A
REPORT
OF
GENETIC SAMPLE COLLECTIONS AND CURATION
FOR SIX RARE PLANTS
WITHIN THE SAN DIEGO MSPA
SAN DIEGO COUNTY, CALIFORNIA

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SAN DIEGO NATURAL HISTORY MUSEUM

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CHAPTER 1 – INTRODUCTION

This cooperative project between Dr. Jon Rebman's laboratory at the San Diego Natural History Museum (SDNHM) and Dr. Amy Vandergast's laboratory at the U. S. Geological Survey (USGS), Western Ecological Research Center, San Diego Field Station examines the genetics of six rare plants within the San Diego Management Strategic Plan Area (MSPA) in San Diego County. This report presents the results of SDNHM's field portion of the project.

1.1 PURPOSE

This project is aimed at assessing the status and genetic diversity of populations of six species of rare plants in San Diego County including *Acanthomintha ilicifolia* (San Diego thornmint) and *Monardella viminea* (willowy monardella) in the Lamiaceae, *Chloropyron maritimum* ssp. *maritimum* (salt marsh bird's-beak) and *Dicranostegia orcuttiana* (Orcutt's bird's-beak) in the Orobanchaceae, and *Baccharis vanessae* (Encinitas baccharis) and *Deinandra conjugens* (Otay tarplant) in the Asteraceae. The results of this project should directly contribute to the conservation and management of these rare plant taxa in the San Diego MSPA. For each of these species, information on the genetic makeup and diversity across its range is needed to inform potential management actions such as establishing new populations and enhancing existing populations. Previously, verification and scientific voucher specimens were lacking from many occurrences of these six target species across San Diego County. Therefore, the goals of this task are to collect genetic material from as many species' occurrences as possible and to collect voucher specimens to serve as a long-term resource for studying the populations associated with this project. These collections are useful for future genetic and morphological work to help inform management action. The genetic analyses of these collections will be performed by USGS.

1.2 PROJECT LOCATION

This project area comprises species occurrences from the MSPA Master Occurrence Matrix (MOM) database (Appendix A) found on public lands throughout San Diego County (Figure 1-1) and includes over 50 preserves or conserved lands. Marine Corps Base Camp Pendleton (CPEN) and Marine Corps Air Station Miramar (MCAS Miramar) in San Diego County are not a part of the MSPA but were included in this study. Many of the known populations of *Chloropyron maritimum* ssp. *maritimum* outside of San Diego County, and MSPA were included in this study with some matching funds provided by U.S. Navy. The following locations outside the MSPA were visited for this project: Orange County's Newport Bay, Ventura County's Naval Base Ventura/Point Mugu (NBV) and Ormond Beach, Santa Barbara County's Carpinteria, San Luis Obispo County's Morro Bay, and Baja California Mexico's Punta Azufre and Bahia Falsa.

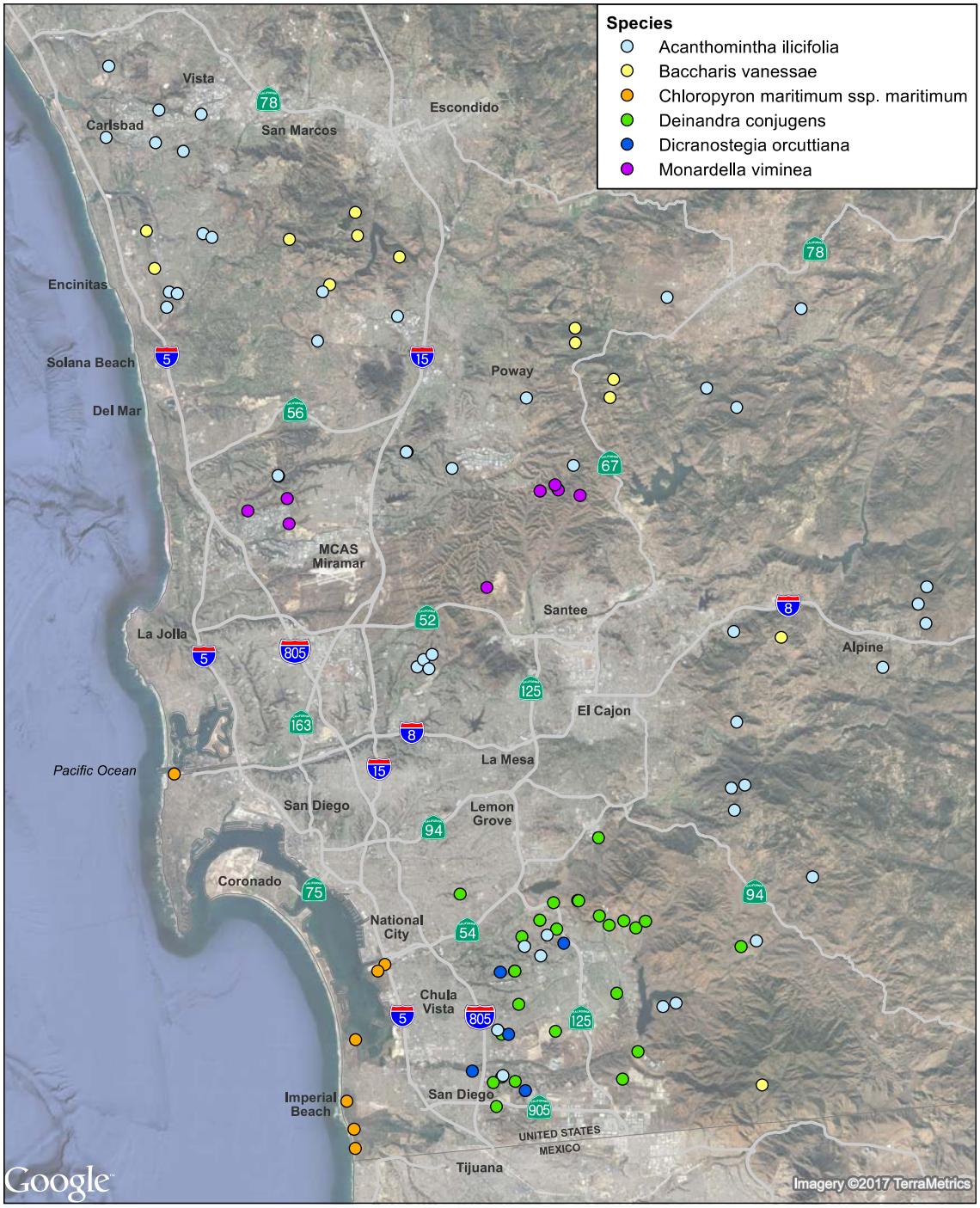

Figure 1-1. Rare plant occurrences on conserved lands from MOM database, 2016.

CHAPTER 2 –
METHODS

2.1 OVERVIEW

SDNHM attended a kick off meeting with USGS on 18 March 2016, began site coordination on 21 March 2016, performed field visits between 8 April 2016 and 11 November 2016, and between 11 April 2017 and 15 June 2017. Data was submitted electronically to Elizabeth Milano, USGS, on 18 October 2016, 1 December 2016, and 8 September 2017. Herbarium voucher data was uploaded to the SD Herbarium specimen database on 16 January 2017 and 15 January 2018. An interim report was submitted on 31 March 2017 and a final report was submitted on 8 March 2018.

2.2 PROJECT TEAM

SDNHM staff members have the taxonomic expertise to identify these rare species, distinguish them from other similar species, and hold federal and state permits to collect plant materials. SDNHM also possesses the infrastructure and database resources to house and curate voucher specimens from each occurrence.

Margie Mulligan has over 21 years of experience working in botanical science with 13 years specifically in San Diego County. She holds a B.S. in Environmental Studies (Biophysical) and a M.S. in Botany with an emphasis in Population Ecology. She has extensive experience with the rare plant species of San Diego County, collecting voucher specimens, making field-based plant genetic collections, performing floristic surveys, and using taxonomic keys. Ms. Mulligan provided technical oversight for all aspects of the collections, including site coordination and field schedule management, and led all field surveys, made all collections, performed data analysis, and authored the interim and final reports.

Jon Rebman, PhD, has been the Mary and Dallas Clark Endowed Chair/Curator of Botany at SDNHM since 1996. Dr. Rebman is a plant taxonomist and conducts extensive floristic research on the Baja California peninsula and in San Diego and Imperial Counties of California. He has co-published the new Annotated Checklist of the Vascular Plants of Baja California, Mexico (Rebman, Gibson & Rich, 2016) and the most recent edition of the Checklist of the Vascular Plants of San Diego County (Rebman and Simpson, 2014). He has over 25 years of field experience with surveying and documenting plants including rare and endangered species. As a field botanist, he is a very active collector of scientific specimens with his personal collections numbering over 33,000. He is the director of the San Diego County Plant Atlas project (www.sdplantatlas.org) and identifies/verifies all of the new specimens (currently over 68,700) coming into the herbarium through this scientific endeavor. As the curator of the SD Herbarium at the SDNHM, he is in charge of this dried plant specimen collection that contains over 260,000 specimens dating back to the 1870s. Dr. Rebman provided taxonomic technical support, helped with project design, reviewed the final report, and accompanied Ms. Mulligan on some of the *Baccharis vanessae* surveys.

Additional field support was provided by Ed Kentner, PhD, Ryan Mesaros, Warren Schmidtmann, Tom Rottler, Melanie Rocks, Maxx Mulligan and Jessie Vinje. GIS support was provided by Justin Palmer, Senior GIS Specialist, AJP Consulting Corporation.

2.3 SITE SELECTION AND COORDINATION

Occurrence information (GPS coordinates, land management agency, previous population numbers, etc.) was provided by San Diego Management and Monitoring Program (SDMMP) for each of the six species. SDNHM also searched the Consortium of California Herbaria (CCH), inspected the USFWS 5-Year Reviews/Draft Recovery Plan (USFWS 2003, USFWS 2009a, USFWS 2009b, USFWS 2011, USFWS 2012), and had conversations with local botanists and land managers to determine additional sites to include in the study.

There were some sites that did not occur in the MSPA that were added to capture the genetic diversity across each species' range. Most of the populations of *Monardella viminea* occur on MCAS Miramar, because of this, SDNHM and USGS felt it was important to add these populations. *Baccharis vanessae* on CPEN was also added because these populations represent the most northern part of its range. Lastly, Michelle Cox, Navy Natural Resource Specialist, provided funds to include *Chloropyron maritimum* ssp. *maritimum* populations at NBV (Pt. Mugu) and populations across its range from the Baja California, Mexico to the south to Morro Bay, San Luis Obispo County in the north.

All site information provided by SDMMP was used to determine the appropriate points of contact for gaining access to each site. Land managers were contacted via email and/or telephone and were given all required documentation necessary to obtain Right of Entry permits for each site.

2.4 SITE VISITS

The Consortium of California Herbaria (CCH, 2016) was used to determine appropriate timing for field surveys of the six species. Voucher specimen phenology was examined to create a time table (Table 2-1) for viable collecting times. The field schedule for collecting was based on this information.

Table 2-1. Project site visits based on voucher specimens from the Consortium of California Herbaria, 2016.

Rare Plant	April	May	June	July	August	September	October	November
Acanthomintha ilicifolia	X	X						
Deinandra conjugens		X	X					
Chloropyron maritimum		X	X	X			X	
Dicranostegia orcuttiana			X					
Monardella viminea			X	X	X			
Baccharis vanessae						X	X	X

Sites access was coordinated with land managers one week prior to the field survey. Navigation to sites was made using information provided by land managers. If site information was not provided with the permit, then Google Earth was used to search for appropriate site access and parking.

All occurrence coordinates were downloaded into the Collector app for ArcGIS. California Natural Diversity Database (CNDDB) polygons were obtained and added to Collector to aid in the search for these populations. In the field, sites were located and were then systematically searched. If no plants were located at the provided coordinates then all adjacent CNDDB polygons and adjacent suitable habitat were searched.

2.5 GENETIC TISSUE COLLECTIONS

If plants were present, then population extent was determined. Depending on population size, up to 20 individuals were sampled from each occurrence. If collections would significantly impact the population, samples were not taken. For each sample, two to six leaves were chosen, depending on the size of the individual. Young, fresh and healthy leaves were selected and leaves with obvious decay and insect damage were avoided. Leaves were placed in paper coin envelopes and assigned a unique identifier. All envelopes were put into an airtight Ziploc container and covered with silica gel beads, which allowed for a quicker drying time resulting in a higher quality of DNA for extraction. Containers were gently shaken daily to maximize surface area contact of the silica. Once a month, genetic collections were deposited at the USGS lab for storage. All sampling was non-destructive with the exception of smaller annuals, in which case the entire plant was vouchered.

2.6 FLOW CYTOMETRY TISSUE COLLECTIONS

Five of the individuals that were collected for genetic material also were sampled for flow cytometry. Between two to five young, fresh and healthy leaves without obvious decay and insect damage were collected and placed in small Ziploc plastic bags. Each bag was labeled with a unique identifier. Collections were put on ice in a cooler in the field and then transported to a refrigerator for short term storage. Within 72 hours of collection, the samples were shipped on ice to an independent lab in Utah for flow cytometry analysis.

2.7 VOUCHER SPECIMENS

At least one voucher specimen was collected at each occurrence. All voucher specimens have been deposited in the SD Herbarium housed at the San Diego Natural History Museum. These scientific specimens will be verified, curated, databased, and available for future genetic or morphological research. All specimen data will be uploaded to the CCH and can be accessed online at http://ucjeps.berkeley.edu/consortium/. One genetic collection and one flow cytometry collection was made from the same plant as the voucher specimen. These collections will be used to determine any morphological differences if significant differences in genetics are discovered between occurrences.

2.8 DATA COLLECTION

All site and population data was collected using I-formbuilder software by Zerion via an iPad. New GPS points were also collected using I-formbuilder. All coordinates were later checked via Google Earth for accuracy. The data was uploaded to a computer from the iPad and transferred into an Excel spreadsheet. The Excel spreadsheets were used to analyze and organize the collection data. All collections included biographic (collector and collecting number), geographic (e.g. coordinates, locality, soil type, aspect), and ecological (e.g. life history stage, associated species) information.

The genetic collection datasheet included the following information:

- Survey Date
- Occurrence ID
- Preserve Name
- Surveyor
- Scientific Name
- Population Size Estimate
- Population Present
- Aspect
- Voucher Collection Number
- SANDAG 2012 Vegetation Classification
- Soil Texture
- Munsell Soil Chart
- Morphology Differences
- Disturbance Notes
- Team Members
- Cytology Collection Numbers
- Genetic Collection Numbers
- Voucher Specimen Cytology Number
- Notes
- Coordinates

The Voucher specimen datasheet included the following information:

- Collector
- Collection Number
- Collection Date
- Plant Atlas Square
- Team Collector
- Coordinates in Decimal Degrees
- Elevation (m)
- Locality Information
- Geology
- Vegetation
- Scientific Name
- Collection Description (morphological differences, site information, population size)
- Phenology

An estimate of the population was determined by counting individuals. A more exhaustive search for every individual was not included in the scope of this project. Soils were run through the California Native Plant Society's (CNPS's) Simplified Key to Soil Texture (CNPS, 2014). Soil samples were also compared to the Munsell Soils Color Charts (Munsell, 2000) to determine soil color. All vegetation classifications were determined using the key in the Vegetation Classification for Western San Diego Manual (Sproul et al., 2011). For populations outside of San Diego County, dominants were listed in lieu of vegetation type.

CHAPTER 3 – RESULTS

3.1 OVERALL PROJECT IN YEARS 2016 AND 2017

SDNHM was provided with 104 occurrences to visit by the SDMMP staff. Thirty-seven new sites were added to the study for a total of 141 sites. Of the 141 sites, 128 sites were visited and 96 sites were sampled in 2016 and 2017. Plants were not found at 27 of the sites and were present but not sampled at five of the sites. For 13 of the sites, access was not granted in 2016 or 2017 (Table 3-1).

Table 3-1. Overall site visit information for Years 2016 and 2017.

Species	MOM Occurrences	New Occurrences	Total Occurrences	No Access	Absent	Present-not sampled	Present-Sampled
Acanthomintha ilicifolia	46	1	**47**	7	15	2	23
Baccharis vanessae	13	3	**16**	2	1	0	13
Chloropyron maritimum ssp. *maritimum*	7	22	**29**	0	3	0	26
Deinandra conjugens	25	1	**26**	3	5	2	16
Dicranostegia orcuttiana	5	4	**9**	1	1	1	6
Monardella viminea	8	6	**14**	0	2	0	12
Total	**104**	**37**	**141**	**13**	**27**	**5**	**96**

3.2 ACANTHOMINTHA ILICIFOLIA

There were 47 *Acanthomintha ilicifolia* occurrences (Fig. 3-1 & Table 3-2). In addition to the 46 occurrences from the MOM database, one new site, Adobe Falls, owned by San Diego State University (SDSU) was added. Seven of the 47 sites, Calavera Hills (ACIL_6CAHI033), Canada San Vicente- Monte Vista- Long's Gulch (ACIL_4CSVI019), Crestridge Ecological Reserve (ACIL_3CERE004), Lower Otay Reservoir, Otay Lakes- south side (ACIL_3OTLA011), Rancho Jamul Ecological Reserve (ACIL_3RJER015), and Saber Springs- east (ACIL_4SASP024), have been reported extirpated by land managers or Conservation Biology Institute (CBI) staff. Of the 40 remaining occurrences, permission was granted to access 33 occurrences. Sites were visited in April and May 2016 and 2017. Plants were not observed at eight of these occurrences, Black Mountain (ACIL_6BLMO032), Canada San Vicente-Monte Vista- Long's Gulch (ACIL_4CSVI020), El Dorado Hills (ACIL_2EDHI002), Mission Trails Regional Park- SW Tierra Santa parcel (ACIL_4MTRP022), PMA3- Poggi Canyon (ACIL_4POGR023), Ramona Grasslands (ACIL_5RAGR031), Viejas Mountain- northwest slope (ACIL_4VIMT0028) and SDSU's Adobe Falls.

Of the 25 occurrences that supported plants (Table 3-3), 23 sets of collections were made in 2016 (11 sets) and 2017 (12 sets) with a total of 422 genetic collections (Table 3-4). The plants of two of the sites, El Fuerte Street- Rancho Carrillo (ACIL_6RACA044) and Carlsbad Racetrack-South (ACIL_6CARA034), did not have enough leaf material to make collections. Rancho Carrillo did have 26 plants but despite multiple watering trips they never grew bigger than one centimeter tall and never flowered. Total population numbers in the sites with *Acanthomintha ilicifolia* ranged from three to 750,000 individuals.

Of the sites that supported *Acanthomintha ilicifolia*, clay soils were present at all sites and non-natives were observed at 43% (10 of the 23) of the sites (Table 3-5). *Brachypodium distachyon* was observed at 63% of the sites with non-natives. *Centaurea melitensis, Brassica nigra*, and *Sonchus asper* were each observed at 25% of the weed sites. The vegetation classifications were as follows: 58% for *Deinandra fasciculata Association,* 17% for *Brachypodium distachyon Semi-Natural Stand Type,* 9% for *Adenostoma faciculatum-Xylococcus bicolor Association*, and 4% each for *Adenostoma fasciculatum Alliance (Salvia clevelandii codominant), Artemisia californica-Salvia mellifera Association, Avena barbata Semi-Natural Stand* and *Nassella pulchra Association.* Elevations ranged from 54 to 956 meters and populations did not appear to favor any specific aspect. The stature of plants was observed to range from diminutive single stem to large multi-branch individuals.

***Acanthomintha ilicifolia*, Simon Preserve, 2017**

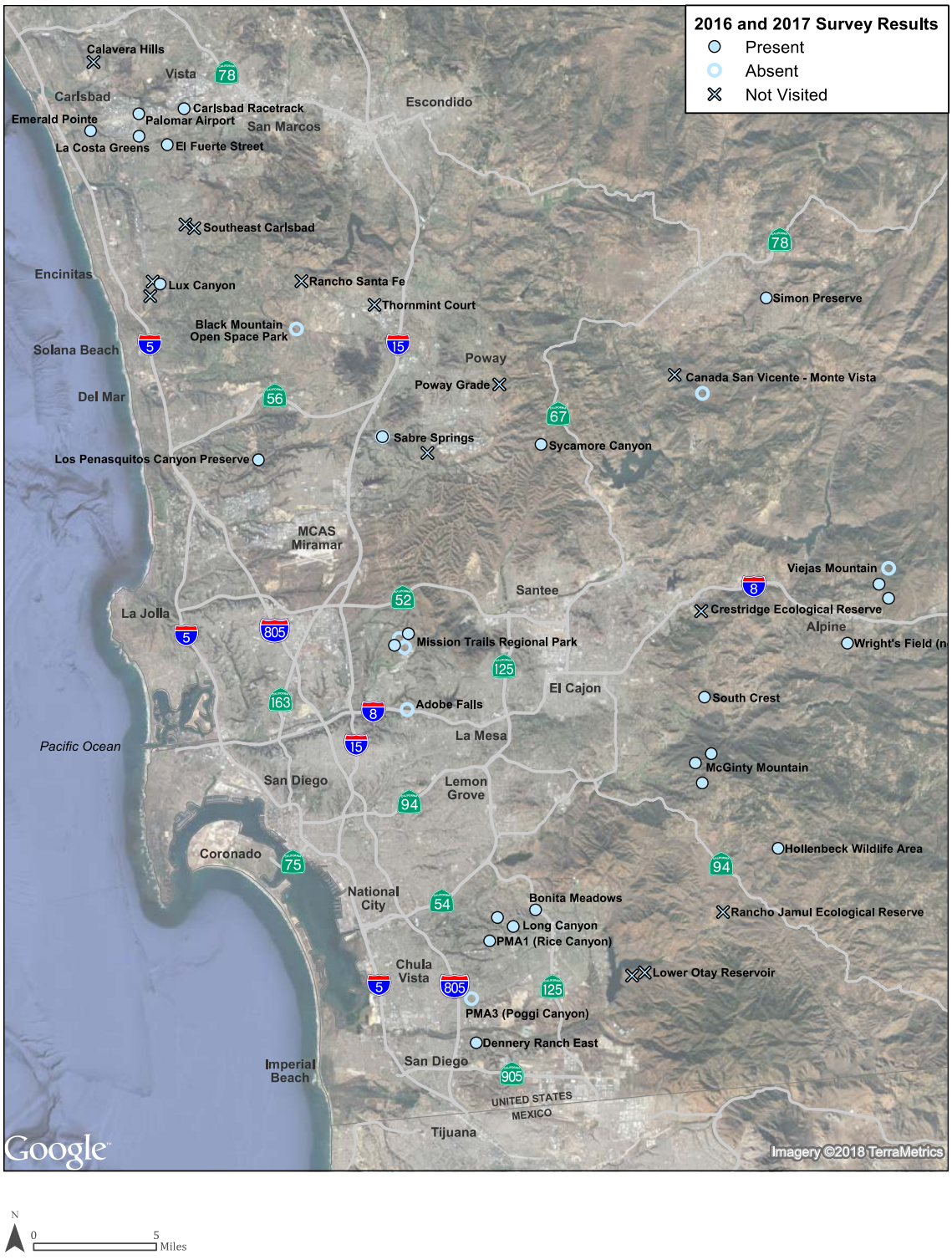

Figure 3-1. *Acanthomintha ilicifolia* occurrences sampled in 2016 and 2017.

Table 3-2. *Acanthomintha ilicifolia* occurrences and visitation status in 2016 and 2017.

Occurrence ID	Occurrence Name	Ownership	Visited
N/A	Adobe Falls	San Diego State University	Yes, 2017
ACIL_6BLMO032	Black Mountain Open Space Park	City of San Diego Park and Recreation Department	Yes, 2016
ACIL_3BOME003	Bonita Meadows	Caltrans	Yes, 2016
ACIL_3WHRI017	Bonita, Wheeler Ridge (Long Canyon PMA 4-1cW)	Chula Vista Central City Preserve; City of Chula Vista	Yes, 2017
ACIL_6CAHI033	Calavera Hills	Calavera Hills HOA/Center for Natural Lands Management	No, reported extirpated
ACIL_4CSVI019	Canada San Vicente--Monte Vista (Long's Gulch)	California Department of Fish and Wildlife	No, reported extirpated
ACIL_4CSVI020	Canada San Vicente--Monte Vista (Long's Gulch)	California Department of Fish and Wildlife	Yes, 2017
ACIL_6CARA034	Carlsbad Racetrack (south)	San Diego Habitat Conservancy	Yes, 2017
ACIL_3CERE004	Crestridge Ecological Reserve	California Department of Fish and Wildlife	No, reported extirpated
ACIL_3DREA005	Dennery Ranch East	City of San Diego Park and Recreation Department	Yes, 2017
ACIL_2EDHI001	El Dorado Hills	City of San Diego Park and Recreation Department	Yes, 2016
ACIL_2EDHI002	El Dorado Hills	City of San Diego Park and Recreation Department	Yes, 2016
ACIL_6RACA044	El Fuerte Street (Rancho Carrillo)	Rancho Carrillo HOA	Yes, 2017
ACIL_6EMPO037	Emerald Pointe Open Space	San Diego Habitat Conservancy	Yes, 2017
ACIL_3HCWA006	Hollenbeck Wildlife Area	California Department of Fish and Wildlife	Yes, 2017
ACIL_6LCGR038	La Costa Greens	Rancho La Costa Habitat Conservation Area/Center for Natural Lands Management	Yes, 2017
ACIL_3LONC007	Long Canyon (PMA 4-2b)	Chula Vista Central City Preserve; City of Chula Vista	Yes, 2017
ACIL_6LPCA039	Los Penasquitos Canyon Preserve	City of San Diego Park and Recreation Department	Yes, 2016
ACIL_3OTLA011	Lower Otay Reservoir	Otay Mountain Ecological Reserve, California Department of Fish and Wildlife	No, reported extirpated
ACIL_6MAMI041	Lux Canyon (east), Manchester Avenue Mitigation Bank	Manchester Mitigation Bank/Center or Natural Lands Management	Yes, 2017
ACIL_6LUCA042	Lux Canyon (west of Manchester Avenue Mitigation Bank)	Calle Ryan HOA	No permission
ACIL_6LUCA040	Lux Canyon (west)	Pacific Pines Racquet Club HOA	No permission

Occurrence ID	Occurrence Name	Ownership	Visited
ACIL_3MGMT008	McGinty Mountain	San Diego National Wildlife Refuge; U.S. Fish and Wildlife Service	Yes, 2017
ACIL_3MGMT009	McGinty Mountain (southwest slope)	Flying Dolphin Trust, The Nature Conservancy	Yes, 2016
ACIL_3MGMT010	McGinty Mountain (summit and ridgeline)	San Diego National Wildlife Refuge; U.S. Fish and Wildlife Service	Yes, 2016
ACIL_4MTRP021	Mission Trails Regional Park	City of San Diego Park and Recreation Department	Yes, 2016
ACIL_4MTRP022	Mission Trails Regional Park (Southwest Tierra Santa parcel, NW of Mission Gorge)	City of San Diego Park and Recreation Department	Yes, 2016
ACIL_3OTLA012	Otay Lakes (south side)	Otay Lakes Cornerstone Lands; City of San Diego Public Utilities Department	No, reported extirpated
ACIL_6PARO043	Palomar Airport Road	Carlsbad Oaks North Habitat Conservation Area/Palomar Airport	Yes, 2016 and 2017
ACIL_3PMA1013	PMA1 (Rice Canyon)	Chula Vista Central City Preserve; City of Chula Vista	Yes, 2017
ACIL_3PMA3014	PMA3 (Poggi Canyon)	Chula Vista Central City Preserve; City of Chula Vista	Yes, 2017
ACIL_4POGR023	Poway Grade	RAAN LLC	No permission
ACIL_5RAGR031	Ramona Grasslands/Hobbes Property	Wildlife Research Institute	Yes, 2017
ACIL_3RJER015	Rancho Jamul Ecological Reserve	California Department of Fish and Wildlife	No, reported extirpated
ACIL_6RSFE045	Rancho Santa Fe	MS Rialto to the Lakes CA LLC	No permission
ACIL_4SASP024	Saber Springs (east)	City of Poway Open Space; City of Poway	No, reported extirpated
ACIL_4SASP025	Sabre Springs (east, subpop 1)	City of San Diego Park and Recreation Department	Yes, 2016
ACIL_4SIPR026	Simon Preserve	County of San Diego Department of Parks and Recreation	Yes, 2017
ACIL_3SOCR016	South Crest (Suncrest)	South Coast Properties; Endangered Habitats Conservancy	Yes, 2016
ACIL_6CARL035	Southeast Carlsbad (East)	Santa Fe Trails HOA	No permission
ACIL_6CARL036	Southeast Carlsbad (West)	Ranch Carlsbad HOA	No permission
ACIL_4SYCA027	Sycamore Canyon	Sycamore Canyon and Goodan Ranch Preserves; County of San Diego Department of Parks and Recreation	Yes, 2017
ACIL_6THCO046	Thornmint Court	4-S Ranch HOA	No permission
ACIL_4VIMT0028	Viejas Mountain (northwest slope)	Cleveland National Forest; U.S. Forest Service	Yes, 2017
ACIL_4VIMT0029	Viejas Mountain (southwest slope)	Viejas Hills Partners LLC/Cleveland National Forest	Yes, 2017
ACIL_4VIMT0030	Viejas Mountain (west-southwest flank)	Cleveland National Forest; U.S. Forest Service	Yes, 2017
ACIL_3WRFI018	Wright's Field (north & south)	Back Country Land Trust	Yes, 2016

***Acanthomintha ilicifolia*, El Fuerte Street (Rancho Carrillo), 14 April 2017.**

Table 3-3. Population status and site visit information of *Acanthomintha ilicifolia* 2016-17.

Survey Date	Occurrence ID	Occurrence Name	Site Status	Population Estimate	Coordinates	Elevation (m)
4/11/17	N/A	Adobe Falls	Absent	0	32.180471 -117.073696	68
4/7/16	ACIL_6BLMO032	Black Mountain	Absent	0	33.004940 -117.153532	77
4/15/16	ACIL_3BOME003	Bonita Meadows	Present	300	32.662591 -116.982947	127
5/2/17	ACIL_4CSVI020	Canada San Vicente-Monte Vista (Long's Gulch)	Absent	0	32.96868 -116.86824	422
4/13/17	ACIL_6CARA034	Carlsbad Racetrack (south)	Present	3	33.134692 -117.233986	132
4/17/17	ACIL_3DREA005	Dennery Ranch East	Present	30	32.583816 -117.023650	99
5/5/16	ACIL_2EDHI001	El Dorado Hills	Present	50	32.818459 -117.083016	128
5/5/16	ACIL_2EDHI002	El Dorado Hills	Absent	0	32.822404 -117.07961	176
4/14/17	ACIL_6RACA044	El Fuerte Street (Rancho Carrillo)	Present	26	33.113309 -117.245507	83
4/14/16	ACIL_6EMPO037	Emerald Pointe	Present	39	33.121116 -117.299570	54
4/25/16	ACIL_3HCWA006	Hollenbeck Wildlife Area	Present	50	32.699929 -116.813437	449
4/14/17	ACIL_6LCGR038	La Costa Greens	Present	1,000	33.118135 -117.265356	65
4/12/17	ACIL_3LONC007	Long Canyon (PMA 4-2b)	Present	200	32.652787 -116.998444	96
4/29/16	ACIL_6LPCA039	Los Penasquitos Canyon	Present	20	32.927540 -117.179404	58
4/14/17	ACIL_6MAMI041	Lux Canyon (east), Manchester Avenue Mitigation Bank	Present	3,000	33.030835 -117.249657	85
4/28/17	ACIL_3MGMT008	McGinty Mountain (southwest slope)	Present	100	32.750100 -116.871793	403
4/28/16	ACIL_3MGMT010	McGinty Mountain (summit and ridgeline)	Present	120	32.755706 -116.860573	606

Survey Date	Occurrence ID	Occurrence Name	Site Status	Population Estimate	Coordinates	Elevation (m)
4/28/16	ACIL_3MGMT009	McGinty Mountain- TNC	Present	200	32.738370 -116.866851	454
5/2/16	ACIL_4MTRP021	Mission Trails Regional Park - City	Present	55	32.825401 -117.073369	189
5/5/16	ACIL_4MTRP022	Mission Trails Regional Park - SW Tierra Santa parcel	Absent	0	32.817336 -117.075837	156
4/13/17	ACIL_6PARO043	Palomar Airport Road	Present	35,000	33.131386 -117.265639	84
4/17/17	ACIL_3PMA1013	PMA1- Rice Canyon	Present	5,000	32.6440161 -117.014741	102
4/12/17	ACIL_4POGR023	PMA3 (Poggi Canyon)	Absent	0	32.609916 -117.0273	101
4/8/17	ACIL_5RAGR031	Ramona Grasslands	Absent	0	33.03178 -116.91546	421
4/27/16	ACIL_4SASP025	Sabre Springs	Present	10	32.941745 -117.092628	120
4/24/17	ACIL_4SIPR026	Simon Preserve	Present	5,000	33.0253589 -116.82383	532
4/21/16	ACIL_3SOCR016	South Crest (Suncrest)	Present	50	32.789056 -116.865582	446
4/21/17	ACIL_4SYCA027	Sycamore Canyon	Present	750,000	32.93787 -116.98132	288
5/30/17	ACIL_4VIMT0028	Viejas Mountain (northwest slope)	Absent	0	32.865749 -116.737218	956
5/19/17	ACIL_4VIMT0029	Viejas Mountain (southwest slope)	Present	245	32.848118 -116.737002	870
4/24/17	ACIL_4VIMT0030	Viejas Mountain (west-southwest flank)	Present	233	32.856444 -116.743803	799
4/17/17	ACIL_3WHRI017	Wheeler Ridge (Long Canyon PMA 4-1cW)	Present	1,000	32.658051 -117.009548	336
4/19/16	ACIL_3WRFI018	Wright's Field	Present	250	32.821467 -116.765655	598

Table 3-4. 2016 Genetic tissue, flow cytometry tissue, and herbarium voucher specimen collection information for *Acanthomintha ilicifolia*, 2016-17.

Occurrence Name	Herbarium Voucher	Cytology Collection Numbers	Genetic Collection Numbers	Voucher Specimen Cytology Number	Morphology Differences
Bonita Meadows	mrm#3348	01-01 to 01-05	01-06 to 01-20	01-01	None observed.
Dennery Ranch East[1]	mrm#3520	01-01 to 01-05	01-06 to 01-25	01-01	Mix of small non-flowering individuals and larger multi-branch.
El Dorado Hills	mrm#3360	01-01 to 01-05	01-06 to 01-25	01-01	Few large individuals. Mostly single branched.
Emerald Pointe	mrm#3346	01-01 to 01-05	01-06 to 01-18	01-02	None observed.
Hollenbeck Wildlife Area	mrm#3353	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
La Costa Greens	mrm#3515	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Long Canyon (PMA 4-2b)	mrm#3507	01-01 to 01-06	01-06 to 01-26	01-02	Mix of very small individuals and larger multi-branch.
Los Penasquitos Canyon	mrm#3358	01-01 to 01-05	01-06 to 01-21	01-01	Small plants overall with 5-6 multi-branch individuals.
Lux Canyon (east), Manchester Avenue Mitigation Bank	mrm#3517	01-01 to 01-05	01-06 to 01-21	01-01	Most plants very small and some flowering with no leaves.
McGinty Mountain (southwest slope)	mrm#3561	01-01 to 01-05	01-06 to 01-21	01-01	Many multi-branch individuals.
McGinty Mountain (summit and ridgeline)	mrm#3356	01-01 to 01-05	01-06 to 01-25	01-01	Plants small, few multi-branched.

Occurrence Name	Herbarium Voucher	Cytology Collection Numbers	Genetic Collection Numbers	Voucher Specimen Cytology Number	Morphology Differences
McGinty Mountain- TNC	mrm#3355a, mrm#3355b	01-01 to 01-05	01-06 to 01-25	01-01 and 01-03	Small and large multi-branch plants.
Mission Trails Regional Park - City	mrm#3359	01-01 to 01-05	01-06 to 01-25	01-01	Several multi-branch and few single small.
Palomar Airport Road	mrm#3508	01-01 to 01-05	01-06 to 01-25	01-01	Mostly small plants.
PMA1- Rice Canyon	mrm#3525	01-01 to 01-05	01-06 to 01-25	01-01	Mostly small plants with small leaves.
Sabre Springs[1]	mrm#3354	01-01 to 01-05	01-06 to 0-15	01-01	None observed.
Simon Preserve	mrm#3544	01-01 to 01-05	01-06 to 0-25	01-01	None observed.
South Crest (Suncrest)	mrm#3351	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Sycamore Canyon	mrm#3531	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Viejas Mountain (southwest slope)	mrm#3589	01-01 to 01-05	01-06 to 01-25	01-01	A mix of multi-branch and single stem individuals.
Viejas Mountain (west-southwest flank)	mrm#3533	01-01 to 01-05	01-06 to 01-25	01-01	All plants small.
Wheeler Ridge (Long Canyon PMA 4-1cW)	mrm#3527	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Wright's Field	mrm#3350	01-01 to 01-05	01-06 to 01-20	01-01	None observed.

[1]Plants were large and multi-stemmed (5-10 branches) so genetic collections were made.

Cracked clay soils of *Acanthomintha ilicifolia* at Wheeler Ridge, 2017

Table 3-5. Habitat descriptions of *Acanthomintha ilicifolia* occurrences from 2016 and 2017 site visits.

Occurrence Name	Aspect	SANDAG 2012 Vegetation	Soil Texture	Munsell Soil Chart	Disturbance Notes
Bonita Meadows	NE	*Brachypodium distachyon Semi-Natural Stand Type*	silty clay loam or silt	5YR 3/1	*Brachypodium* dominant at northern pop. Southern not as disturbed so *Deinandra fasciculata Association*.
Dennery Ranch East	N	*Deinandra fasciculata Association*	silty clay loam or silt	10YR 4/2 moist	Invasive species prevalent including *Centaurea melitensis, Sonchus asper* and *Brassica nigra*.
El Dorado Hills	NW	*Brachypodium distachyon Semi-Natural Stand Type*	sandy clay loam	10YR 4/2 moist	*Brachypodium* dominate with some *Deinandra fasciculata* and *Convolvulus simulans*.
Emerald Pointe	SW	*Artemisia californica-Salvia mellifera Association*	sandy clay or clay	7.5YR 4/1 moist	No disturbance noted.
Hollenbeck Wildlife Area	NE	*Deinandra fasciculata Association*	silty clay loam or silt	7.5YR 3/1 moist	No disturbance noted.
La Costa Green	SE	*Deinandra fasciculata Association*	silty clay loam or silt	2.5Y 3/3 moist	No disturbance noted.
Long Canyon (PMA 4-2b)	NE	*Avena barbata Semi-Natural Stand*	sandy clay loam	10YR 3/2 moist	Weeds prevalent esp. *Sonchus asper*, *Brassica nigra* and *Erodium botrys*.
Los Penasquitos Canyon	SW	*Deinandra fasciculata Association*	silty clay loam or silt	7.5YR 4/6 moist	No disturbance noted.
Lux Canyon (east), Manchester Avenue Mitigation Bank	NE	*Deinandra fasciculata Association*	silty clay loam or silt	2.5Y 4/3 moist	Some *Sonchus asper* present.
McGinty Mountain (southwest slope)	SW	*Brachypodium distachyon Semi-Natural Stand Type*	sandy clay loam	2.5YR 4/3 moist	*Brachypodium distachyon* invaded site.
McGinty Mountain (summit and ridgeline)	W	*Deinandra fasciculata Association*	silty clay loam or silt	10YR 4/3 moist	*Brachypodium* present but not dominating. *Sonchus asper* present.

Occurrence Name	Aspect	SANDAG 2012 Vegetation	Soil Texture	Munsell Soil Chart	Disturbance Notes
McGinty Mountain-TNC	E	*Adenostoma fasciculatum Alliance (Salvia clevelandii codominant)*	silty clay loam or silt	10YR 4/4 moist	*Hirschfeldia incana* and *Centaurea melitensis* present. Dog tracks.
Mission Trails Regional Park - City	SSE	*Deinandra fasciculata Association*	silty clay loam or silt	10YR 3/4 moist	Population is enclosed by fence. City sprayed for *Brachypodium*.
Palomar Airport Road	NW	*Deinandra fasciculata Association*	silty clay loam or silt	2.5Y 6/3 moist	*Brachypodium distachyon* and *Sonchus asper* both are present.
PMA1- Rice Canyon	SW	*Brachypodium distachyon Semi-Natural Stand Type*	sandy clay loam	2.5Y 4/1 moist	Weeds are prevalent including *Brachypodium distachyon, Centaurea melitensis, Avena barbata* and *Brassica nigra*.
Sabre Springs	E	*Deinandra fasciculata Association*	silty clay loam or silt	10YR 4/3 moist	*Helminthotheca* present. City sprayed for *Brachypodium*.
Simon Preserve	N	*Adenostoma faciculatum-Xylococcus bicolor Association*	silty clay loam or silt	7.5YR 4/2 moist	*Bromus rubens* and *Centaurea melitensis* dominating with some *Hirschfeldia incana* and *Erodium botrys.*
South Crest (Suncrest)	SW	*Deinandra fasciculata Association*	silty clay loam or silt	7.5 YR 4/3 moist	Some *Bromus rubens* and *Erodium cicutarium* present.
Sycamore Canyon	SW	*Deinandra fasciculata Association*	silty clay loam or silt	10YR 5/3 moist	*Brachypodium distachyon* dominant in some areas.
Viejas Mountain (west-southwest flank)	SW	*Nassella pulchra Association*	sandy clay loam	2.5Y 3/2 moist	Gopher activity present. *Brachypodium distachyon, Gastridium phleoides* and *Avena barbata* present.
Viejas Mountain (southwest slope)	W	*Adenostoma faciculatum-Xylococcus bicolor Association*	silty clay loam or silt	10R 3/2 moist	No disturbance noted.
Wheeler Ridge (Long Canyon PMA 4-1cW)	SE	*Deinandra fasciculata Association*	silty clay loam or silt	5Y 6/2 moist	*Centaurea melitensis* present.
Wright's Field	N	*Deinandra fasciculata Association*	silty clay loam or silt	5Y 2.5/1 moist	Population is fenced.

***Acanthomintha ilicifolia* competing with the non-natives *Centaurea melitensis* and *Bromus madritensis* ssp. *rubens*, Simon Preserve, 2017**

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3.3 BACCHARIS VANESSAE

There were 16 total occurrences of *Baccharis vanessae* (Fig.3-2 & Table 3-6). In addition to the 13 occurrences from the MOM database, two new sites on CPEN and one new occurrence on Otay Mountain (BAVA3_3OTMT016) were added. Permission was granted for 14 of the sites. One of the sites, Ralph's Preserve/4S Ranch (BAVA3_64SRA007), was private property and permission was declined due to privacy. There was no response to requests to access Santa Fe Valley (BAVA3_6SFVA012). Sites were visited in September through November in 2016 and 2017 (Table 3-7). Collections were made at 13 of the 14 sites with a total of 184 genetic collections (Table 3-8). One of the sites, Iron Mountain South (BAVA3_4IRMT002), did not support the target species. Total population numbers in the sites with *Baccharis vanessae* ranged from one to 700 individuals.

Of the 13 sites that supported *Baccharis vanessae,* sandy soils were present at all sites. Non-natives were observed as present at one of the sites, and disturbance by trails/roads was observed at 85% (11 of 13) of the sites (Table 3-9). The vegetation classifications were all chaparral associations with the exceptions of Mt. Woodson (BAVA3_4MTWO09) and Escondido Creek Preserve (BAVA3_6ECPR006) which were both *Quercus agrifolia/Quercus (berberidifolia, ×acutidens). Adenostoma fasciculatum* was a main component of the vegetation classification in 73% of the sites. Additional sites included *Ceanothus verrucosus Association, Ceanothus cyaneus Special Stands,* and *Cercocarpus minutiflorus Provisional Association.* All but one of the sites (Gibson Highlands) had a north-facing aspect and elevations ranged from 91 to 896 meters. Shrubs were observed to be generally dry and spindly in 2016 except for Gibson Highland which had robust plants.

Robust-looking *Baccharis vanessae* shrubs, Gibson Highlands, 2016

Table 3-6. *Baccharis vanessae* occurrences and visitation status in 2016 and 2017.

Occurrence ID	Occurrence Name	Ownership	Source	Visited
No Occurrence ID[1]	CPEN – Case springs	CPEN	New	Yes, 2016
No Occurrence ID[1]	CPEN - Devil's Canyon	CPEN	New	Yes, 2016
BAVA3_6DDHP004	Del Dios Highlands Preserve	County San Diego	MOM	Yes, 2016
BAVA3_6EFRR005	Elfin Forest Recreational Reserve	San Diego County Water Authority	MOM	Yes, 2016
BAVA3_6ENRA013	Encinitas Ranch	Open Space Holding LLC	MOM	Yes, 2017
BAVA3_6ECPR006	Escondido Creek Preserve	Escondido Creek Conservancy	MOM	Yes, 2016
BAVA3_3GIHI010	Gibson Highlands	South Crest Properties; Endangered Habitats Conservancy	MOM	Yes, 2016
BAVA3_4IRMT011	Iron Mountain North	City of Poway	MOM	Yes, 2016
BAVA3_4IRMT002	Iron Mountain South	City Poway	MOM	Yes, 2016
BAVA3_4MTWO003	Mount Woodson North	City Poway	MOM	Yes, 2016
BAVA3_4MTWO09	Mount Woodson South	City San Diego	MOM	Yes, 2016
BAVA3_6OAPA008	Oakcrest Park	City Encinitas	MOM	Yes, 2016
BAVA3_3OTMT016	Otay Mountain peak	Otay Mountain Wilderness; BLM	New	Yes, 2016
BAVA3_3OTMT001	Otay Mountain south side & east of Otay Mountain Truck Trail	Otay Mountain Wilderness; BLM	MOM	Yes, 2016
BAVA3_64SRA007	Ralph's Preserve/4S Ranch Specific Plan Area	Private	MOM	No- denied permission
BAVA3_6SFVA012	Santa Fe Valley	MS Rialto to the Lakes CA LLC	MOM	No- contact info unavailable

[1] CPEN populations were not assigned an occurrence ID because they are not included in the MSPA.

Typical bright green color of *Baccharis vanessae*, Del Dios Highland Preserve, 2016

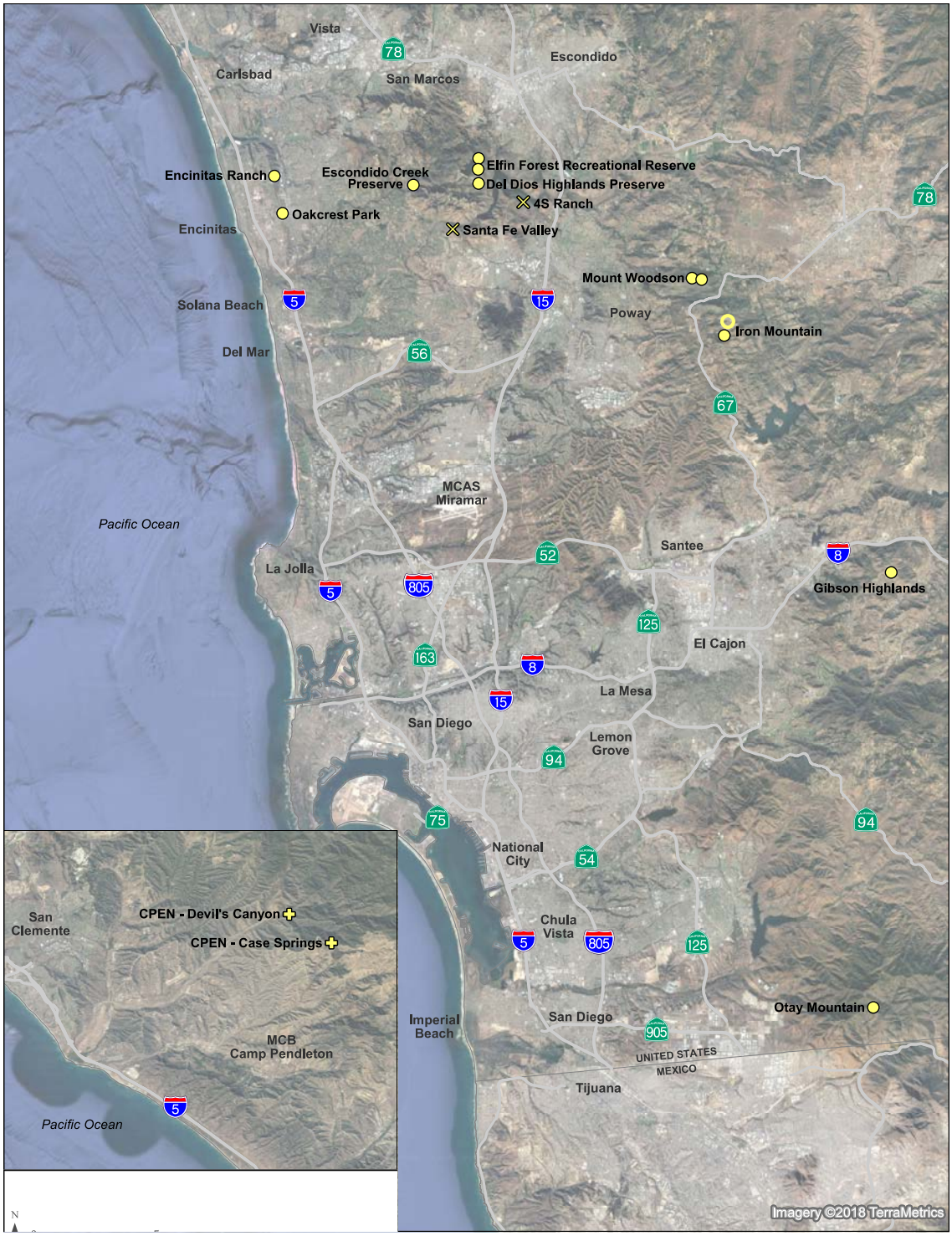

Figure 3-2. *Baccharis vanessae* occurrences sampled in 2016 and 2017.

Table 3-7. Population status and site visit information of *Baccharis vanessae* in 2016 and 2017.

Survey Date	Occurrence ID	Occurrence Name	Site Status	Population Estimate	Coordinates	Elevation (m)
9/23/16	No Occurrence ID[1]	CPEN - Case Springs	New	10	33.45431 -117.438946	653
9/23/16	No Occurrence ID[1]	CPEN - Devil's Canyon	New	14	33.471216 -117.463755	212
11/1/16	BAVA3_6DDHP004	Del Dios Highlands Preserve	Present	30	33.064602 -117.127776	216
10/5/16	BAVA3_6EFRR005	Elfin Forest Recreational Reserve - north	Present	49	33.079325 -117.127844	370
10/5/16	BAVA3_6EFRR005	Elfin Forest Recreational Reserve - south	Present	9	33.072915 -117.128040	377
6/15/17	BAVA3_6ENRA013	Encinitas Ranch	Present	10	33.067896 -117.27112	91
9/26/16	BAVA3_6ECPR006	Escondido Creek Preserve	Present	29	33.063325 -117.173568	120
9/30/16	BAVA3_3GIHI010	Gibson Highlands	Present	700	32.836405 -116.836610	626
9/27/16	BAVA3_4IRMT011	Iron Mountain North	Absent	0	32.984041 -116.952207	763
9/27/16	BAVA3_4IRMT002	Iron Mountain South	Present	6	32.975820 -116.954671	672
10/10/16	BAVA3_4MTWO003[2]	Mount Woodson North	Included with South	N/A	N/A	N/A
10/10/16	BAVA3_4MTWO09	Mount Woodson South	Present	100	33.008897 -116.970663	871
11/1/16	BAVA3_6OAPA008	Oakcrest Park	Present	16	33.045899 -117.265106	99
11/11/16	BAVA3_3OTMT016	Otay Mountain peak	New	1	32.573277 -116.841687	851
11/11/16	BAVA3_3OTMT001	Otay Mountain south side and east of Otay Mountain Truck Trail	Present	21	32.579371 -116.847406	896

[1] CPEN populations were not assigned an occurrence ID because they are not included in the MSPA.

[2] Shrubs were consistently found between Mount Woodson North and South so sites were combined for this study.

Table 3-8. Genetic, flow cytometry, and herbarium voucher specimen collection information for *Baccharis vanessae*, 2016 and 2017.

Occurrence Name	Herbarium Voucher	Cytology Collection Numbers	Genetic Collection Numbers	Voucher Specimen Cytology Number	Morphology Differences
CPEN - Case Springs	mrm#3469	01-01 to 01-05	01-06 to 01-15	01-01	None observed.
CPEN - Devil's Canyon	mrm#3465 male, mrm#3466 female	01-01 to 01-05	01-06 to 01-20	01-01 male, 01-05 female	None observed.
Del Dios Highlands Preserve	mrm#3490	01-01 to 01-05	01-06 to 01-25	01-01 female	None observed.
Elfin Forest Recreational Reserve - north	mrm#3475	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Elfin Forest Recreational Reserve - south	mrm#3477	02-01 to 02-05	02-06 to 02-14	02-01 male	None observed.
Encinitas Ranch	mrm#3617	01-01 to 01-05	01-06 to 01-15	01-01	None observed.
Escondido Creek Preserve	mrm#3470 male, mrm#3471 female	01-01 to 01-05	01-06 to 01-25	01-01 male, 01-02 female	None observed.
Gibson Highlands	mrm#3475 female, mrm#3476 male	01-01 to 01-05	01-06 to 01-25	01-01 male, 01-05 female	Portion of population flowered in spring.
Iron Mountain South	mrm#3472	01-01 to 01-05	01-06 to 01-11	01-01	None observed.
Mount Woodson South	mrm#3479 with galls, mrm#3480 female, mrm#3481 male	01-01 to 01-05	01-06 to 01-25	01-01 female, 01-02 male	Shaded plants are green, in open are dry. Some shrubs have old fruits so maybe flower in spring.
Oakcrest Park	mrm#3492	01-01 to 01-05	01-06 to 01-18	01-01 female	None observed.
Otay Mountain peak	N/A	02-01	02-06	N/A	None observed.
Otay Mountain south side and east of Otay Mountain Truck Trail	mrm#3290	01-01 to 01-05	01-06 to 01-25	01-01	None observed.

***Baccharis vanessae*, Gibson Highlands, 2016**

Typical habit of shrub of *Baccharis vanessae* at Iron Mountain, 2016

Table 3-9. Habitat descriptions of *Baccharis vanessae* populations from 2016 and 2017 site visits.

Occurrence Name	Aspect	SANDAG 2012 Vegetation	Soil Texture	Munsell Soil Chart	Disturbance Notes
CPEN - Case Springs	N	*Adenostoma fasciculatum-Ceanothus crassifolius Association*	sandy loam or loam	10R 2.5/2 moist	None observed.
CPEN - Devil's Canyon	N	*Adenostoma fasciculatum-Ceanothus tomentosus Association*	sandy clay loam or clay loam	2.5YR 2.5/1 moist	Shrubs growing adjacent to trail. *Bromus diandrus* present.
Del Dios Highlands Preserve	NE	*Ceanothus verrucosus Association*	sandy loam or loam	5YR 4/2 moist	Some slope erosion most likely from trails created by monitoring efforts.
Elfin Forest Recreational Reserve - north	N	*Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus verrucosus Association*	sandy loam or loam	7.5YR 4/3 moist	Trail with fence running through population.
Elfin Forest Recreational Reserve - south	N	*Adenostoma fasciculatum-Lotus scoparius Association*	sandy loam or loam	10YR 5/6 moist	Post fire 2007.
Encinitas Ranch	NW	*Adenostoma fasciculatum-(Eriogonum fasciculatum, Artemisia californica, Salvia mellifera) Association*	sandy loam or loam	2.5Y 5/2 moist	None observed.
Escondido Creek Preserve	N	*Quercus agrifolia/Quercus (berberidifolia, ×acutidens) Association*	sandy loam or loam	7.5YR 3/1 moist	None observed.
Gibson Highlands	SW	*Ceanothus cyaneus Special Stands*	sandy loam or loam	10YR 4/3 moist	Road running through population.
Iron Mountain South	N	*Arctostaphylos glandulosa-Adenostoma fasciculatum Association*	sandy loam or loam	5YR 3/1 moist	None observed.
Mount Woodson South	N	*Quercus agrifolia/Quercus (berberidifolia, ×acutidens) Association*	loamy sand	10YR 3/2 moist	Mastication observed and trail through populations.
Oakcrest Park	NE	*Cercocarpus minutiflorus Provisional Association*	loamy sand	5YR 3/2 moist	Many man-made trails through population. Taking advantage of shade of non-native pines.
Otay Mountain peak	N	*Arctostaphylos glandulosa-Adenostoma fasciculatum/Chamaebatia australis Association*	sandy clay loam or clay loam	N/A	Illegal trails near shrub.
Otay Mountain south side and east of Otay Mountain Truck Trail	NW	*Arctostaphylos glandulosa-Adenostoma fasciculatum/Chamaebatia australis Association*	sandy clay loam or clay loam	5YR 3/2 moist	None observed.

***Baccharis vanessae* flowering heads, pistillate/female (left) and staminate/male (right)**

Close up of staminate/male flowers, *Baccharis vanessae*

***Baccharis vanessae*, Mount Woodson, 2016**

3.4 CHLOROPYRON MARITIMUM SSP. MARITIMUM

There were 29 occurrences of *Chloropyron maritimum* ssp. *maritimum*. In addition to the seven occurrences from the MOM database (Table 3-10), 22 occurrences were added to the project (Fig. 3-3); three at the Tijuana Estuary (COMAM3_1TIES009, COMAM3_1TIES010, COMAM3_1TIES011), one at Camp Surf/Naval Base Coronado (COMAM3_1IMBE008), three from Baja California, Mexico (Fig. 3-4), five at NBV, two at Carpinteria Marsh, four at Morro Bay, two at Ormond Beach, and two at Newport Bay (Fig. 3-5). Permission was granted to visit all occurrences (Table 3-11). Collections were made at 25 occurrences, with two sets of collections made at Sweetwater Marsh Complex's occurrence COMAM3_1TIES005 and at Tijuana Estuary's occurrence COMAM3_1TIES002, for a total of 27 sets of collections (Table 3-12). The target species was not found at three of the occurrences, neither of the two Borderfield State Park sites (COMAM3_1TIES001 and COMAM3_1TIES003) nor at the Naval Radar Receiving Facility, Naval Base Coronado (COMAM3_1SDBA004). Total population numbers in the sites with plants ranged from three to 3,000 individuals. There were 540 genetic collections made for *Chloropyron maritimum* ssp. *maritimum*.

At the sites where soil was collected, sandy soils were found in all but Pt. Mugu-Camera Pad (Table 3-13). Soils were not collected from three of the sites located in the Sweetwater Marsh complex due to the soil contamination of toxic burnt ash from a historic ammunition factory onsite. Soils were not collected from Baja California due to permit restrictions. Non-natives were observed at 28% (7 of 25) of the sites; *Limonium duriusculum* at three, *L. ramosissimum* at one, *Lepidium latifolium* at one, and *Parapholis incurva* at two sites. The vegetation classification at most of the San Diego sites was *Sarcocornia pacifica-Monanthochloe littoralis Special Stands* apart from the Tijuana Estuary site near Caspian which was the *Frankenia salina Alliance.* The dominant plant at non-San Diego sites was either *Distichlis spicata* or *D. littoralis* except for NRG Energy which was *Parapholis incurva*. Populations did not appear to favor any specific aspect, and elevations ranged from one to five meters. Morphologically, the northern populations in Morro Bay were observed to be shorter but more robust in stature compared to plants in the rest of its range. White-leaved or -flowered individuals were observed in several of the populations in Newport Bay and Morro Bay.

***Chloropyron maritimum* ssp. *maritimum*, Dog Beach, 2016**

Table 3-10. *Chloropyron maritimum* ssp. *maritimum* occurrences and visitation status in 2016 and 2017.

Occurrence ID	Occurrence Name	Ownership	Source	Visited
No Occurrence ID. [1]	Bahia falsa, Baja California, MX	Terra Peninsular	Sula Vanderplank	Yes, 2017
COMAM3_1IMBE008	Camp Surf, NB Coronado	Naval Base Coronado	Navy	Yes, 2016
No Occurrence ID. [1]	Carpinteria Salt Marsh Reserve - East	Natural Reserve System, University of California	SBBG [2]	Yes, 2017
No Occurrence ID. [1]	Carpinteria Salt Marsh Reserve - West	Natural Reserve System, University of California	SBBG[2]	Yes, 2017
COMAM3_1DOBE007	Dog Beach, Flood Control Channel Southern Wildlife Preserve	City of San Diego Park and Recreation Department	MOM	Yes, 2016
No Occurrence ID. [1]	Morro Bay Marina Peninsula	CA State Parks	CA State Parks	Yes, 2017
No Occurrence ID. [1]	Morro Bay Pecho Rd	CA State Parks	Morro Coast Audubon Society	Yes, 2017
No Occurrence ID. [1]	Morro Bay Sandspit	CA State Parks	SBBG[2]	Yes, 2017
No Occurrence ID. [1]	Morro Bay Sweet Springs	Morro Coast Audubon Society	SBBG[2]	Yes, 2017
No Occurrence ID. [1]	Newport Aquatic Center	CDFW	SBBG[2]	Yes, 2017
No Occurrence ID. [1]	Ormond Beach, City of Oxnard	City of Oxnard	Trisha Munro	Yes, 2017
COMAM3_1TIES005[3]	Paradise Marsh	San Diego Bay National Wildlife Refuge, USFWS	Ranger at Sweetwater	Yes, 2017
No Occurrence ID. [1]	Pt. Mugu – Beach Pad West	Naval Base Ventura County	NBVC[4]	Yes, 2017
No Occurrence ID. [1]	Pt. Mugu - Camera Pad	Naval Base Ventura County	NBVC[4]	Yes, 2016
No Occurrence ID. [1]	Pt. Mugu – Cotar	Naval Base Ventura County	NBVC[4]	Yes, 2016
No Occurrence ID. [1]	Pt. Mugu MAD Road	Naval Base Ventura County	NBVC[4]	Yes, 2017
No Occurrence ID. [1]	Pt. Mugu - Perimeter Rd	Naval Base Ventura County	NBVC[4]	Yes, 2016
No Occurrence ID. [1]	Power Plant NRG Energy, Ormond Beach	NRG Energy	Trisha Munro	Yes, 2017
No Occurrence ID. [1]	Punta Azufre (north), San Quintin, Baja California, Mexico	Terra Peninsular	Sula Vanderplank	Yes, 2017

Occurrence ID	Occurrence Name	Ownership	Source	Visited
No Occurrence ID. [1]	Punta Azufre (south), San Quintin, Baja California, Mexico	Terra Peninsular	Sula Vanderplank	Yes, 2017
COMAM3_1SDBA004	San Diego Bay, Naval Radar Receiving Facility, Naval Base Coronado	Naval Base Coronado	MOM	Yes, 2016
COMAM3_1SWMA005	Sweetwater Marsh – West Side of I-5	San Diego Bay National Wildlife Refuge, USFWS	MOM	Yes, 2016
COMAM3_1SWMA006	Sweetwater Marsh – West Side of I-5 and South of Sweetwater River	San Diego Bay National Wildlife Refuge, USFWS	MOM	Yes, 2016
COMAM3_1TIES002	Tijuana Estuary Area – Between mouth of Tijuana River and Coronado Ave	Tijuana Slough National Wildlife Refuge, USFWS	MOM	Yes, 2016
COMAM3_1TIES009	Tijuana Estuary Area - Caspian Way	Tijuana Slough National Wildlife Refuge, USFWS	New	Yes, 2016
COMAM3_1TIES001	Tijuana Estuary Area – Boundary Monument #258	Borderfield State Park, California State Parks	MOM	Yes, 2016
COMAM3_1TIES003	Tijuana Estuary Area – Near the Mouth of the Tijuana River and the North Part of Border Field State Park	Tijuana Slough National Wildlife Refuge, USFWS	MOM	Yes, 2016
COMAM3_1TIES010	Tijuana Estuary Area - Seacoast Dr N	Tijuana Slough National Wildlife Refuge, USFWS	New	Yes, 2016
COMAM3_1TIES011	Tijuana Estuary Area - Seacoast Dr S	Tijuana Slough National Wildlife Refuge, USFWS	New	Yes, 2016
No Occurrence ID. [1]	Upper Newport Bay/Back Bay Science Center	SBBG[2]	SBBG[2]	Yes, 2017

[1] Occurrences were not assigned an occurrence ID because they are not included in the MSPA.
[2] Heather Schneider at San Diego Botanical Garden
[3] Occurrence guidelines include this with Sweetwater Marsh but population was separated by water.
[4] Valerie Plume at Naval Base Ventura County

***Chloropyron maritimum* ssp. *maritimum*, Newport Bay, Science Center, 2017**

***Chloropyron maritimum* ssp. *maritimum*, Ormond Beach, 2017**

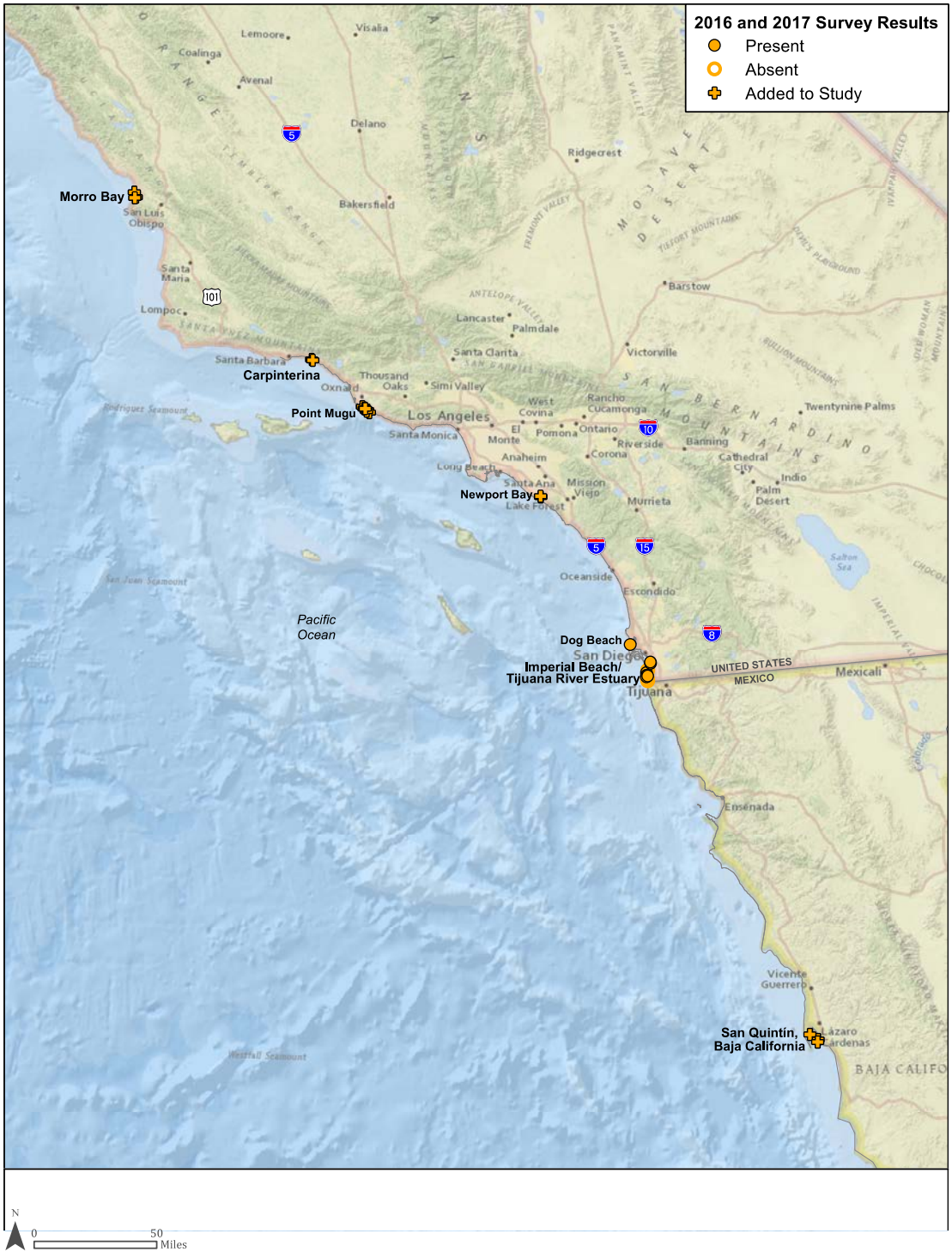

Figure 3-3. Overall map of *Chloropyron maritimum* ssp. *maritimum* occurrences sampled in 2016 and 2017.

Figure 3-4. *Chloropyron maritimum* ssp. *maritimum* occurrences sampled in San Diego County and Baja California, Mexico in 2016 and 2017.

Figure 3-5. *Chloropyron maritimum* ssp. *maritimum* occurrences sampled outside of San Diego County in 2016 and 2017.

Table 3-11. Population status and site visit information of *Chloropyron maritimum* ssp. *maritimum* in 2016.

Survey Date	Occurrence ID	Occurrence Name	Site Status	Population Estimate	Coordinates	Elevation (m)
4/20/17	No Occurrence ID. [1]	Bahia falsa, Baja California, Mexico	New	300	30.451918 -115.996514	1
6/9/16	COMAM3_1IMBE008	Camp Surf, NB Coronado	New	200	32.588709 -117.131612	1
6/7/17	No Occurrence ID. [1]	Carpinteria Salt Marsh Reserve - East	New	1,000	34.398433 -119.533829	1
6/6/17	No Occurrence ID. [1]	Carpinteria Salt Marsh Reserve - West	New	3,000	34.402674 -119.541585	0
5/16/16	COMAM3_1DOBE007	Dog Beach	Present	3,000	32.755394 -117.248791	2
6/9/17	No Occurrence ID. [1]	Morro Bay Marina Peninsula	New	3	35.344691 -120.838628	2
6/8/17	No Occurrence ID. [1]	Morro Bay Pecho Rd	New	200	35.317657 -120.85368	4
6/8/17	No Occurrence ID. [1]	Morro Bay Sandspit	New	1,000	35.351170 -120.858640	3
6/7/17	No Occurrence ID. [1]	Morro Bay Sweet Springs	New	1,500	35.321968 -120.84465	1
6/5/17	No Occurrence ID. [1]	Newport Aquatic Center	New	1,500	33.625831 -117.892686	3
6/6/17	No Occurrence ID. [1]	Ormond Beach, City of Oxnard	New	100	34.123830 -119.157322	1
6/18/16	COMAM3_1TIES005[2]	Paradise Marsh	Present	70	32.651880 -117.106057	2
6/6/17	No Occurrence ID. [1]	Pt. Mugu – Beach Pad West	New	100	34.098988 -119.119874	0
7/28/16	No Occurrence ID. [1]	Pt. Mugu – Camera Pad	New	30	34.106993 -119.138907	1
7/28/16	No Occurrence ID. [1]	Pt. Mugu – Cotar	New	140	34.121115 -119.157556	1
6/6/17	No Occurrence ID. [1]	Pt. Mugu MAD Road	New	200	34.112983 -119.133823	0
7/28/16	No Occurrence ID. [1]	Pt. Mugu – Perimeter Rd	New	70	34.120688 -119.149946	1
6/6/17	No Occurrence ID. [1]	Power Plant NRG Energy, Ormond Beach	New	300	34.130838 -119.170018	0
4/18/17	No Occurrence ID. [1]	Punta Azufre (north), San Quintin, Baja California, Mexico	New	500	30.422155 -115.941741	1

Survey Date	Occurrence ID	Occurrence Name	Site Status	Population Estimate	Coordinates	Elevation (m)
4/18/17	No Occurrence ID. [1]	Punta Azufre (south), San Quintin, Baja California, Mexico	New	150	30.406609 -115.943907	1
5/19/16	COMAM3_1SDBA004	San Diego Bay, Naval Radar Receiving Facility, NB Coronado	Absent	0	32.6037 -117.12369	1
5/17/16	COMAM3_1SWMA006	Sweetwater Marsh	Present	293	32.643324 -117.103765	2
5/17/16	COMAM3_1SWMA005[2]	Sweetwater Marsh – CALTRANS	Present	201	32.649657 -117.104015	2
6/6/16	COMAM3_1TIES002[3]	Tijuana Estuary Area – Between mouth of Tijuana River and Coronado Ave	Present	1,500	32.569878 -117.127536	4
5/25/16	COMAM3_1TIES009	Tijuana Estuary Area – Caspian Way	New	80	32.574493 -117.127202	5
6/9/16	COMAM3_1TIES001	Tijuana Estuary Area – Boundary Monument #258	Absent	0	32.541832 -117.123617	4
5/25/16	COMAM3_1TIES003	Tijuana Estuary Area – Near the Mouth of the Tijuana River and the North Part of Border Field	Absent	0	32.552505 -117.124057	5
6/6/16	COMAM3_1TIES010	Tijuana Estuary Area – Seacoast Dr N	New	1,200	32.572731 -117.131654	4
6/6/16	COMAM3_1TIES011	Tijuana Estuary Area – Seacoast Dr S	New	3,000	32.565172 -117.131868	5
5/25/16	COMAM3_1TIES002[3]	Tijuana Estuary Area – Iris Ave	Present	1,000	32.569061 -117.123546	4
6/5/17	No Occurrence ID. [1]	Upper Newport Bay/Back Bay Science Center	New	1,500	33.620986 -117.890962	4

[1] Occurrences were not assigned an occurrence ID because they are not included in the MSPA.
[2] Population but two sets of collections because one was on an island.
[3] Same population but two sets of collections because separated by water.

Table 3-12. Genetic, flow cytometry, and herbarium voucher specimen collection information for *Chloropyron maritimum* ssp. *maritimum*, 2016.

Occurrence Name	Herbarium Voucher	Cytology Collection Numbers	Genetic Collection Numbers	Voucher Specimen Cytology Number	Morphology Differences
Bahia falsa	sev#6126	N/A	01-06 to 01-25	N/A	None observed.
Camp Surf, NB Coronado	mrm#3409	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Carpinteria Salt Marsh Reserve – East	mrm#3609	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Carpinteria Salt Marsh Reserve – West	mrm#3606	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Dog Beach	mrm#3373	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Morro Bay Pecho Rd	mrm#3610	01-01 to 01-05	01-06 to 01-25	01-01	Plants short and wider than others in range.
Morro Bay Sandspit	mrm#3613	N/A	01-06 to 01-25	N/A	Plants short but have bigger flowers and wider leaves than others in range.
Morro Bay Sweet Springs	mrm#3611	01-01 to 01-05	01-06 to 01-25	01-01	Plants short but wider than others in range. White individuals present with purple flowers.
Newport Aquatic Center	mrm#3600	01-01 to 01-05	01-06 to 01-25	01-01	White individuals with flowers with purple dots common.
Ormond Beach, City of Oxnard	mrm#3605	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Paradise Marsh	mrm#3423	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Pt. Mugu – Beach Pad West	mrm#3603	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Pt. Mugu – Camera Pad	mrm#3454	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Pt. Mugu – Cotar	mrm#3455	01-01 to 01-05	01-06 to 01-25	01-01	Some large multiple branches.

Occurrence Name	Herbarium Voucher	Cytology Collection Numbers	Genetic Collection Numbers	Voucher Specimen Cytology Number	Morphology Differences
Pt. Mugu MAD Road	mrm#3604	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Pt. Mugu – Perimeter Rd	mrm#3456	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Power Plant NRG Energy, Ormond Beach	mrm#3602	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Punta Azufre (north), San Quintin, BC, Mexico	sev#6122	N/A	01-06 to 01-25	01-01	None observed.
Punta Azufre (south), San Quintin, BC, Mexico	sev#6126	N/A	01-06 to 01-25	01-01	None observed.
Sweetwater Marsh	mrm#3376	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Sweetwater Marsh – CALTRANS	mrm#3381	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Tijuana Estuary Area – Between mouth of Tijuana River and Coronado Ave	mrm#3402	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Tijuana Estuary Area – Caspian Way	mrm#3392	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Tijuana Estuary Area – Seacoast Dr N	mrm#3400	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Tijuana Estuary Area – Seacoast Dr S	mrm#3401	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Tijuana Estuary Area- Iris Ave	mrm#3393	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Upper Newport Bay/Back Bay Science Center	mrm#3598	01-01 to 01-05	01-06 to 01-25	01-01	Some very large multibranched individuals.

***Chloropyron maritimum* ssp. *maritimum*, Dog Beach, 2016**

***Chloropyron maritimum* ssp. *maritimum*, Camp Surf, Naval Base Coronado, 2016**

Table 3-13. Habitat descriptions of *Chloropyron maritimum* ssp. *maritimum* population from 2016 site visits.

Occurrence Name	Aspect	SANDAG 2012 Vegetation	Soil Texture	Munsell Soil Chart	Disturbance Notes
Bahia falsa	S	(*Distichlis littoralis, Salicornia bigelovii, S. pacifica, Frankenia salina* and *Batis maritima*) [1]	sandy loam or loam	N/A	Road bisecting the population.
Camp Surf, NB Coronado	E	*Sarcocornia pacifica-Monanthochloe littoralis Special Stands*	sandy loam or loam	7.5YR 2.5/1 moist	Lots of rabbit browse on other plants. In youth camp so threatened by off trail traffic.
Carpinteria Salt Marsh Reserve - East	NW	(*Distichlis littoralis, Salicornia pacifica,* and *Frankenia salina*) [1]	sandy clay loam	2.5YR 2.5/2 moist	*Limonium duriusculum* dominating.
Carpinteria Salt Marsh Reserve - West	W	(*Distichlis littoralis, Salicornia pacifica,* and *Frankenia salina*) [1]	sandy clay loam	7.5YR 3/2 moist	*Limonium duriusculum* dominating.
Dog Beach	E	*Sarcocornia pacifica-Monanthochloe littoralis Special Stands*	sand	mix of 5Y 7/1 and 5Y 3/2 dry sand	*Limonium duriusculum* dominating.
Morro Bay Pecho Rd	N	(*Distichlis spicata, Salicornia pacifica, Athrocnemum subterminale* and *Frankenia salina*) [1]	sandy loam or loam	N/A	Plants located on edge of an artificial embankment.
Morro Bay Sandspit	SE	(*Distichlis spicata, Salicornia pacifica* and *Frankenia salina*) [1]	sandy loam or loam	7.5YR 3/1 moist	None observed.
Morro Bay Sweet Springs	NE	(*Distichlis spicata, Salicornia pacifica* and *Frankenia salina*) [1]	sandy loam or loam	10YR 3/3 moist	Game trail through some of the population. *Parapholis incurva* starting to invade.
Newport Aquatic Center	NE	(*Distichlis littoralis, Salicornia pacifica,* and *Frankenia salina*) [1]	sandy loam or loam	7.5YR 3/1 moist	*Limonium ramosissimum* beginning to invade site.
Ormond Beach, City of Oxnard	SW	(*Distichlis spicata, Salicornia pacifica* and *Frankenia salina*) [1]	sandy loam or loam	2.5Y 3/3 moist	Plants located on a well-established trail.

Occurrence Name	Aspect	SANDAG 2012 Vegetation	Soil Texture	Munsell Soil Chart	Disturbance Notes
Paradise Marsh	S	*Sarcocornia pacifica-Monanthochloe littoralis Special Stands*	N/A	N/A	No soil collected due to contamination. Evidence of flooding.
Pt. Mugu – Beach Pad West	NE	(*Distichlis spicata, Salicornia pacifica* and *Frankenia salina*) [1]	sandy loam or loam	10YR 2/2 moist	Lots of debris/trash from storm surges. The invasive *Lepidium latifolium* beginning to invade site.
Pt. Mugu – Camera Pad	N	(*Distichlis spicata, Salicornia pacifica* and *Frankenia salina*) [1]	silty clay loam or silt	2.5YR 2.5/1 moist	None observed.
Pt. Mugu – Cotar	SW	(*Distichlis spicata, Salicornia pacifica* and *Frankenia salina*) [1]	sandy loam or loam	7.5YR 4/2 moist	Sand dunes are encroaching on slough.
Pt. Mugu – Perimeter Rd	NW	(*Distichlis spicata* and *Salicornia pacifica*) [1]	sandy loam or loam	7.5YR 2.5/1 moist	None observed.
Pt. Mugu – MAD Rd	W	(*Distichlis spicata, Salicornia pacifica* and *Frankenia salina*) [1]	sandy clay loam	10YR 2/2 moist	None observed.
Power Plant NRG Energy, Ormond Beach	SE	(*Salicornia pacifica*, *Parapholis incurva*, and *Frankenia salina*) [1]	sandy loam or loam	2.5Y 3/2 moist	Historic tire tracks. The weed *Parapholis incurva* is common.
Punta Azufre (north), San Quintin, BC, Mexico	SW	(*Distichlis littoralis, Salicornia pacifica, Frankenia salina* and *Athrocnemum subterminale*) [1]	sandy loam or loam	N/A	Adjacent to road and oyster farms.
Punta Azufre (south), San Quintin, BC, Mexico	NW	(*Distichlis littoralis, S. pacifica*, and *Athrocnemum subterminale*) [1]	sandy loam or loam	N/A	Road bisecting population.
Sweetwater Marsh	NW	*Sarcocornia pacifica-Monanthochloe littoralis Special Stands*	N/A	N/A	No soil collected due to contamination. Evidence of flooding and debris.
Sweetwater Marsh – CALTRANS	W	*Sarcocornia pacifica-Monanthochloe littoralis Special Stands*	N/A	N/A	No soil collected due to contamination. Homeless trash and trails affecting population.

Occurrence Name	Aspect	SANDAG 2012 Vegetation	Soil Texture	Munsell Soil Chart	Disturbance Notes
Tijuana Estuary Area – Between mouth of Tijuana River and Coronado Ave	SW	*Sarcocornia pacifica-Monanthochloe littoralis Special Stands*	sandy loam or loam	7.5YR 3/1 moist	None observed.
Tijuana Estuary Area – Caspian Way	W	*Frankenia salina Alliance*	sandy loam or loam	2.5YR 2.5/1 moist	Close to trail and edge of waterway.
Tijuana Estuary Area – Seacoast Dr N	NE	*Sarcocornia pacifica-Monanthochloe littoralis Special Stands*	sandy loam or loam	2.5Y 2.5/1 moist	Near paved road.
Tijuana Estuary Area – Seacoast Dr S	S	*Sarcocornia pacifica-Monanthochloe littoralis Special Stands*	sandy loam or loam	2.5Y 3/1 moist	None observed.
Tijuana Estuary Area-Iris Ave	W	*Sarcocornia pacifica-Monanthochloe littoralis Special Stands*	sandy clay loam or clay loam	7.5YR 3/2 moist	Trails through population. Trash present.
Upper Newport Bay/Back Bay Science Center		(*Distichlis littoralis, Salicornia pacifica*, and *Triglochin concinna*)[1]	sandy loam or loam	10YR 3/1 moist	Trash and wood debris from flooding present. On edge of road/parking lot.

[1]Dominants were listed in lieu of SANDAG 2012 Vegetation, which is based on western San Diego County.

3.5 DEINANDRA CONJUGENS

There were 26 total occurrences of *Deinandra conjugens* (Table 3-14). In addition to the 25 original MOM occurrences (Fig. 3-6), one occurrence was added to the project, Lonestar Open Space Preserve (DECO13_3LOST027). Permission was granted to visit 23 occurrences. However, Spring Valley Fuel Break (DECO13_3SVFB011) was a duplicate GPS point for Mother Miguel Grassland (DECO13_3MMGR010). Of the remaining 22 occurrences, sites were visited in May and June 2016 and 18 supported *Deinandra conjugens* (Table 3-15). Collections were only made at 15 occurrences due to a low number of plants at San Miguel Habitat Area East (DECO13_3SMHA025) and Rolling Hills Ranch (DECO13_3RHRA012). Two sets of collections were made at Cal Terraces-Dennery Canyon Area (DECO13_3DREA021) on different dates due to obvious morphological differences observed (Table 3-16). Total population numbers in the sites with plants ranged from two to 50,000 plants. There were 325 genetic collections made for *Deinandra conjugens*. Plants were observed to be quite morphologically variable with small and large flowers.

Occurrences that supported *Deinandra conjugens* all had clay soils except for Paradise Valley (DECO13_2PAVA001) which had sandy loam or loam. Non-natives were observed as prominent at 88% (15 of the 17) of the sites with *Brachypodium distachyon* (59% of sites) and *Centaurea melitensis* (41% of sites) most commonly observed. Five of the occurrences were classified as one of the following non-native dominated vegetation classifications: *Bromus rubens Semi-Natural Stand Type, Avena barbata Semi-Natural Stands* or *Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands.* Four of the sites were classified as the native vegetation types: *Deinandra fasciculata Association* at Paradise Valley Park (DECO13_2PAVA001), Rancho Jamul Ecological Reserve (DECO13_3RJER015) and Shinohara Vernal Pool Complex - SE Sweetwater Reservoir (DECO13_3SVPC007) and the last site as *Nassella pulchra Association*, Proctor Valley (DECO13_3PRVA013), (Table 3-17). Elevations ranged from 85 to 255 meters and populations did not appear to favor any specific aspect.

***Deinandra conjugens,* Cal Terraces, 2016**

Table 3-14. *Deinandra conjugens* occurrences and visitation status in 2016.

Occurrence ID	Occurrence Name	Ownership	Source	Visited
DECO13_3BOME009	Bonita Meadows	CALTRANS	MOM	Yes
DECO13_3DENC022	Dennery Canyon South	CALTRANS	MOM	Yes
DECO13_3DERA020	Dennery Ranch	City of San Diego Park and Recreation Department	MOM	Yes
DECO13_3DREA021	Dennery Ranch East	City of San Diego Park and Recreation Department	MOM	Yes
DECO13_3JAHI006	Jamacha Hills	San Diego National Wildlife Refuge; U.S. Fish and Wildlife Service	MOM	Yes
DECO13_3JOCA019	Johnson Canyon	County San Diego	MOM	No- denied permission
DECO13_3LOST027	Lonestar	San Diego Habitat Conservancy	New	Yes
DECO13_3MMGR010	Mother Miguel Grassland	San Diego National Wildlife Refuge; U.S. Fish and Wildlife Service	MOM	Yes
DECO13_3ORVA018	North Side of Otay River Valley near Wolf Canyon	County San Diego/City Chula Vista/Private	MOM	No- denied permission
DECO13_3ORVA017	Otay Valley East End; Otay Ranch Preserve	Otay Ranch POM (County San Diego & City Chula Vista)	MOM	Yes
DECO13_2PAVA001	Paradise Valley Park	City of San Diego Park and Recreation Department	MOM	Yes
DECO13_3PMA1002	PMA1 (Rice Canyon & Other Canyons)	Chula Vista Central City Preserve; City of Chula Vista	MOM	Yes
DECO13_3PMA2003	PMA2	Chula Vista Central City Preserve; City of Chula Vista	MOM	Yes

Occurrence ID	Occurrence Name	Ownership	Source	Visited
DECO13_3PMA3004	PMA3	Chula Vista Central City Preserve; City of Chula Vista	MOM	Yes
DECO13_3PMA4005	PMA4	Chula Vista Central City Preserve; Sam Holty	MOM	Yes
DECO13_3PRVA013	Proctor Valley	City San Diego PUD; Otay Lakes Cornerstone Lands	MOM	Yes
DECO13_3PRVA014	Proctor Valley (Bella Lago)	San Diego National Wildlife Refuge; U.S. Fish and Wildlife Service	MOM	Yes
DECO13_3RJER015	Rancho Jamul Ecological Reserve	California Department of Fish and Wildlife	MOM	Yes
DECO13_3RHRA012	Rolling Hills Ranch	Private, being transferred to City Chula Vista	MOM	Yes
DECO13_3SCPA016	Salt Creek Parcel; Otay Ranch Preserve	Otay Ranch POM (County San Diego & City Chula Vista)	MOM	No- denied permission
DECO13_3SMHA025	San Miguel Habitat Area East	Otay Water District	MOM	Yes
DECO13_3SMHA024	San Miguel Habitat Area West	Otay Water District	MOM	Yes
DECO13_3SVPC007	Shinohara Vernal Pool Complex - SE Sweetwater Reservoir	San Diego National Wildlife Refuge; U.S. Fish and Wildlife Service	MOM	Yes
DECO13_3SVFB011	Spring Valley Fuel Break	San Diego National Wildlife Refuge; U.S. Fish and Wildlife Service	MOM	No, GPS point same as Mother Miguel Grassland
DECO13_3TRIM008	Trimark/Gobbler's Knob/Horseshoe Bend	San Diego National Wildlife Refuge; U.S. Fish and Wildlife Service	MOM	Yes

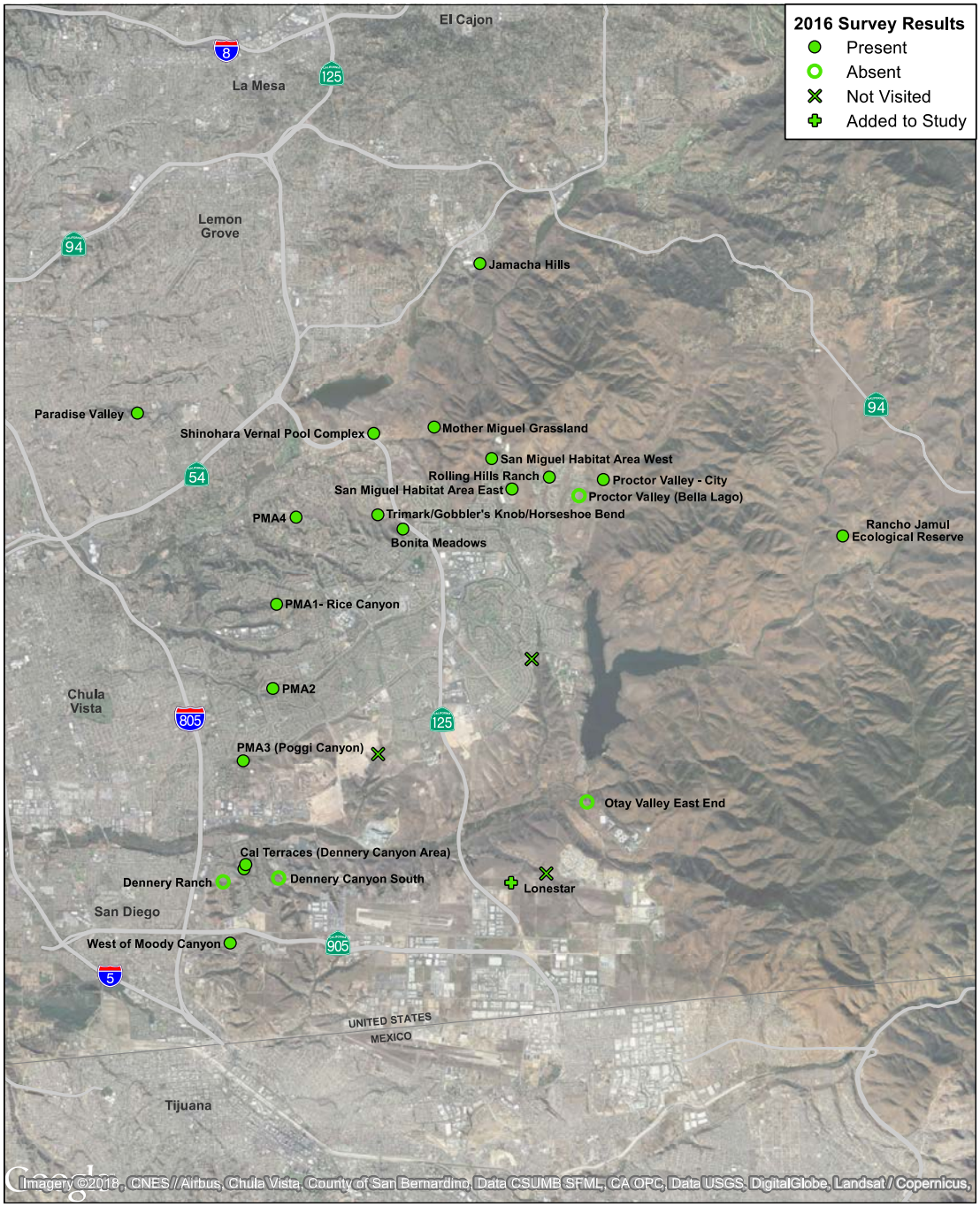

Figure 3-6. *Deinandra conjugens* occurrences sampled in 2016, San Diego County, CA.

Table 3-15. Population status and site visit information of *Deinandra conjugens* in 2016.

Survey Date	Occurrence ID	Occurrence Name	Site Status	Population Estimate	Coordinates	Elevation (m)
5/20/16	DECO13_3BOME009	Bonita Meadows	Present	150	32.661178-116.981767	150
5/11/16	DECO13_3DREA021	Cal Terraces (Dennery Canyon Area)	Present	10,000	32.582779 -117.024334	115
6/10/16	DECO13_3DREA021	Cal Terraces (Dennery Canyon Area)	Present	20	32.583758 -117.023855	97
6/8/16	DECO13_3DENC022	Dennery Canyon South	Absent	0	32.580719 -117.014839	85
5/11/16	DECO13_3DERA020	Dennery Ranch	Absent	0	32.579781 -117.029921	115
5/9/16	DECO13_3JAHI006	Jamacha Hills	Present	100	32.722368 -116.961303	182
6/3/16	DECO13_3LOST027	Lonestar	New	2,000	32.580048 -116.951726	161
5/16/16	DECO13_3MMGR010	Mother Miguel Grassland - USFWS	Present	3,000	32.684662 -116.973501	179
6/3/16	DECO13_3ORVA017	Otay Valley East End	Absent	0	32.598662 -116.931229	124
6/3/16	DECO13_2PAVA001	Paradise Valley Park	Present	200	32.687403 -117.054252	90
6/1/16	DECO13_3PMA1002	PMA1- Rice Canyon	Present	50,000	32.643705 -117.016004	103
5/31/16	DECO13_3PMA2003	PMA2	Present	200	32.624302 -117.016852	103
6/15/16	DECO13_3PMA3004	PMA3 (Poggi Canyon)	Present	10,000	32.607614 -117.024780	87
6/1/16	DECO13_3PMA4005	PMA4	Present	10,000	32.663758 -117.010807	98
5/10/16	DECO13_3PRVA013	Proctor Valley - City	Present	855	32.672900 -116.927332	207
5/16/16	DECO13_3PRVA014	Proctor Valley (Bella Lago)	Absent	0	32.669119 -116.933939	228
5/10/16	DECO13_3RJER015	Rancho Jamul Ecological Reserve	Present	3,000	32.660266 -116.862155	255
6/1/16	DECO13_3RHRA012	Rolling Hills Ranch	Present	3	32.673357 -116.942051	229
5/18/16	DECO13_3SMHA025	San Miguel Habitat Area East	Present	2	32.670602 -116.952202	249
5/18/16	DECO13_3SMHA024	San Miguel Habitat Area West	Present	100	32.677548 -116.957748	255
5/12/16	DECO13_3SVPC007	Shinohara Vernal Pool Complex - SE Sweetwater Reservoir	Present	10,000	32.683146 -116.989917	86
5/12/16	DECO13_3TRIM008	Trimark/Gobbler's Knob/Horseshoe Bend	Present	50,000	32.664433 -116.988632	91
5/11/16	DECO13_3WMCA023	West of Moody Canyon	Present	350	32.565667 -117.027904	125

Table 3-16. Genetic, flow cytometry, and herbarium voucher specimen collection information for *Deinandra conjugens*, 2016.

Occurrence Name	Herbarium Voucher	Cytology Collection Numbers	Genetic Collection Numbers	Voucher Specimen Cytology Number	Morphology Differences
Bonita Meadows	mrm#3387a, mrm#3387b	01-01 to 01-5	01-06 to 01-25	01-01 and 01-05	Individuals with small and large flowers.
Cal Terraces (Dennery Canyon Area)	mrm#3367	01-01 to 01-05	01-06 to 01-25	01-01	Small and large ray flowers.
Cal Terraces (Dennery Canyon Area)	mrm#3413	02-01 to 02-05	02-06 to 02-10	02-01	These are much more robust than collections made on 5/11/2016. About 20 in exclosure.
Jamacha Hills	mrm#3362	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Lonestar	mrm#3399	01-01 to 01-05	01-05 to 01-25	01-01	None observed.
Mother Miguel Grassland - USFWS	mrm#3372	01-01 to 01-05	01-06 to 01-25	01-01	Some big ray flowers and small.
Paradise Valley Park	mrm#3398	01-01 to 01-05	01-06 to 01-25	01-01	No differences noted within pop but this pop is very late flowering compared to all pops.
PMA1- Rice Canyon	mrm#3396	01-01 to 01-05	01-05 to 01-25	01-01	None observed.
PMA2	mrm#3394a, mrm#3394b	01-01 to 01-05	01-06 to 01-25	01-01, 01-05	None observed.
PMA3 (Poggi Canyon)	mrm#3421	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
PMA4	mrm#3397	01-01 to 01-05	01-06 to 01-25	01-01	Small and large ray flowers.
Proctor Valley - City	mrm#3363	01-01 to 01-05	01-06 to 01-25	01-01	Small and large plants.
Rancho Jamul Ecological Reserve	mrm#3364a, mrm#3364b	01-01 to 01-05	01-06 to 01-25	01-01	Very large flowers and plants to 1 m tall. Few small.
San Miguel Habitat Area West	mrm#3383a, mrm#3383b	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Shinohara Vernal Pool Complex - SE Sweetwater Reservoir	mrm#3370a, mrm#3370b, mrm#3370c	01-01 to 01-05	01-06 to 01-25	01-01, 01-02	Hybrid, large flower, small flower.
Trimark/Gobbler's Knob/Horseshoe Bend	mrm#3371	01-01 to 01-05	01-06 to 01-25	01-01	Small and large ray flowers.
West of Moody Canyon	mrm#3365	01-01 to 01-05	01-06 to 01-25	01-01	Small and large ray flowers.

***Deinandra conjugens*, Cal Terraces, 2017**

Deinandra conjugens
Shinohara Vernal Pool Complex, 2016

Table 3-17. Habitat descriptions of *Deinandra conjugens* populations from 2016 site visits.

Occurrence Name	Aspect	SANDAG 2012 Vegetation	Soil Texture	Munsell Soil Chart	Disturbance Notes
Bonita Meadows	W	*Brachypodium distachyon Semi-Natural Stand Type*	sandy clay loam or clay loam	10YR 3/4 moist	*Brachypodium*, *Centaurea melitensis* and *Brassica tournefortii.*
Cal Terraces (Dennery Canyon Area)	NW	*Avena barbata Semi-Natural Stand*	silty clay loam or silt	7.5YR 3/4 dry	Dominated by *Centaurea melitensis Glebionis coronaria* and *Avena*.
Cal Terraces (Dennery Canyon Area)	NW	*Brachypodium distachyon Semi-Natural Stand Type*	silty clay loam or silt	7.5YR 3/4 dry	*Brachypodium* and *Centaurea* present.
Jamacha Hills	N	*Brachypodium distachyon Semi-Natural Stand Type*	silty clay loam or silt	10YR 2/2 moist	Dominated by *Centaurea melitensis, Bromus rubens, B. hordeaceus* and *Brachypodium.*
Lonestar	SE	*Brachypodium distachyon Semi-Natural Stand Type*	silty clay loam or silt	5YR 4/1 moist	Area dominated by *Brachypodium* and *Avena.*
Mother Miguel Grassland - USFWS	S	*Brachypodium distachyon Semi-Natural Stand*	silty clay loam or silt	5YR 3/4 moist	Dominated by *Brachypodium* and *Avena.*
Paradise Valley Park	N	*Deinandra fasciculata Association*	sandy loam or loam	2.5Y 3/2 moist	Animal/homeless trails throughout pop.
PMA1- Rice Canyon	N	*Avena barbata Semi-Natural Stands*	sandy clay loam or clay loam	7.5YR 3/1 moist	Dominated by *Avena barbata*, *Brachypodium distachyon* and *Gastridium phleoides.*
PMA2	S	*Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands*	silty clay loam or silt	7.5 YR 4/1 moist	Road running through population. *Centaurea melitensis* dominating.

Occurrence Name	Aspect	SANDAG 2012 Vegetation	Soil Texture	Munsell Soil Chart	Disturbance Notes
PMA3 (Poggi Canyon)	N	*Brachypodium distachyon Semi-Natural Stand Type*	sandy clay loam or clay loam	5YR 2.5/1 wet	*Brachypodium* dominant.
PMA4	W	*Mediterranean Californica Naturalized Annual and Perennial Grassland Semi-Natural Stands*	silty clay loam or silt	10YR 4/3 moist	Trails running through population.
Proctor Valley - City	SE	*Nassella pulchra Association*	silty clay loam or silt	10YR 2/2 moist	*Brachypodium* dominant.
Rancho Jamul Ecological Reserve	S	*Deinandra fasciculata Association*	silty clay loam or silt	10YR 3/4 moist	*Brassica nigra*, *Centaurea melitensis*, and *Silybum.*
San Miguel Habitat Area West	W	*Brachypodium distachyon Semi-Natural Stand Type*	sandy clay loam or clay loam	10 YR 3/4 moist	*Brachypodium* dominated site.
Shinohara Vernal Pool Complex - SE Sweetwater Reservoir	NW	*Deinandra fasciculata Association*	silty clay loam or silt	10YR 3/4 moist	Dominated by *Helminthotheca*, *Salsola*, and a little *Brassica nigra.*
Trimark/Gobbler's Knob/Horseshoe Bend	S	*Brachypodium distachyon Semi-Natural Stand Type*	silty clay loam or silt	10YR 3/6 Dry	Dominated by *Avena* and *Brachypodium.*
West of Moody Canyon	W	*Bromus rubens Semi-Natural Stand Type*	silty clay loam or silt	10 YR 3/3 moist	Dominated by *Bromus rubens*, *Centaurea melitensis* and *Brassica tournefortii.*

3.6 DICRANOSTEGIA ORCUTTIANA

There were nine occurrences of *Dicranostegia orcuttiana* (Table 3-18). In addition to the five original MOM occurrences, four new occurrences were added to the project, one at the Borderfield State Park (COOR7_1TIRI008), one at the County's Tijuana River Valley/Spooner Mesa (COOR7_1TIRI009), one at Cal Terraces-Dennery Canyon Area (COOR7_3DREA007), and one at Valle Tranquilo, Baja California, Mexico (Fig. 3-7). Permission was granted for eight of the sites. Sites were visited in May and June 2016 except for Valle Tranquilo which was visited in April 2017. Of the eight accessible occurrences, seven occurrences supported the target species (Table 3-19). However, collections were only made at six because the land manager while onsite at PMA3 (COOR7_3PMA3003) denied permission to collect specimens after plants were found (Table 3-20). There were a total of 120 genetic collections made for *Dicranostegia orcuttiana.* Total population numbers in the sites with plants ranged from 50 to 10,000 plants.

Of the sites that supported *Dicranostegia orcuttiana*, all had sandy soils (Table 3-21). Non-natives were observed at 50% (three of six) of the sites; *Hirschfeldia incana, Bromus rubens, Mesembryanthemum crystallinum*, and *Salsola australis* were present at a few of the sites but did not appear to affect the populations. *Asphodelus fistulosus* was found to be dominating at PMA1-Rice Canyon (COOR7_3PMA1002). Trails were present at PMA1-Rice Canyon and Tijuana River Valley/Spooner Mesa (COOR7_1TIRI009) bisecting the populations. The vegetation classifications were all coastal sage scrub with two *Bahiopsis laciniata-Artemisia californica-Eriogonum fasciculatum Association*, two *Artemisia californica Alliance*, and one *Isocoma menziesii Provisional Association.* Valle Tranquilo in northwestern Baja California was dominated by succulent maritime scrub, which is a common coastal vegetation type in this part of the peninsula in northern Baja California. Populations did not appear to favor any specific aspect and elevations ranged from 12 to 482 meters.

***Dicranostegia orcuttiana*, Tijuana River Valley, 2016**

Table 3-18. *Dicranostegia orcuttiana* occurrences and visitation status in 2016 and 2017.

Occurrence ID	Occurrence Name	Ownership	Source	Visited
COOR7_1TIRI008	Borderfield State Park	Borderfield State Park	New	Yes, 2016
COOR7_3DCCT005	Cal Terraces (Dennery Canyon Area)	City of San Diego Park and Recreation Department	MOM	Yes, 2016
COOR7_3DREA007	Cal Terraces (Dennery Canyon Area)	City of San Diego Park and Recreation Department	New	Yes, 2016
COOR7_3ORVA001	Otay River Valley	City of San Diego Park and Recreation Department	MOM	Yes, 2016
COOR7_3PMA1002	PMA1- Rice Canyon	Chula Vista Central City Preserve; City of Chula Vista	MOM	Yes, 2016
COOR7_3PMA3003	PMA3	Sam Holty- Ayers Group	MOM	Yes, 2016
COOR7_3PMA4004	PMA4	East Lake Community HOA	MOM	No- denied permission
COOR7_1TIRI009	Tijuana River Valley/Spooner Mesa	County of San Diego	New	Yes, 2016
No Occurrence ID. [1]	Valle Tranquilo, Fusiques Arroyo, Baja California, MX	Terra Peninsular	New	Yes, 2017

[1] Occurrences were not assigned an occurrence ID because they are not included in the MSPA.

***Dicranostegia orcuttiana*, Cal Terraces, 2016**

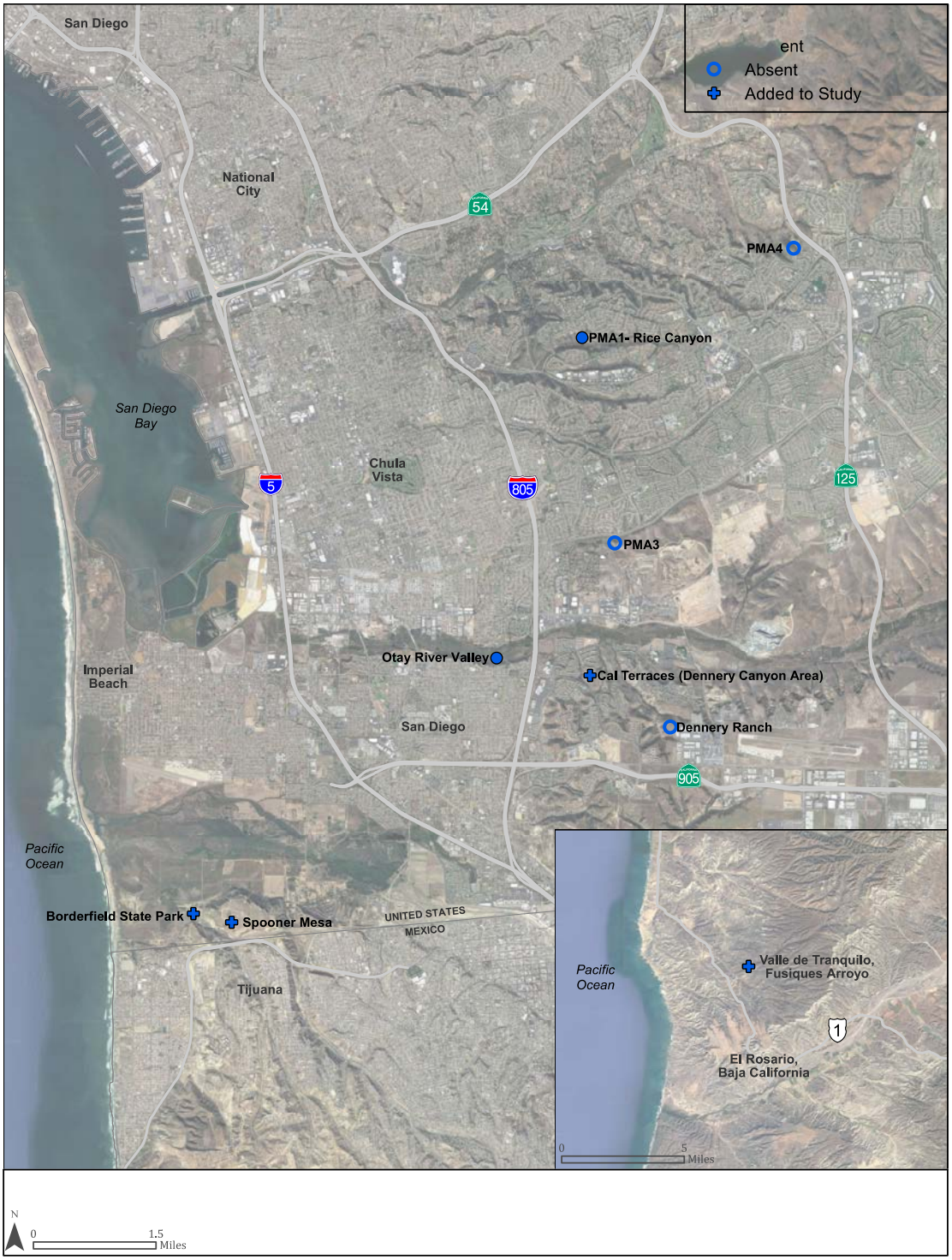

Figure 3-7. *Dicranostegia orcuttiana* occurrences sampled in 2016 and 2017, San Diego County, CA and Baja California, Mexico.

Table 3-19. Population status and site visit information of *Dicranostegia orcuttiana* in 2016.

Survey Date	Occurrence ID	Occurrence Name	Site Status	Population Estimate	Coordinates	Elevation (m)
6/8/16	COOR7_1TIRI008	Borderfield State Park	New	1,634	32.541225 -117.107538	12
6/10/16	COOR7_3DREA007	Cal Terraces (Dennery Canyon Area)	New	10,000	32.584035 -117.024778	99
6/10/16	COOR7_3DCCT005	Dennery Ranch	Absent	0	32.574974 -117.007874	161
5/23/16	COOR7_3ORVA001	Otay River Valley	Present	800	32.586992 -117.044386	22
6/14/16	COOR7_3PMA1002	PMA1 (Rice Canyon)	Present	50	32.643957 -117.026913	81
6/15/16	COOR7_3PMA3003	PMA3 (Poggi Canyon)	Present	N/A	32.608422 -117.021152	77
6/23/16	COOR7_1TIRI009	Tijuana River Valley/Spooner Mesa	New	150	32.539750 -117.099529	90
4/19/17	No Occurrence ID. [1]	Valle Tranquilo, Fusiques Arroyo	New	300	30.126134 -115.737464	482

[1] Occurrences were not assigned an occurrence ID because they are not included in the MSPA.

***Dicranostegia orcuttiana*, Tijuana River Valley, 2016**

Table 3-20. Genetic, flow cytometry, and herbarium voucher specimen collection information for *Dicranostegia orcuttiana*, 2016.

Occurrence Name	Herbarium Voucher	Cytology Collection Numbers	Genetic Collection Numbers	Voucher Specimen Cytology Number	Morphology Differences
Borderfield State Park	mrm#3403	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Cal Terraces	mrm#3414	01-01 to 01-05	01-06 to 01-25	01-01	Many small plants and some large multi-branch.
Otay River Valley	mrm#3388	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
PMA1- Rice Canyon	mrm#3416	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Tijuana River Valley/Spooner Mesa	mrm#3429	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Valle Tranquilo, Fusiques Arroyo	jr#32994	N/A	01-06 to 01-25	N/A	None observed.

***Dicranostegia orcuttiana*, Valle Tranquilo, Baja California, Mexico, 2017**

Table 3-21. Habitat descriptions of *Dicranostegia orcuttiana* populations from 2016 site visits.

Occurrence Name	Aspect	SANDAG 2012 Vegetation	Soil Texture	Munsell Soil Chart	Disturbance Notes
Borderfield State Park	NE	*Isocoma menziesii Provisional Association*	sandy loam or loam	10YR 4/1 moist	Edge of holding pond with weeds and trash. *Salsola* and *Hirschfeldia* dominating but not affecting population.
Cal Terraces	S	*Bahiopsis laciniata-Artemisia californica-Eriogonum fasciculatum Association*	sandy clay loam or clay loam	10YR 4/3 moist	None observed.
Otay River Valley	W	*Artemisia californica Alliance*	sandy loam or loam	10YR 3/2 moist	Population bisected by maintained gravel trail. Both sides fenced. Weeds minimal.
PMA1- Rice Canyon	S	*Artemisia californica Alliance*	sandy clay loam or clay loam	7.5YR 4/2 moist	Illegal trail through population. *Asphodelus* infested site with some *Salsola*.
Tijuana River Valley/Spooner Mesa	W	*Bahiopsis laciniata-Artemisia californica-Eriogonum fasciculatum Association*	sandy clay loam or clay loam	7.5YR 3/1 moist	Illegal trails present.
Valle Tranquilo, Fusiques Arroyo	N	N/A [1]	sandy loam or loam	N/A	*Mesembryanthemum crystallinum* and *Bromus rubens* present.

[1]Succulent Maritime Scrub dominated by *Ambrosia chenopodiifolia, Frankenia palmeri, Euphorbia misera, Rosa minutifolia* and *Aesculus parryi*.

***Dicranostegia orcuttiana*, Valle Tranquilo, 2017**

3.7 MONARDELLA VIMINEA

There were 14 occurrences of *Monardella viminea* (Table 3-22). In addition to the eight original MOM occurrences, six occurrences were added on MCAS Miramar (Fig. 3-8). These six sites were spatially chosen to represent the range of the species on the Station. Permission was granted for all sites. Of the 14 occurrences visited, 12 sites supported the target species (Table 3-23) and collections were made at all 12 sites (Table 3-24). Population number estimates of extant occurrences ranged from seven to 238 plants. Population numbers on MCAS Miramar only reflect the plots that were chosen and do not represent the total number of shrubs found on the Station. There was a total of 218 genetic collections made for *Monardella viminea*.

Occurrences that supported *Monardella viminea* all had sandy soils and occurred along streams with a southern aspect except for Lopez Canyon (West) and Sycamore-Canyon- City (East) (Table 3-25). Non-natives were observed at 29% (four of the 14) of the sites; *Bromus diandrus* at two sites, *B. rubens* at two sites, *Festuca myuros* at one site, *Hirschfeldia incana* at one site, and *Erodium botrys* and *Brachypodium distachyon* at one site. The vegetation classifications were as follows: nine for *Eriogonum fasciculatum Association*, one *Baccharis sarothroides Association*, one *Platanus racemosa-Quercus agrifolia Association*, and one *Bromus (diandrus hordeaceus)-Brachypodium distachyon Semi-Natural Stands*. Elevations ranged from 27 to 812 meters.

***Monardella viminea*, Lopez Canyon, 2016**

Table 3-22. *Monardella viminea* occurrences and visitation status in 2016.

Occurrence ID	Occurrence Name	Ownership	Source	Visited
MOLIV_6FLCA007	Flander's Canyon	City of San Diego Park and Recreation Department	MOM	Yes
MOLIV_6LOCA004	Lopez Canyon	City of San Diego Park and Recreation Department	MOM	Yes
MOLIV_6LOCA005	Lopez Canyon Translocation	City of San Diego Park and Recreation Department	MOM	Yes
No occurrence ID [1]	San Clemente Canyon - Miramar SR-near 163	MCAS Miramar	New	Yes
No occurrence ID[1]	San Clemente Canyon - Miramar Plots Q, P[2]	MCAS Miramar	New	Yes
No occurrence ID[1]	San Clemente Canyon - Miramar West	MCAS Miramar	New	Yes
MOLIV_4SPCA008	Spring Canyon	Sycamore Landfill	MOM	Yes
MOLIV_4SYCA001	Sycamore Canyon	City of San Diego Park and Recreation Department	MOM	Yes
MOLIV_4SYCA002	Sycamore Canyon	California Department of Fish and Wildlife	MOM	Yes
MOLIV_4SYCA006	Sycamore Canyon	County San Diego Department of Parks and Recreation	MOM	Yes
No occurrence ID[1]	Sycamore Canyon - Miramar Plot W[2]	MCAS Miramar	New	Yes
MOLIV_4WSCA003	West Sycamore Canyon - City	City of San Diego Park and Recreation Department	MOM	Yes
No occurrence ID[1]	West Sycamore Canyon - Miramar Plots A, O, N[2]	MCAS Miramar	New	Yes
No occurrence ID[1]	West Sycamore Canyon - Miramar Plots H, G, L	MCAS Miramar	New	Yes

[1]MCAS Miramar populations were not assigned an occurrence ID because they are not included in the MSPA.
[2]Plot letters are correspond with unique IDs assigned by MCAS Miramar management program.

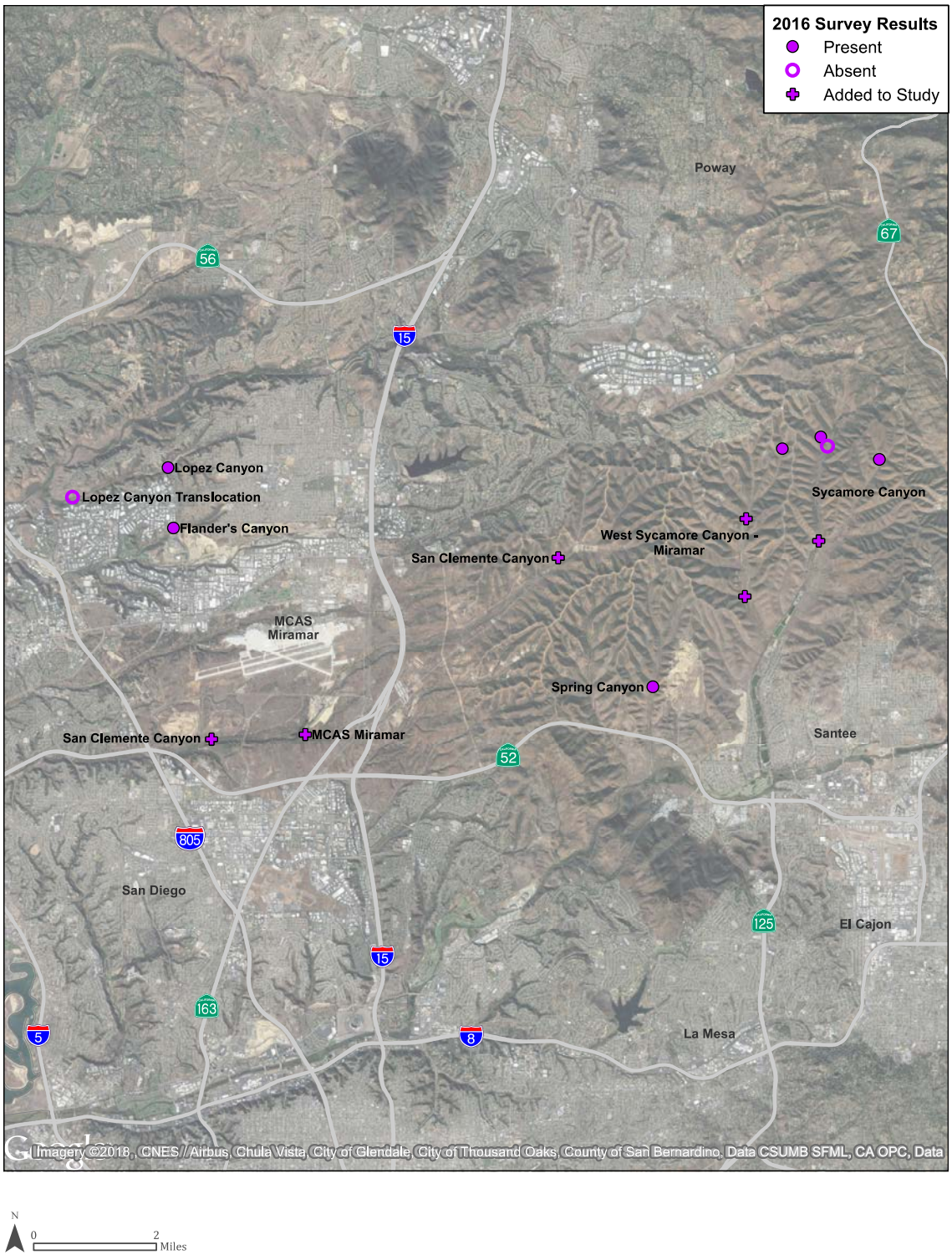

Figure 3-8. *Monardella viminea* occurrences sampled in 2016, San Diego County, CA.

Table 3-23. Population status and site visit information of *Monardella viminea* in 2016.

Survey Date	Occurrence ID	Occurrence Name	Site Status	Population Estimate	Coordinates	Elevation (m)
7/7/16	MOLIV_6FLCA007	Flander's Canyon	Present	57	32.899980 -117.171851	243
6/17/16	MOLIV_6LOCA004	Lopez Canyon	Present	7	32.914312 -117.173505	210
6/17/16	MOLIV_6LOCA005	Lopez Canyon Translocation	Absent	0	32.9071 -117.20019	27
7/8/16	No occurrence ID [1]	San Clemente Canyon - Miramar SR-near 163	New	16	32.851446 -117.134372	357
6/30/16	No occurrence ID [1]	San Clemente Canyon - Miramar Plots Q, P[2]	New	40	32.893740 -117.063906	636
6/30/16	No occurrence ID [1]	San Clemente Canyon - Miramar West	New	25	32.850147 -117.160649	275
6/29/16	MOLIV_4SPCA008	Spring Canyon	Present	25	32.863381 -117.037075	444
6/22/16	MOLIV_4SYCA002	Sycamore Canyon - CDFW	Absent	0	32.920605 -116.988599	655
6/22/16	MOLIV_4SYCA001	Sycamore Canyon - City	Present	22	32.922789 -116.990437	695
6/22/16	MOLIV_4SYCA006	Sycamore Canyon - County	Present	238	32.917557 -116.974014	754
6/22/16	No occurrence ID [1]	Sycamore Canyon - Miramar Plot W[2]	New	30	32.898146 -116.990877	527
7/7/16	MOLIV_4WSCA003	West Sycamore Canyon - City	Present	26	32.919929 -117.001200	812
6/22/16	No occurrence ID [1]	West Sycamore Canyon - Miramar Plots A, O, N[2]	New	30	32.884915 -117.011465	489
7/8/16	No occurrence ID [1]	West Sycamore Canyon - Miramar Plots H, G, L[2]	New	27	32.903291 -117.011272	595

[1]MCAS Miramar populations were not assigned an occurrence ID because they are not included in the MSPA.
[2]Plot letters are correspond with unique IDs assigned by MCAS Miramar management program.

Table 3-24. Genetic, flow cytometry, and herbarium voucher specimen collection information for *Monardella viminea*, 2016.

Occurrence Name	Herbarium Voucher	Cytology Collections	Genetic Collection Numbers	Voucher Specimen Cytology Number	Morphology Differences
Flander's Canyon	mrm#3437	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Lopez Canyon	mrm#3422	01-01 to 01-05	01-06 to 01-12	01-01	None observed.
San Clemente Canyon - Miramar SR-163	mrm#3438	01-01 to 01-05	01-06 to 01-21	01-01	None observed.
San Clemente Canyon - Miramar Plots Q, P	mrm#3432	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
San Clemente Canyon - Miramar West	mrm#3434	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Spring Canyon	mrm#3431	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Sycamore Canyon - City	mrm#3425	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
Sycamore Canyon - County	mrm#3424	01-01 to 01-05	01-06 to 01-25	01-01	Large and smaller plants/flowers
Sycamore Canyon - Miramar Plot W	mrm#3427	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
West Sycamore Canyon - City	mrm#3436	01-01 to 01-05	01-06 to 01-20	01-01	Some dead shrubs.
West Sycamore Canyon - Miramar Plots A, O, N	mrm#3428	01-01 to 01-05	01-06 to 01-25	01-01	None observed.
West Sycamore Canyon - Miramar Plots H, G, L	mrm#3439	01-01 to 01-05	01-06 to 01-25	01-01	None observed.

***Monardella viminea*, Marine Corps Air Station Miramar, 2016**

Typical Habitat of *Monardella viminea*, Lopez Canyon, 2016

Table 3-25. Habitat descriptions of *Monardella viminea* populations from 2016 site visits.

Occurrence Name	Aspect	SANDAG 2012 Vegetation	Soil Texture	Munsell Soil Chart	Disturbance Notes
Flander's Canyon	SW	*Eriogonum fasciculatum Association.*	sandy loam or loam	7.5YR 4/3 moist	None observed.
Lopez Canyon	W	*Baccharis sarothroides Association*	sandy loam or loam	10YR 3/2 moist	Non-native grasses *Bromus rubens, Festuca myuros, Hirschfeldia incana*.
San Clemente Canyon - Miramar SR-163	SW	*Eriogonum fasciculatum Association*	loamy sand	7.5YR 3/3 moist	None observed.
San Clemente Canyon - Miramar Plots Q, P	SW	*Eriogonum fasciculatum Association*	loamy sand	2.5YR 3/1 moist	None observed.
San Clemente Canyon - Miramar West	SW	*Eriogonum fasciculatum Association*	sandy loam or loam	7.5YR 2.5/3 moist	None observed.
Spring Canyon	S	*Eriogonum fasciculatum Association*	sandy loam or loam	10YR 3/4 moist	None observed.
Sycamore Canyon - City	SE	*Eriogonum fasciculatum Association*	sandy loam or loam	10YR 4/4 moist	Non-native grasses present.
Sycamore Canyon - County	E	*Artemisia californica-Eriogonum fasciculatum Alliance*	sandy loam or loam	7.5YR 3/3 moist	*Erodium botrys* and *Brachypodium* dominant.
Sycamore Canyon - Miramar Plot W	S	*Platanus racemosa-Quercus agrifolia Association*	loamy sand	10YR 3/3 moist	*Bromus diandrus* common.
West Sycamore Canyon - City	SW	*Bromus (diandrus, hordeaceus)-Brachypodium distachyon Semi-Natural Stands*	sandy loam or loam	7.5YR 3/4 moist	None observed.
West Sycamore Canyon - Miramar Plots A, O, N	SW	*Eriogonum fasciculatum Association*	sandy loam or loam	10YR 4/6 moist	None observed.
West Sycamore Canyon - Miramar Plots H, G, L	SW	*Eriogonum fasciculatum Association*	sandy loam or loam	7.5YR 3/4 moist	None observed.

***Monardella viminea*, Sycamore Canyon, 2016**

3.8 VOUCHER SPECIMENS

A total of 109 herbarium voucher specimens were collected for this project in 2016 and 2017. All voucher specimens were numbered and deposited in the SD Herbarium housed at SDNHM. All associated voucher specimen data will be available in the specimen database of the Consortium of California Herbaria at http://ucjeps.berkeley.edu/consortium/

CHAPTER 4 –
FIELD OBSERVATIONS

4.1 OVERALL

SDNHM was able to access most of the MOM sites and add many new populations to the SDMMP database. The following information summarizes field observations, research literature, and conversations with land managers and local botanists.

4.2 ACANTHOMINTHA ILICIFOLIA

Acanthomintha ilicifolia (Lamiaceae) is an annual herb that is restricted to clay lenses in San Diego County and northwestern Baja California. The most common habitat appears to be a *Deinandra fasciculata Association* typically with deep clay cracked soils often with native associates including: *Deinandra fasciculata, Apiastrum angustifolium, Plantago rhodosperma, Convolvulus simulans,* and *Microseris douglasii* ssp. *platycarpha*. This species is in decline with 38% of this project's sites reported as extirpated either though field visits or communication with land managers. Even in extant populations, it appears that many of the populations that had been reported to be large a decade ago are significantly diminished. The City's Los Penasquitos Canyon reported 2,091 individuals in 2005 and only had 20 individuals in 2016. The CDFW's Hollenbeck had 33,000 individuals in 2003 and ca. 50 plants in 2016. The summit and ridgeline of McGinty Mountain had 2,400 individuals in 1994 and ca. 120 plants in 2016 (USFWS, 2009a). Despite this decline, there are still some large populations persisting in San Diego. In 2017, the County's Sycamore Canyon population was at 750,000 individuals, spread out amongst a matrix of clay openings in the chaparral. Palomar Airport, managed by the County of San Diego, was at 35,000 plants split between six clay openings. Rice Canyon and Simon Preserve both reported about 5,000 plants each in 2017.

Habit of *Acanthomintha ilicifolia,* Wheeler Ridge, 2017

***Brachypodium distachyon* infested *Acanthomintha ilicifolia* site at McGinty Mountain, 2017**

Historically, urbanization and development were reported as the most significant threat for *Acanthomintha ilicifolia* (USFWS, 2009a). Today, many surviving populations are on preserves or otherwise protected lands so they are theoretically protected. However, populations on many of the privately-owned properties, such as Home Owner Associations (HOAs), are not actively managed and provide limited to no access for botanists doing monitoring protocols. Therefore, the status of these populations is unknown. It is known that many of the populations are threatened by invasives, especially *Brachypodium distachyon*, which was observed at almost half (43%) of the sites visited. These clay lenses are vulnerable to invasion by various non-native weedy species with *Centaurea melitensis, Brassica nigra*, and *Sonchus asper* becoming an increasing problem on these substrates.

Drought conditions were also reported as a concern by land managers and local botanists, and occurrences that are being managed and watered appear to be faring better. Wright's Field sites, which are managed by the Back County Land Trust, had multi-branched robust individuals in 2016. However, plants at El Fuerte-Rancho Carillo remained very small and appeared to never reach the flowering stage despite occasional watering and no apparent competition by weeds.

Illegal cannabis growing operations have begun to be observed in San Diego's back country in recent years. Buckets and tubing were observed hidden in the chaparral adjacent to one of the clay openings at Palomar Airport in 2017. These supplies were not seen during the 2016 field visit. This observation was immediately reported to the land manager. Encroachment by illegal cannabis growing presents an emerging threat to populations on previously protected land.

California macrophylla (Geraniaceae), a California native and CNPS 1B.1, is only known to exist at two extant sites in San Diego County, Ramona Grasslands and Hollenbeck Canyon Wildlife Area. During 2017 surveys (a good rain year), *California macrophylla* was observed during three *Acanthomintha ilicifolia* site visits, Ramona Grasslands and two new sites Wheeler Ridge (Chula Vista) and Sycamore Canyon County Preserve. This species should be looked for on clay lenses with *Acanthomintha ilicifolia* when it is most likely to be in fruit during surveys and can easily be confused with *Erodium botrys*.

***California macrophylla*, Ramona Grasslands, 2017**

***California macrophylla* in fruit, Sycamore Canyon, 2017**

***Acanthomintha ilicifolia* at Wheeler Ridge, 2017**

4.3 BACCHARIS VANESSAE

Baccharis vanessae (Asteraceae) is a dioecious shrub endemic to San Diego County, with a patchy distribution from CPEN to Otay Mountain. This species is often found hidden in dense chaparral habitats on north-facing slopes with sandy soils. *Adenostoma fasciculatum* is the most common associate in its preferred habitat. Even at Mt. Woodson and Escondido Creek Preserve, where their vegetation classification was dominated by oaks, the sites were closely surrounded by chaparral dominated by *Adenostoma fasciculatum*.

Additional occurrences should be looked for on the southern edge of Otay Mountain across the USA/Mexico border and to the north into Riverside County in the Santa Margarita Mountains. Also, there are several historic records of this rare shrub that warrant renewed searches in San Diego County. The City of San Diego's Carmel Valley and Crest Canyon both have older voucher specimens, but no current populations known. Poway's Van Dam Mountain and the canyon east of the San Diego Botanical Garden (Quail) should also be surveyed again.

Without much research on this species, it is hard to quantify its status. Historically, there have been no range wide monitoring methods. SDMMP began surveys in 2016 and hopefully can repeat this effort every five years to better track this species. It is suspected that this species was more common at one time and urbanization/habitat loss has reduced its range. It is also theorized that disturbance helps this species and low intensity fire may open up canopies to provide more light and improved growing conditions for it. There have been several anecdotal observations of more robust shrubs returning after a fire (USFWS, 2011), but we are unsure as to what percentage. More research is needed to quantify these observations.

Again, due to inconsistent monitoring, threats are hard to determine. We did not observe invasive species affecting the growth of this species. We did observe that many of these shrubs appeared to be in drought stress in 2016, after several low rainfall years. CPEN shrubs that had looked green in the spring of 2016 were very dry with few leaves in the fall of 2016 and had evidence of aborted flowers on several individuals. Otay Mountain and Iron Mountain occurrences all had only vegetative shrubs with no signs of flowering or setting fruit for several years. Gibson Highlands was the only site where shrubs appeared to be in good condition. They were bright green and robust with many leaves. They were not restricted to shady areas and northern slopes, but were quite common throughout the site. Multiple pollinators, such as *Apis mellifera* (European Honey Bee), were observed on shrubs at many of the populations. An insect species of the genus *Melanopleurus* which are seed predators was observed by SDNHM and AECOM/CBI staff at several of the sites. A photo (below) with these insects was captured at Gibson Highlands.

An insect of the genus *Melanopleurus* which are seed predators, Gibson Highlands, 2016.

***Apis mellifera* (European honey bee) on pistillate/female flower, Gibson Highlands, 2016.**

Jessie Vinje and Patricia Gordon-Reedy (CBI) have reported two sets of flowering times at Gibson Highlands, one in spring and one in fall. Ms. Mulligan has noted spring flowering of some shrubs at Mount Woodson in May 2015 and also CPEN in early August 2015. Studies need to be conducted that focus on the phenology of this species across its range, especially focusing on flowering periods. Future studies should also analyze the sex ratios between and among populations throughout its range. More basic natural history information is needed for this species.

Close up of the stem of *Baccharis vanessae*

***Baccharis vanessae* pistillate/female flowers and fruits.**

***Baccharis sarothroides* (left) and *Baccharis vanessae* (right), Gibson Highlands**

4.4 CHLOROPYRON MARITIMUM SSP. MARITIMUM

Chloropyron maritimum ssp. *maritimum* (Orobanchaceae), a hemiparasitic annual, is distributed in salt marshes from Morro Bay along the coast of California to Punta Azufre in northern Baja California, Mexico. The largest populations in the United States appear to occur in the Tijuana Estuary and Sweetwater Marsh complex with Carpinteria Salt Marsh closely behind. In Baja California, populations appear to be much smaller with 150 and 500 plants observed in 2017 at Punta Azufre and ca. 300 plants at Bahia Falsa, both near San Quintín. Sula Vanderplank (2016) believes that the San Telmo/Colonet and San Ramon populations in Baja California may be extirpated. More salt marshes should be surveyed in these areas, in addition to more areas surrounding the San Quintín populations.

In San Diego County, during the 2016 season, *Chloropyron maritimum* spp. *maritimum* appeared to be at high numbers. Land managers reported larger populations and expansion of populations especially at the Sweetwater and Tijuana Estuary areas where several new occurrences were found. Joy Zedler (2016), who has been monitoring populations at these two locations for over 20 years, shared that she found greater than 14,000 individuals in 2016 throughout the marsh and fewer than 100 individuals in 2014. Populations at Sweetwater Marsh are most likely a result of an intentional seeding event that occurred between 1990 and 1992. Seeds were collected annually from Tijuana Estuary and sown at the Sweetwater Marsh. The last native population of plants at Sweetwater Marsh was seen in 1987. This was a requirement of the California Department of Transportation (CALTRANS) project as part of mitigation for a freeway expansion project (Parsons & Zedler, 1997 as cited in USFWS, 2009b). Dr. Zedler (2016) reported that the seeding event did not occur north of the Sweetwater River so the Paradise Marsh population is a natural occurring population. However, she was not sure if the population was a result of the seeding event or from the original seedbank. She mentioned an unpublished experiment that showed that *Chloropyron maritimum* ssp. *maritimum* seeds could last up to 11 years in a lab. Since populations at Sweetwater were reseeded only after three years there could have been be a mix of natural and reintroduced populations at the complex.

***Chloropyron maritimum* ssp. *maritimum*, Tijuana Slough National Wildlife Refuge, 2016**

The Dog Beach site is not a natural population but a result of a seeding event ca. 2009. The seeds were harvested from plants at Tijuana Estuary at a construction site off of Seacoast Dr. This is the only *Chloropyron maritimum* ssp. *maritimum* occurrence in San Diego County that is impacted by the non-native *Limonium duriusculum*, although this species along with *L. ramosissimum* (erroneously identified as the other) are both reported by other land managers across its range.

Borderfield State Park is a historic location for this species. However, 2016 surveys did not find any *Chloropyron maritimum* ssp. *maritimum* at either of the occurrences in this area. The last known documented record from this site is a Frank Gander voucher specimen from 1938. Park staff reported having no record of ever monitoring or mapping this plant. Brian Collins, USFWS biologist, says there has been a lot of stream channel manipulation in the area over the years which may have altered hydrology. A high concentration of invasive plants that typically inhabit drier habitats, *Mesembryanthemum* spp. and *Malephora* sp. were observed at the site in 2016. With all the potential salt marsh habitat at Borderfield State Park, more areas should be surveyed for this species.

Threats for this species include rising sea levels, habitat loss, hydrological changes, and invasive plants (USFWS, 2009b). At NBV, one known population was destroyed in 2016 from storm surge. Otherwise, land managers did not report this as an imminent issue. Invasive species were observed at almost one-third of the sites with non-native *Limonium* spp. being the most common problem. *Parapholis incurva* could be a potential problem at more sites. It was dominating at ERG Energy in Ormond Beach in 2017. During a visit to Tijuana Slough it was observed that this species was spreading even though it was not detected at populations in 2016. Site quality does appear to be affected by trails and ocean trash from high tides in lower areas.

Trash at Newport Bay, Back Bay Science Center, 2017

Trails going through populations of *Chloropyron maritimum* ssp. *maritimum* at Newport Bay Aquatic Center

***Limonium duriusculum* and *Chloropyron maritimum* ssp. *maritimum*, Carpinteria Marsh West, 2017**

Across the range of *Chloropyron maritimum* ssp. *maritimum*, morphological variations were observed. For most individuals of a population, plants are slender with linear leaves and multiple branches. However, in the Morro Bay and Newport Bay populations, plants were more stout with few branches. These populations also commonly had variations in flower and/or leaf colors. See photos below.

Morphological variation of *Chloropyron maritimum* ssp. *maritimum* plants Morro Bay (left) and Carpinteria (right)

Chloropyron maritimum ssp. *maritimum* Color Variations

Two leaf color variations at Morro Bay Sweet Springs, 2017

Newport Bay Aquatic Center Yellow-tinged flowers, 2017

Dog Beach, San Diego County, 2016

4.5 DEINANDRA CONJUGENS

Deinandra conjugens (Asteraceae) is an annual with a self-incompatible breeding system. It is restricted to clay soils in the southwestern portion of San Diego County and extends into northwestern Baja California. Population numbers are known to fluctuate from year to year with only a portion of the individuals in the seed bank germinating each year. Therefore, the number of individuals counted does not always indicate the magnitude of the population (USFWS, 2003). Land managers at Lonestar (DECO13_3LOST027) have reported a fluctuation of 0 to 300,000 plants in a five-year period. For at least three years (2013-2015) no plants were seen there, but in 2016 ca. 2,000 plants were observed onsite and extended onto the adjacent private land.

Overall in 2016, *Deinandra conjugens* was faring well and was relatively abundant. Much like *Acanthomintha ilicifolia*, invasive non-native plant species appear to be a major impact for *Deinandra conjugens*. *Brachypodium distachyon* was observed at many of the sites, and at Dennery Canyon South, where plants were not found, the area was dominated by a dense layer of this invasive grass. The Otay Valley East End site was not the appropriate habitat and did not have clay soils. Proctor Valley had adjacent CNDDB polygons but John Martin (USFWS land manager) said he had never heard of this occurrence. Ms. Mulligan did observe plants on USFWS property, but they appeared to be part of the City's adjacent Proctor Valley population. Lastly, this species was observed in 2017 at Chula Vista's Wheeler Ridge *Acanthomintha ilicifolia* site. This occurrence appears to be a new record for the SDMMP database.

Paradise Valley Park (DECO13_2PAVA001) is the only site that was classified with sandy soils and not clay. Even though a soil sample was taken right next to plants this could be an anomaly at the site and should be checked. Populations were found growing in a mix of native and non-native communities with *Brachypodium distachyon* being the dominant invasive. It should be noted that this population was just beginning to flower on 3 May 2016 when the rest of the populations of this species were beginning to senesce.

***Deinandra conjugens*, Shinohara Vernal Pool Complex, 2011**

This species has a lot of morphological variability and some of the individuals have characteristics i.e., pappus length that approaches the measurements of *Deinandra paniculata* and could thus be confused in the Jepson 2 Manual keys (Baldwin et al,, 2012). Flower size variability within a population was also observed at many of the sites. Some individuals within a population had small ray flowers and others had large ray flowers.

Deinandra conjugens
Shinohara Vernal Pool Complex, 2016

***Deinandra conjugens* (brown) in the foreground and *Deinandra fasciculata* (yellow) in the background. Paradise Valley, April 2016**

4.6 DICRANOSTEGIA ORCUTTIANA

Dicranostegia orcuttiana (Orobanchaceae), a hemiparasitic annual, occurs on sandy loam or sandy clay loam soils in coastal sage scrub in the southwestern portion of San Diego County. This species does not tend to favor a particular aspect and is found at lower elevations in the County. This appears to be the most northern part of its range, extending south through the northwestern part of Baja California, Mexico, to the central part of the peninsula where it is reported by Dr. Jon Rebman to be more prevalent in some areas. We were able to travel to Valle Tranquilo in northwestern Baja California and make genetic collections to make a comparison with San Diego County plants for this project.

In San Diego County, this species is not federally or state listed so it may often get overlooked in more southern areas of the County. Additional efforts should be made to survey this region for more populations. For example, there were reports (CCH, local botanist observations, etc.) of this species occurring at Borderfield State Park (COOR7_1TIRI008), Tijuana River Valley/Spooner Mesa (COOR7_1TIRI009), and at Cal Terraces-Dennery Canyon Area (COOR7_3DREA007) and field visits turned up new locations of this species. The one occurrence where *Dicranostegia orcuttiana* was not found was in the Dennery Ranch area (COOR7_3DCCT005). This area is very large and is adjacent to the Cal Terraces area (COOR7_3DCCT005). The GPS coordinates of the documented occurrence put the plants in vernal pools, but adjacent slopes could support the populations. It is recommended to survey this area more thoroughly.

Non-native plants were a minor issue at most sites and did not appear to be affecting the populations, with the exception of *Asphodelus fistulosus* which was dominating at PMA1- Rice Canyon (COOR7_3PMA1002). Management intervention of some sort is needed at this site to deter weeds and illegal trails.

At Border Field State Park, several bumblebees were observed on the flowers of this species. We sent a photo of one (photo below) to San Diego bee expert, Dr. James Hung and he identified it as *Bombus crotchii*. This insect species is considered Endangered on the IUCN Red List. IUCN is the International Union of Conservation of Nature which is the largest worldwide authority on the conservation status of species. The IUCN Listing reports that this rare bee is extirpated from most of its historic range in the Central Valley of California. Its current range appears to be mainly the Mediterranean regions in southern California and uncommonly in Baja California. Red List estimates that the average decline of this species since the early 1800s is 67.5% and most of this decline has occurred in the last 10 years with agricultural expansion and rapid urbanization (Hatfield et al., 2015).

***Dicranostegia orcuttiana*, Otay River Valley, 2016**

Trail through *Dicranostegia orcuttiana* population at PMA1-Rice Canyon

***Bombus crotchii* on *Dicranostegia orcuttiana*, Border Field State Park, 2016**

4.7 MONARDELLA VIMINEA

Monardella viminea (Lamiaceae), a shrub or subshrub, is a narrow endemic to the central foothills of San Diego with most of the populations occurring on MCAS Miramar. Occurrences that support *Monardella viminea* are found on a mixture of sand/cobble bottoms and banks of well-drained ephemeral washes in large watersheds. Most of the populations occur within coastal sage scrub or riparian scrub vegetation. Even though the City's West Sycamore (MOLIV_4WSCA0030) occurrence keyed out to *Bromus (diandrus, hordeaceus)-Brachypodium distachyon Semi-Natural Stands* vegetation classification due to its prevalence of weeds, it was still dominated by *Eriogonum fasciculatum*. Besides this occurrence, weeds appear to be a minor issue with indiscriminate non-native grasses and forbs occurring in the populations. However, MCAS Miramar's multiyear population study may dispute this observation.

The two occurrences where *Monardella viminea* were not found during this study were Lopez Canyon Translocation (MOLIV_6LOCA005) and Sycamore Canyon-CDFW (MOLIV_4SYCA002). The Lopez Canyon Translocation area coordinates did not have the typical sandy, rocky stream bottoms, but was more dominated by hydrophilic vegetation and canopy, such as *Salix* species. The Sycamore Canyon-CDFW site did have typical habitat and is adjacent to extant populations on public and private lands. It appears that this population may be extirpated.

Across its range, many of the *Monardella viminea* plants encountered in 2016 appeared to be in severe drought stress. There were several dry crispy shrubs that appeared to have flowered but browned up before setting mature fruit. This dryness is unusual since the leaves of this perennial shrub are usually green year-round. Land managers have also reported substantial decline in population numbers and hypothesize low rainfall as the main culprit. On a positve note, pollinators were abundant on greener shrubs with flowers, especially *Bombus* species.

Dry shrubs of *Monardella viminea*, Spring Canyon, 2016

***Bombus vosnesenskii* on *Monardella viminea*,**
West Sycamore Canyon, 2016

***Monardella viminea*, Sycamore Canyon, MCAS Miramar, 2016**

CHAPTER 5–
REFERENCES

Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken, eds. 2012. *The Jepson Manual: Vascular Plants of California, second edition*. University of California Press, Berkeley, CA.

[CCH] Consortium of California Herbaria, accessed 2016. Plant accession results. http://ucjeps.berkeley.edu/consortium/

[CNPS] California Native Plant Society/Department of California Fish and Wildlife Protocol for Releve Surveys (Simplified Key to Soil Structure) 2014. Accessed 28 March 2016 at: http://www.cnps.org/cnps/vegetation/pdf/protocol-combined-2014.pdf

Hatfield, R., Jepsen, S., Thorp, R., Richardson, L. & Colla, S. 2015. *Bombus crotchii*. The IUCN Red List of Threatened Species 2015: e.T44937582A46440211. http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T44937582A46440211.en. Accessed on 09 February 2018.

Munsell, A. H. 2000. *Munsell Soil Color Charts*: *Washable Edition.* Munsell Color (Firm), New Windsor, NY.

Rebman, J.P., J. Gibson, K. Rich, 2016. *Annotated Checklist of the Vascular Plants of Baja California, Mexico.* Proceedings of the San Diego Society of Natural History. Number 45.

Rebman, J.P. and M. G. Simpson, 2014. *Checklist of the Vascular Plants of San Diego County, 5th Edition.* San Diego Natural History Museum, San Diego, CA.

Sproul, F., T. Keeler-Wolf, P. Gordon-Reedy, J. Dunn, A. Klein, K. Harper, 2011. *SANDAG Vegetation Classification Manual for Western San Diego County, first edition*. AECOM, California Department of Fish and Wildlife, Vegetation Classification and Mapping Program and Conservation Biological Institute, San Diego, CA.

Schneider, Heather, 2017. Rare Plant Biologist, Santa Barbara Botanic Garden. Personal communication with Margie Mulligan, 17 February 2017.

[USFWS] U. S. Fish and Wildlife Service, 2003. Draft Recovery Plan for Deinandra conjugens (Otay Tarplant) December 2003. Portland, Oregon. https://www.fws.gov/pacific/ecoservices/endangered/recovery/documents/OtayTarplantDraftRecoveryPlan.pdf

[USFWS] U.S. Fish and Wildlife Service, 2009a. *Acanthomintha ilicifolia (San Diego thornmint) Five Year Review: Summary and Evaluation, Carlsbad, CA August 12, 2009.* https://www.fws.gov/carlsbad/SpeciesStatusList/5YR/20090812_5YR_ACIL.pdf

[USFWS] U.S. Fish and Wildlife Service, 2009b. *Chloropyron maritimum subsp. maritimum (Cordylanthus maritimus subsp. maritimus) (salt marsh bird's beak) Five Year Review: Summary and Evaluation, Carlsbad, CA August 13, 2009.* https://www.fws.gov/carlsbad/speciesstatuslist/5yr/20090813_5yr_chmama.pdf

[USFWS] U.S. Fish and Wildlife Service, 2011. *Baccharis vanessae (Encinitas baccharis) Five Year Review: Summary and Evaluation. Carlsbad, CA December 22, 2011.* https://www.fws.gov/carlsbad/SpeciesStatusList/5YR/20111222_5YR_BAVA.pdf

[USFWS] U. S. Fish and Wildlife Service, 2012. *Monardella viminea (Willowy monardella) Five Year Review: Summary and Evaluation, Carlsbad, CA August 3, 2012.* https://www.fws.gov/carlsbad/SpeciesStatusList/5YR/20120803_5YR_MOVI.pdf

Vanderplank, Sula, 2016. Biodiversity Explorer, Botanical Research Institute of Texas. Personal communication with Margie Mulligan, 8 January 2016.

Zedler, Joy B., Professor of Botany and Aldo Leopold Chair in Restoration Ecology, University of Wisconsin. Personal communication with Margie Mulligan, March 2016 and March 2017.

APPENDIX A
ORIGINAL SDMMP RARE PLANT OCCURRENCES

Acanthomintha ilicifolia sites:

Occurrence ID	Occurrence Name	Preserve	Landowner	Land Manager
ACIL_2EDHI001	El Dorado Hills	El Dorado Hills	City of San Diego	City of San Diego Park and Recreation Department
ACIL_2EDHI002	El Dorado Hills	El Dorado Hills	City of San Diego	City of San Diego Park and Recreation Department
ACIL_3BOME003	Bonita Meadows	Bonita Meadows	Caltrans	Caltrans
ACIL_3CERE004	Crestridge Ecological Reserve	Crestridge Ecological Reserve	California Department of Fish and Wildlife	Conservation Biology Institute
ACIL_3DREA005	Dennery Ranch East	Dennery Ranch	City of San Diego	City of San Diego Park and Recreation Department
ACIL_3HCWA006	Hollenbeck Wildlife Area	Hollenbeck Canyon Wildlife Area	California Department of Fish and Wildlife	California Department of Fish and Wildlife
ACIL_3LONC007	Long Canyon (PMA 4-2b)	City of Chula Vista Central City Preserve	City of Chula Vista	City of Chula Vista
ACIL_3MGMT008	McGinty Mountain	San Diego National Wildlife Refuge	U.S. Fish and Wildlife Service	U.S. Fish and Wildlife Service
ACIL_3MGMT009	McGinty Mountain (southwest slope)	Flying Dolphin Trust	The Nature Conservancy	The Nature Conservancy
ACIL_3MGMT010	McGinty Mountain (summit and ridgeline)	San Diego National Wildlife Refuge	U.S. Fish and Wildlife Service	U.S. Fish and Wildlife Service
ACIL_3OTLA011	Lower Otay Reservoir	Otay Mountain Ecological Reserve	California Department of Fish and Wildlife	California Department of Fish and Wildlife
ACIL_3OTLA012	Otay Lakes (south side)	Otay Lakes Cornerstone Lands	City of San Diego Public Utilities Department	City of San Diego Public Utilities Department
ACIL_3PMA1013	PMA1 (Rice Canyon)	City of Chula Vista Central City Preserve	City of Chula Vista	City of Chula Vista
ACIL_3PMA3014	PMA3 (Poggi Canyon)	City of Chula Vista Central City Preserve	City of Chula Vista	City of Chula Vista
ACIL_3RJER015	Rancho Jamul Ecological Reserve	Rancho Jamul Ecological Reserve	California Department of Fish and Wildlife	California Department of Fish and Wildlife
ACIL_3SOCR016	South Crest (Suncrest)	South Coast Properties	Endangered Habitats Conservancy	Endangered Habitats Conservancy
ACIL_3WHRI017	Bonita, Wheeler Ridge (Long Canyon PMA 4-1cW)	City of Chula Vista Central City Preserve	City of Chula Vista	City of Chula Vista
ACIL_3WRFI018	Wright's Field (north & south)	Wright's Field	Back Country Land Trust	Back Country Land Trust
ACIL_4CSVI019	Canada San Vicente--Monte Vista (Long's Gulch)	Canada de San Vicente	California Department of Fish and Wildlife	California Department of Fish and Wildlife
ACIL_4CSVI020	Canada San Vicente--Monte Vista (Long's Gulch)	Canada de San Vicente	California Department of Fish and Wildlife	California Department of Fish and Wildlife
ACIL_4MTRP021	Mission Trails Regional Park	Mission Trails Regional Park	City of San Diego	City of San Diego Park and Recreation Department
ACIL_4MTRP022	Mission Trails Regional Park (Southwest Tierra Santa parcel, NW of MG)	Mission Trails Regional Park	City of San Diego	City of San Diego Park and Recreation Department
ACIL_4POGR023	Poway Grade	RAAN LLC	RAAN LLC	UNKNOWN
ACIL_4SASP024	Saber Springs (east)	City of Poway Open Space	City of Poway	City of Poway
ACIL_4SASP025	Sabre Springs	Sabre Springs	City of San Diego	City of San Diego Park and Recreation Department
ACIL_4SIPR026	Simon Preserve	Simon Preserve	County San Diego Department of Parks and Recreation	County of San Diego Department of Parks and Recreation

ACIL_4SY CA027	Sycamore Canyon	Sycamore Canyon and Goodan Ranch Preserves	County San Diego Department of Parks and Recreation	County of San Diego Department of Parks and Recreation
ACIL_4VI MT0028	Viejas Mountain (northwest slope)	Cleveland National Forest	U.S. Forest Service	U.S. Forest Service
ACIL_4VI MT0029	Viejas Mountain (southwest slope)	VIEJAS HILLS PARTNERS LLC	VIEJAS HILLS PARTNERS LLC	
ACIL_4VI MT0030	Viejas Mountain (west-southwest flank)	Cleveland National Forest	U.S. Forest Service	U.S. Forest Service
ACIL_5RA GR031	Ramona Grasslands/Hobbes Property	Ramona Grasslands Preserve	Ramona Municipal Water District	County of San Diego Department of Parks and Recreation
ACIL_6BL MO032	Black Mountain	Black Mountain Open Space Park	City of San Diego	City of San Diego Park and Recreation Department
ACIL_6CA HI033	Calavera Hills	Calavera Hills Ph 2 & Robertson Ranch	Calavera Hills HOA	Center for Natural Lands Management
ACIL_6CA RA034	Carlsbad Racetrack (south)	Carlsbad Raceway	Fenton Raceway LLC	Fenton Raceway LLC
ACIL_6CA RL035	Southeast Carlsbad (East)	Santa Fe Trails HOA	Santa Fe Trails HOA	Santa Fe Trails HOA
ACIL_6CA RL036	Southeast Carlsbad (West)	Ranch Carlsbad HOA	Ranch Carlsbad HOA	La Costa HOAs
ACIL_6EM PO037	Emerald Pointe	Emerald Point Open Space	San Diego Habitat Conservancy	San Diego Habitat Conservancy
ACIL_6LC GR038	La Costa Greens	Rancho La Costa Habitat Conservation Area	Center for Natural Lands Management	Center for Natural Lands Management
ACIL_6LPC A039	Los Penasquitos Canyon subpop #3	Los Penasquitos Canyon Preserve	City of San Diego	City of San Diego Park and Recreation Department
ACIL_6LU CA040	Lux Canyon (west)	PACIFIC PINES RAQUET CLUB HOA	PACIFIC PINES RAQUET CLUB HOA	PACIFIC PINES RAQUET CLUB HOA
ACIL_6LU CA042	Lux Canyon (west of Manchester Avenue Mitigation Bank)	CALLE RYAN HOMEOWNERS ASSOCIATION	CALLE RYAN HOA	CALLE RYAN HOA
ACIL_6MA MI041	Manchester Avenue Mitigation Bank--Lux Canyon (east)	Manchester Mitigation Bank	Center for Natural Lands Management	Center for Natural Lands Management
ACIL_6PA RO043	Palomar Airport Road	Carlsbad Oaks North Habitat Conservation Area	County of San Diego, Public Works	Center for Natural Lands Management
ACIL_6RA CA044	El Fuerte Street (Rancho Carrillo)	Rancho Carrillo HOA	Rancho Carrillo Master HOA	Rancho Carrillo Master HOA
ACIL_6RSF E045	Rancho Santa Fe	MS Rialto to the Lakes CA LLC	MS Rialto to the Lakes CA LLC	MS Rialto to the Lakes CA LLC
ACIL_6TH CO046	Thornmint Court	4-S Ranch	4S Ranch HOA	4S Ranch HOA

Baccharis vanessae sites:

Occurrence ID	Occurrence Name	Preserve	Landowner	Land Manager
BAVA3_3OT MT001	Otay Mountain south side & east of Otay Mountain Truck Trail	Otay Mountain Wilderness Area	BLM	BLM
BAVA3_4IR MT002	Iron Mountain South	Iron Mountain	City Poway	City Poway
BAVA3_4IR MT011	Iron Mountain North	Iron Mountain	City of Poway	City of Poway
BAVA3_4M TWO003	Mount Woodson North	Mount Woodson	City Poway	City Poway
BAVA3_4M TWO09	Mount Woodson South	Mount Woodson	City San Diego	City San Diego
BAVA3_6D DHP004	Del Dios Highlands Preserve	Del Dios Highlands Preserve	County San Diego	County San Diego DPR

BAVA3_6EFRR005	Elfin Forest Recreational Reserve	Elfin Forest Recreational Reserve	San Diego County Water Authority	Olivenhain Water District
BAVA3_6ECPR006	Escondido Creek Preserve	Escondido Creek Preserve	Escondido Creek Conservancy	Escondido Creek Conservancy
BAVA3_64SRA007	4S Ranch Specific Plan Area	Ralph's Preserve	Private	Private
BAVA3_6OAPA008	Oakcrest Park	Oakcrest Park	City Encinitas	City Encinitas
BAVA3_3GIHI010	Gibson Highlands	South Crest Properties	Endangered Habitats Conservancy	Endangered Habitats Conservancy
BAVA3_6SFVA012	Santa Fe Valley	MS Rialto to the Lakes CA LLC	MS Rialto to the Lakes CA LLC	MS Rialto to the Lakes CA LLC
BAVA3_6ENRA013	Encinitas Ranch	Open Space Holding LLC	Open Space Holding LLC	Open Space Holding LLC

Chloropyron maritimum ssp. *maritimum* sites:

Occurrence ID	Occurrence Name	Preserve	Landowner	Land Manager
COMAM3_1TIES001	Tijuana Estuary Area - At Boundary Monument #258	Border Field State Park	CDPR	CDPR
COMAM3_1TIES002	Tijuana Estuary Area - Between mouth of Tijuana River and Coronado Ave, Imperial Beach	Tijuana Slough National Wildlife Refuge	USFWS	USFWS
COMAM3_1TIES003	Tijuana Estuary Area - Near the Mouth of the Tijuana River and the North Part of Border Field State Park	Tijuana Slough National Wildlife Refuge	USFWS	USFWS
COMAM3_1SDBA004	San Diego Bay, Naval Radar Receiving Facility, Naval Base Coronado	San Diego Bay, Naval Radar Receiving Facility, Naval Base Coronado	US Navy	USFWS
COMAM3_1SWMA005	Sweetwater Marsh - West Side of I-5	San Diego Bay National Wildlife Refuge	USFWS	USFWS
COMAM3_1SWMA006	Sweetwater Marsh - West Side of I-5 and South of Sweetwater River	San Diego Bay National Wildlife Refuge	USFWS	USFWS
COMAM3_1DOBE007	Dog Beach	Flood Control Channel Southern Wildlife Preserve	City San Diego	City San Diego PRD

Deinandra conjugens sites:

Occurrence ID	Occurrence Name	Preserve	Landowner	Land Manager
DECO13_2PAVA001	Paradise Valley	Paradise Valley Park	City San Diego	City San Diego PRD
DECO13_3PMA1002	PMA1 (Rice Canyon & Other Canyons)	Chula Vista Central City Preserve	City Chula Vista	City Chula Vista
DECO13_3PMA2003	PMA2	Chula Vista Central City Preserve	City Chula Vista	City Chula Vista
DECO13_3PMA3004	PMA3	Chula Vista Central City Preserve	City Chula Vista	City Chula Vista
DECO13_3PMA4005	PMA4	Chula Vista Central City Preserve	City Chula Vista	City Chula Vista
DECO13_3JAHI006	Jamacha Hills	San Diego National Wildlife Refuge	USFWS	USFWS
DECO13_3SVPC007	Shinohara Vernal Pool Complex - SE Sweetwater Reservoir	San Diego National Wildlife Refuge	USFWS	USFWS
DECO13_3TRIM008	Trimark/Gobbler's Knob/Horseshoe Bend	San Diego National Wildlife Refuge	USFWS	USFWS
DECO13_3BOME009	Bonita Meadows	Bonita Meadows	CALTRANS	CALTRANS
DECO13_3MMGR010	Mother Miguel Grassland	San Diego National Wildlife Refuge	USFWS	USFWS

DECO13_3SVFB011	Spring Valley Fuel Break	San Diego National Wildlife Refuge	USFWS	USFWS
DECO13_3RHRA012	Rolling Hills Ranch	Rolling Hills Ranch	Private, being transferred to City Chula Vista	Private, being transferred to City Chula Vista
DECO13_3PRVA013	Proctor Valley	Otay Lakes Cornerstone Lands	City San Diego PUD	City San Diego PUD
DECO13_3PRVA014	Proctor Valley (Bella Lago)	San Diego National Wildlife Refuge	USFWS	USFWS
DECO13_3RJER015	Rancho Jamul Ecological Reserve	Rancho Jamul Ecological Reserve	CDFW	CDFW
DECO13_3SCPA016	Salt Creek Parcel	Otay Ranch Preserve	Otay Ranch POM	POM (County San Diego & City Chula Vista)
DECO13_3ORVA017	Otay Valley East End	Otay Ranch Preserve	Otay Ranch POM	POM (County San Diego & City Chula Vista)
DECO13_3ORVA018	North Side of Otay River Valley near Wolf Canyon	Otay Valley Regional Park	County San Diego/City Chula Vista/Private	County San Diego/City Chula Vista/Private
DECO13_3JOCA019	Johnson Canyon	Otay Valley Regional Park	County San Diego	County San Diego DPR
DECO13_3DERA020	Dennery Ranch	Dennery Ranch	City San Diego	City San Diego PRD
DECO13_3DREA021	Dennery Ranch East	Dennery Ranch	City San Diego	City San Diego PRD
DECO13_3DENC022	Dennery Canyon South	Unknown Name	Private	Private
DECO13_3WMCA023	West of Moody Canyon	Otay Mesa South	City San Diego	City San Diego PRD
DECO13_3SMHA024	San Miguel Habitat Area West	San Miguel Habitat Area	Otay Water District	Otay Water District
DECO13_3SMHA025	San Miguel Habitat Area East	San Miguel Habitat Area	Otay Water District	Otay Water District

Dicranostegia orcuttiana sites:

Occurrence ID	Occurrence Name	Preserve	Landowner	Land Manager
COOR7_3ORVA001	Otay River Valley	Otay Valley Regional Park	City San Diego	City San Diego PRD
COOR7_3PMA1002	PMA1- Rice Canyon	Chula Vista Central City Preserve	City Chula Vista	City Chula Vista
COOR7_3PMA3003	PMA3	Chula Vista Central City Preserve	City Chula Vista	City Chula Vista
COOR7_3PMA4004	PMA4	Chula Vista Central City Preserve	City Chula Vista	City Chula Vista
COOR7_3DCCT005	Cal Terraces (Dennery Canyon Area)	Cal Terraces	City San Diego	None

Monardella viminea sites:

Occurrence ID	Occurrence Name	Preserve	Landowner	Land Manager
MOLIV_4SYCA001	Sycamore Canyon	Sycamore Canyon	City San Diego	City San Diego PRD
MOLIV_4SYCA002	Sycamore Canyon	Sycamore Canyon and Goodan Ranch Preserves	CDFW	CDFW
MOLIV_4SYCA006	Sycamore Canyon	Sycamore Canyon and Goodan Ranch Preserves	County San Diego Department of Parks and Recreation	County San Diego Department of Parks and Recreation

MOLIV_4WSCA003	West Sycamore Canyon	West Sycamore Canyon	City San Diego	City San Diego PRD
MOLIV_6LOCA004	Lopez Canyon	Los Penasquitos Canyon Preserve	City San Diego	City San Diego PRD
MOLIV_6LOCA005	Lopez Canyon Translocation	Los Penasquitos Canyon Preserve	City San Diego	City San Diego PRD
MOLIV_6FLCA007	Flander's Canyon	Mira Mesa Open Space	City of San Diego	City of San Diego Park and Recreation Department
MOLIV_4SPCA008	Spring Canyon	Sycamore Canyon Landfill	County of San Diego?	County of San Diego?