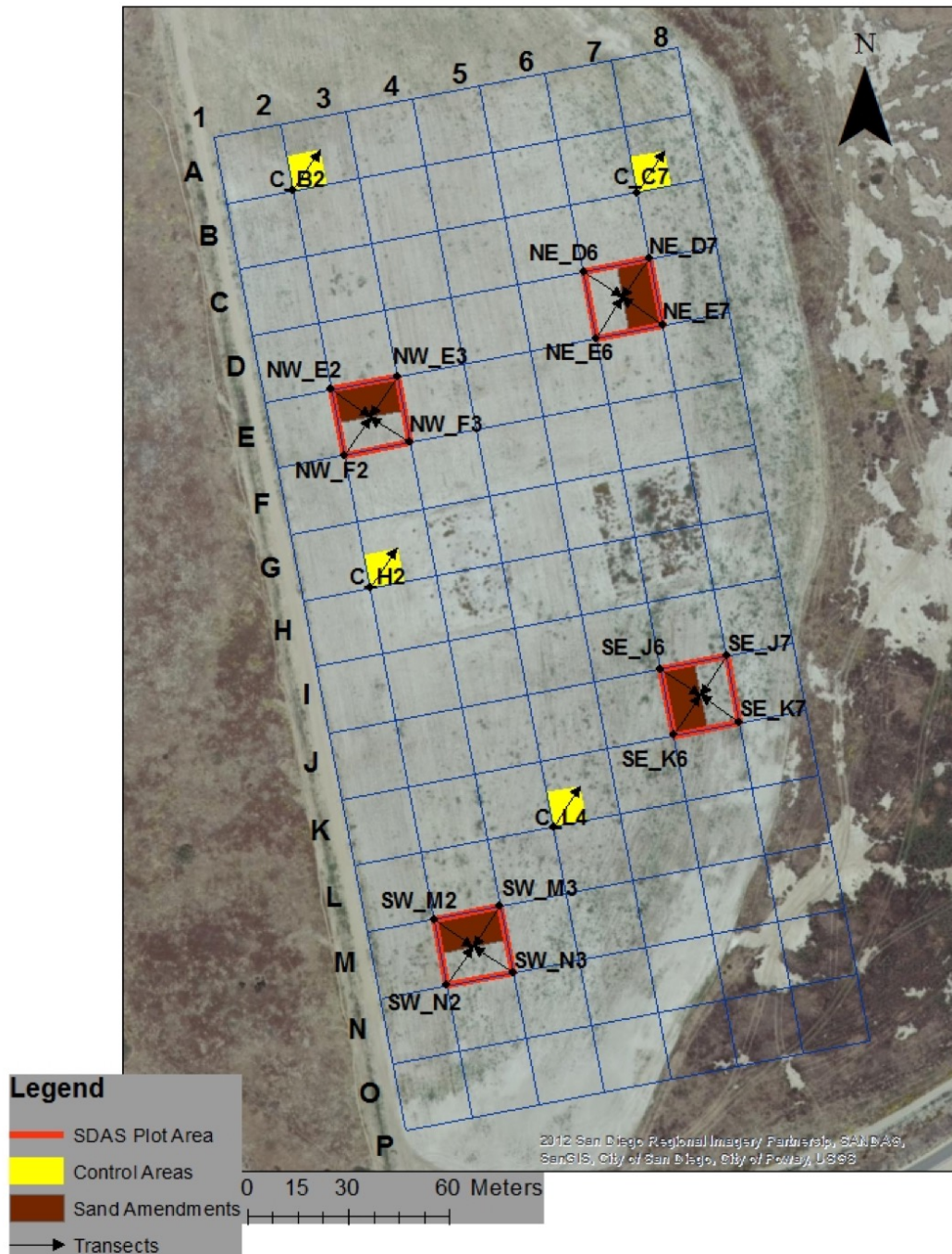
Appendix G: Vegetation monitoring map for Stony Point

Stony Point (SP) Tern Nesting Habitat



Appendix H: Vegetation monitoring map for North Fiesta Island

North Fiesta Island (NFI) Tern Nesting Habitat



Appendix I: Photo monitoring locations for FAA Island

