



Management Strategic Plan for Conserved Lands in Western San Diego County

Volume 3: Supporting Documents



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Management Strategic Plan for Conserved Lands in Western San Diego County Volume 3: Supporting Documents

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Prepared For

San Diego Association of Governments (SANDAG)
401 B Street, Suite 800
San Diego, CA 92101

Prepared By

San Diego Management and Monitoring Program (SDMMP)
4165 Spruance Road, Suite 200
San Diego, CA 92101

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San Diego Management and Monitoring Program staff:

Ron Rempel, Program Administrator

Yvonne C. Moore, Management and Monitoring Coordinator

Dr. Kristine Preston, Program Ecologist

Emily Perkins, GIS Manager

Front Cover Photograph:

Starting top left and moving clockwise: 1) Nuttall's acmison, Betsy Miller, City of San Diego, 2) San Diego coast horned lizard, Chris Brown, USGS, 3) Short-leaved dudleya, David Hogan, Chaparral Lands Conservancy, 4) Hermes copper butterfly, John Martin, USFWS

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Contact Info:

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5.0. Detailed Definitions

In progress.

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1.0 Introduction

This is Volume 3 of a three volume Management Strategic Plan (MSP). Volume 1 of the MSP is intended to be an operational document, while Volume 2 contains the functional sections and Volume 3 contains more technical information.

*Vol. 1
Overview &
Approach*

Volume 1 includes an overview of the MSP, approach and rationale for categorizing and prioritizing species and vegetation communities and for developing management goals and objectives, characterization of the MSPA, MUs, and threats/stressors, and a description of databases and the implementation process.

*Vol. 2
Goals &
Objectives*

Volume 2 includes regional and MU goals and objectives for species and vegetation communities, the prioritized timeline for implementation, and management goals and objectives for regional threat and stressor management.

*Vol. 3
Supporting
Documents*

Volume 3 contains the supporting documents that are part of and/or were used to develop the MSP. These include species profiles, additional methodological details and definitions, and the implementation plan format.

1.1 GUIDE TO VOLUME 3

The sections included in Volume 3 provide supporting documents for the MSP.

Section 1.0 provides the introduction and guide to Volume 3.

Section 2.0 provides Species Profiles for MSP species that were used to develop goals and objectives.

Section 3.0 includes a list and links to available best management practices (BMPs) for use in implementing the MSP management objectives.

Section 4.0 includes the Implementation Plan (IP) format.

Section 5.0 includes MSP detailed definitions.

At the end of Volume 3 is **Appendix 3A** which includes the References for all three volumes. This same appendix is included in Volumes 1 and 2.

Section 2.0 Species Profiles

2.1. Overview

See Vol. 1, Section 2.4 for additional information on species profiles. Species profiles were developed for Orcutt's spineflower, short-leaved dudleya, southwestern pond turtle, western burrowing owl, San Diego ambrosia, golden eagle, coastal cactus wren, sticky dudleya, small-leaved rose, coastal California gnatcatcher, and southern mule deer. Additional species will be added in future versions of the MSP.

2.2. SL Species Profiles

Orcutt's spineflower (*Chorizanthe orcuttiana*)

Current Distribution Rangewide	List Status	Habitat Affinities	Taxonomy and Genetics	Life History/ Demography	Seasonal Phenology	Pollination/ Seed Dispersal	Threats
Coastal San Diego County from Torrey Pines south to Point Loma ^{1,2,3} . Within the MSPA, Orcutt's spineflower occurs at Torrey Pines Extension in MU7 and previously was extant at Oakcrest Park in Encinitas. There are also four occurrences outside the MSPA at Point Loma Naval Base.	FE/CE	Sandy soils in openings in southern maritime chaparral on coastal bluffs within 5 km of the Pacific Ocean ^{1,2,4,5} .	Overall low genetic diversity among Point Loma populations, which exhibit some within patch diversity, a high degree of selfing, and limited seed dispersal ⁶ .	Annual dicot herb. Large annual fluctuations in population size attributed to pattern and amount of rainfall and number of viable seeds banked in the soil ⁶ . Removal of ice plant and duff has led to the appearance of Orcutt's spineflower, indicating seeds may live in soil for decades. Capable of selfing, the importance of outcrossing to maximizing seed set is unknown ⁵ .	The phenology of germination and seedling establishment of this annual plant depends on the timing and amount of rainfall ⁶ .	Little known about pollination or seed dispersal. Potential for Argentine ants to out-compete native insect pollinators ⁵ ? Unknown whether genes disperse by pollen, seeds or both.	Invasive non-native plants, especially ice plant (<i>Carpobrotus</i> spp.). Loss of sandy openings due to native plant encroachment in the absence of a natural fire regime ^{1,2,6} . Trampling, irrigation runoff, and drainage outflow from culverts causing erosion. Low genetic diversity ⁶ . Small number of occurrences with large annual fluctuations in population size makes species vulnerable to demographic and environmental stochasticity and to loss from a catastrophic disturbance ^{2,6} .
<p>Special considerations: This species is considered to have reduced potential for recovery given that there are few populations, little remaining suitable habitat and a high risk of threats². BMPs have been developed by the U.S. Navy to effectively expand populations and to establish new populations^{5,6}. Recommendations are to eliminate non-native invasive plants and duff from areas with suitable habitat to see if there may be re-emergence of this species in new locations, given that seeds are likely to be long-lived^{1,5,6}. Before seed supplementation is used for restoration, invasive non-native plants should be managed for at least two years of suitable growing conditions to determine if there are viable seeds remaining in soil.</p>							

Orcutt's Spineflower Sources

1. Bauder, Ellen. 2000. *Recovery and Management of Orcutt's Spineflower (Chorizanthe orcuttiana) Final Report*. Prepared for the California Department of Fish and Game.
2. USFWS. 2007. *Chorizanthe orcuttiana (Orcutt's spineflower) Five-Year Review: Summary and Evaluation*. Prepared by U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office.
3. MSP-MOM. 2013. *Management Strategic Plan Master Occurrence Matrix*. <http://www.sdmmp.com/Home.aspx>

4. Reiser, C. 1994. *Rare Plants of San Diego County*. <http://sandiego.sierraclub.org/rareplants/> Accessed 2012 and 2013.
5. Bauder, Ellen T., Juda Sakrison and Jonathan Snapp-Cook. 2010b. *Chorizanthe orcuttiana (Orcutt's Spineflower) Final Report (2010)*. Prepared for Coastal IPT NAVFACSW and Naval Facilities Engineering Command, Southwest. Contract #: N68711-02-LT-00041, Department of the Navy.
6. Bauder, Ellen T., Juda Sakrison and H. David Truesdale. 2010a. *Chorizanthe orcuttiana (Orcutt's Spineflower) Final Report*. Prepared for Coastal IPT NAVFACSW and Naval Facilities Engineering Command, Southwest. Contract #: N68711-02-LT-00041, Department of the Navy.
7. Thomas Oberbauer. 2013. *Comment on Draft Management Strategic Plan version 01-07-13*.

Short-leaved Dudleya (*Dudleya brevifolia*)

Current Distribution Rangewide	List Status	Habitat Affinities	Taxonomy and Genetics	Life History/ Demography	Seasonal Phenology	Pollination/ Seed Dispersal	Threats
Endemic to San Diego County occurring only along the coast between Del Mar and La Jolla ¹ . There are 5 occurrences in MUs 6 and 7 ² .	CE	Occurs on sandstone bluffs and in sandy openings in chamise chaparral in association with small iron concretions ¹ . It is often in areas with native annual forbs and while not a wetland species it occurs in areas where soils remain saturated for a relatively long period after rain ³ .	In the family Crassulaceae.	Herbaceous perennial ⁴ .	Large annual fluctuations in population size ⁴ .	Pollinated by insects ⁵ . Seeds are thought to be self-dispersed.	Trampling by hikers, bikers, dogs and horses, illegal trails, invasive non-native plants and erosion ⁶ . A small number of occurrences in close proximity make the species vulnerable to loss from catastrophic disturbance and environmental stochasticity.
Special considerations: Very small and can be difficult to detect when not flowering ⁴ .							

Short-leaved Dudleya Sources

1. Reiser, C. 1994. *Rare Plants of San Diego County*. <http://sandiego.sierraclub.org/rareplants/> Accessed 2012 and 2013.
2. MSP-MOM. 2013. *Management Strategic Plan Master Occurrence Matrix*. <http://www.sdmmp.com/Home.aspx>
3. City of San Diego. In prep. *Dudleya brevifolia Restoration Plan*.
4. McEachern, Kathryn, Bruce Pavlik, Jon Rebman, and Rob Sutter. 2010a. *Assessment of Eleven Years of Rare Plant Monitoring Data from the San Diego Multiple Species Conservation Plan*. USGS-WERC-Channel Islands Field Station Administrative Report 2010-01, Ventura, CA.
5. SANDAG. 2003. *Volume II: Final MHCP Plan Biological Analysis and Permitting Conditions*. Prepared by AMEC Earth and Environmental, Inc., Conservation Biology Institute, and AMEC. Prepared for the Multiple Habitat Conservation Program administered by the San Diego Association of Governments (SANDAG).
6. City of San Diego. 2001-2006, 2009-2012. *Rare Plant Monitoring Data*. <http://www.sandiego.gov/planning/programs/mscp/pdf/monitor/monitoringsummary1999to2009.pdf>

Burrowing Owl (*Athene cunicularia hypugaea*)

Current Distribution Rangelwide	List Status	Habitat Affinities	Taxonomy and Genetics	Seasonal Activity	Life History/ Reproduction	Diet and Foraging	Dispersal	Threats
Found from S. interior British Columbia (nearly extirpated), S. Alberta, S. Saskatchewan (extirpated from a portion of the province), and S. Manitoba (extirpated from a portion of the province), south through E. Washington, central Oregon, and Calif. to Baja California, east to W. Minnesota, NW Iowa, E. Nebraska, central Kansas, Oklahoma, E. Texas, and Louisiana, and south to central Mexico. ¹	CSC	Occurs in shortgrass prairies, grasslands, lowland scrub, agricultural lands (particularly rangelands), prairies, coastal dunes, desert floors, and some artificial, open areas as a year-long resident. They require large open expanses of sparsely vegetated areas on gently rolling or level terrain with an abundance of active small mammal burrows. As a critical habitat feature need, they require the use of rodent or other burrows for roosting and nesting cover. ¹	Variouly placed in the monotypic genus <i>Speotyto</i> or in <i>Athene</i> , where it has three congeners. ¹	The burrowing owl is primarily a diurnal species with crepuscular hunting habits. ³ They may move the location of their perch in order to thermoregulate by perching in open sunlight in early morning and then moving to shade or to the burrow, when temperatures are hot. ⁴	Breeding occurs from March through August, with a peak in April and May; the clutch size is 6-11 eggs, with an average of 7-9 eggs; this clutch size may increase to the north. ⁵ The young emerge from the burrow at about two weeks, and they fly by about four weeks. ⁶	Diet is composed of a variety of foods included <i>Peromyscus</i> , <i>Microtus</i> and beetles; they also may take reptiles, birds, and carrion. ^{1,2} They are a crepuscular hunter and hunt by using short flights, running along the ground, hovering or by using an elevated perch from where prey is spotted. They typically forage in short-grass, mowed, or overgrazed pasture, golf courses and airports. ³	A total of 92 percent of 555 owls that were banded at a nesting area were never re-encountered after the year in which they were banded. The 8 percent that returned to the natal area after being banded, returned one or more years after banding and stayed in the natal area for 2 to 4 breeding seasons. ⁷ Returns of one year old owls were located 2.4 to 26.4 kilometers from the natal nest. ¹	Conversion of grassland to agriculture, other habitat destruction, predators, collisions with vehicles, and pesticides/poisoning of ground squirrels. ^{6, 8, 9}

Special considerations: excerpted from the Western Riverside Co. MSHCP (see Riverside County 2003 and citations within) - The importance of retaining colonies must be stressed, as this species appears to have evolved as a colonial species in association with burrowing mammal communities (Dyer 1987). Minimum viable colony size is unknown. While these owls appear to adapt fairly well to human presence in some cases, i.e., airport runways and other human modified open spaces, the continued presence of active mammal-created burrows is essential. In Oklahoma, the removal of prairie dogs allowed deterioration of burrows, making them unsuitable for nest burrows after one year (Butts 1973). Rodent eradication programs may reduce the consistent availability of high and moderate function habitat. The remaining habitat is often roadside drainage ditches, increasing potential for significant losses to vehicle collisions (Remsen 1978). The available soil type appears to be a factor in nest burrow selection.

Burrowing Owl Sources

1. Haug, E. A., B. A. Millsap, and M. S. Martell. 1993. Burrowing Owl (*Speotyto cunicularia*). In *The Birds of North America*, No. 130 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
2. Marti, C. D. 1974. Feeding ecology of four sympatric owls. *Condor* 76: 45-61.
3. Thomsen, L. 1971. Behavior and ecology of burrowing owls on the Oakland Municipal airport. *Condor* 73: 177-192.
4. Coulombe, H.N. 1971. Behavior and population ecology of the burrowing owl, *Speotyto cunicularia*, in the Imperial Valley of California. *Condor* 73: 162-176.
5. Bent, A. C. 1938. Life histories of North American birds of prey. Part 2. U.S. Natl. Mus. Bull. 170. 482pp.
6. Zarn, M. 1974. Burrowing Owl, Report No. 11. Habitat management series for unique or endangered species. Bureau of Land Management, Denver. 25 pp.
7. Lutz, R. S., and D. L. Plumpton. 1999. Philopatry and nest site reuse by burrowing owls: implications for productivity. *J. Raptor Research* 33: 149-153.
8. Grinnell, J. and A.H. Miller. 1944. *The Distribution of the Birds of California*. Pacific Coast Avifauna Number 27. Copper Ornithological Club, Berkeley, California. Reprinted by Artemisia Press, Lee Vining, California; April 1986. 617 pp.
9. Remsen, J. V., Jr. 1978. Bird species of special concern in California. Calif. Dep. Fish and Game, Sacramento. Wildl. Manage. Admin. Rep. No. 78-1. 54pp.

Southwestern Pond Turtle (*Emys marmorata pallida*)

Current Distribution Rangewide	List Status	Habitat Affinities	Taxonomy and Genetics	Seasonal Activity	Life History/ Reproduction	Diet and Foraging	Threats	Dispersal
Puget Sound, WA to northern Baja California, Mexico ^{1, 2, 3}	SSC	Slow moving permanent or intermittent streams, small ponds, small lakes, reservoirs, abandoned gravel pits, permanent and ephemeral shallow wetlands, stock ponds, and sewage treatment lagoons. Emergent basking sites, vegetation and suitable terrestrial shelter and nesting sites characterize optimal habitat. Adjacent upland areas provide overwintering and estivation sites. ^{3, 4}	Two subspecies of western pond turtle are recognized, <i>E.m. marmorata</i> (SF and Sacramento Vly northward) and <i>E.m. pallida</i> (south of SF). Four distinct mitochondrial clades have been identified: (1) Northern (2) San Joaquin Valley (3) Santa Barbara (4) Southern. ^{5,6} Additionally, recent genetic studies by USGS suggests SW pond turtles are distinct between watersheds in S. Calif. ⁷	Activity is dependent on temperature, with most activity when water temperature above 15°C; courting and mating observed February - November ^{3, 8}	Females may reproduce at 4-8 years of age; most nests are within 50m of edge of water; clutch size varies from 2-13 eggs; incubations times vary from 94-122 days in wild. ^{3, 8}	Feeds on larvae of dragonflies, mayflies, stoneflies, caddisflies, midges, beetles, plus crayfish, other aquatic invertebrates and vegetation; will scavenge on fish, frogs, and toads ³	Human activities (e.g., recreation, collection, roads), water quality, drought, non-native turtles, native and non-native predatory species (e.g. bullfrogs, large-mouth bass, coyotes, raccoons, opossums, sunfish, crayfish, carp, mosquitofish). ⁹ Feral pigs may eat young turtles and their rooting can impact pond turtle habitat. ¹⁰	Occupies small home range in streams but larger area in uplands; females move shorter distances than males (149m vs 367m, mean values). ^{3, 11}
<p>Special considerations: excerpted from the Western Riverside Co. MSHCP (see Riverside County 2003 and citations within) - Destruction of suitable habitat appears to be the biggest threat to populations of the western pond turtle (Brattstrom, 1988; Brattstrom and Messer, 1988). Today, the only extensive populations remaining are in northern California and southern Oregon. In recent years, the southern California pond turtle population has experienced an alarming decline. Between Ventura County and the Mexican border, known localities have decreased from 87 in 1960, to 57 in 1970, and as of 1987, only 10 of 255 sites inspected were thought to support reproductively viable populations (Brattstrom, 1988; Brattstrom and Messer, 1988; Lovitch, 1999). Fifty-three of the 255 sites inspected contained pond turtles, the distribution of these sites follows: 25 in Ventura County, 10 in Los Angeles County, eight in San Diego County, four in Orange County, three in southwestern San Bernardino County, and three in western Riverside County.</p> <p>Conservation management of aquatic turtles should include not only protection of aquatic habitat, but also preservation and restoration of dispersal corridors and adjacent terrestrial habitat (potentially 500 m or more from the wetland boundary) for nesting, hibernation, and estivation (Holland, 1994; Burke and Gibbons, 1995). These corridors should also be protected from impacts associated with exotic plant and animal species, new road construction, cattle and off-road vehicle use. Reintroductions and the establishment of satellite populations would also contribute to the protection of the pond turtle.</p>								

Southwestern Pond Turtle Sources

1. Bury, R.B. 1970. *Clemmys marmorata*. Catalogue of American Amphibians and Reptiles 100:1-3.
2. Stebbins, R.C. 1985. A field guide to western reptiles and amphibians, 2nd ed. Houghton Mifflin Co., Boston, Massachusetts.
3. Bury, R.B. and D.J. Germano. 2008. *Actinemys marmorata* (Baird and Girard 1852) – western pond turtle, pacific pond turtle. In: Rhodin, A.G.J., Pritchard, P.C.H., van Dijk, P.P., Saumure, R.A., Buhlmann, K.A., and Iverson, J.B. (Eds.) Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/NSSC Tortoise and Freshwater Turtle Specialist Group. *Chelonian Research Monographs* No. 5. Pp. 001-001.9, doi: 10.3854/crm.5.001.marmorata.v1.2008, <http://www.iucn-tftsg.org/cbftt>.
4. Rathbun, G.B., N. Siepel and D. Holland. 1992. Nesting behavior and movements of western pond turtles, *Clemmys marmorata*. *Southwest. Nat.* 37:319-324.
5. Spinks, P.Q. and H.B. Schaffer. 2005. Range-wide molecular analysis of the western pond turtle (*Emys marmorata*): cryptic variation, isolation by distance, and their conservation implications. *Molecular Ecology* 14: 2047-2064.
6. Spinks, P.Q., R.C. Thomson, and H.B. Bradley. 2010. Nuclear gene phylogeography reveals the historical legacy of an ancient inland sea on lineages of the western pond turtle, *Emys marmorata* in California. *Molecular Ecology* (2010) 19, 542-556.
7. Fisher, R.N., D.A. Wood, C.W. Brown, P.Q.S., and A.G. Vandergast. 2012. Assessment of Western Pond Turtle Population Genetic Structure and Diversity in Southern California. Powerpoint presentation at the SDMMMP monthly management/monitoring coordination meeting. July.
8. Holland, D.C. 1994. The western pond turtle: habitat and history. U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon. 11 chapters + appendices.
9. Madden-Smith, Melanie, Ervin, Edward, Meyer, Kathy, Hathaway, Stacie, and Robert N. Fisher. 2005. Distribution and Status of the Arroyo Toad (*Bufo californicus*) and Western Pond Turtle (*Emys marmorata*) in the San Diego MSCP and Surrounding Areas. Prepared for California Department of Fish and Game and the County of San Diego. U.S. Geological Survey, Western Ecological Research Center.
10. Personal communication between Y. Moore, SDMMMP and S. Tremore, SDNHM. 2013.
11. Bury, R.B. 1972. Habitats and home range of the pacific pond turtle, *Clemmys marmorata*, in a stream community. Ph.D. dissertation, University of California Berkeley. 205 pp.
12. Riverside County. 2003. Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). Final MSHCP, volume II. Prepared for County of Riverside County Transportation and Lands Management Agency by Dudek & Associates, Inc. Approved June 17, 2003.

2.3. SO Species Profiles

San Diego Ambrosia (*Ambrosia pumila*)

Current Distribution Rangewide	List Status	Habitat Affinities	Taxonomy and Genetics	Life History/ Demography	Seasonal Phenology	Pollination/ Seed Dispersal	Threats
<p>Distributed from western Riverside County and western San Diego County, California south in widely scattered populations along the west coast of Baja California, Mexico, to the vicinity of Cabo Colone^{1,2}. Majority of U.S. populations in San Diego County, with 12 occurrences on Conserved Lands in the MSPA³.</p>	<p>FE</p>	<p>Occurs in open floodplain terraces in variety of ruderal associations or in openings in coastal sage scrub and chaparral^{1,2,4}. In San Diego County most occurrences associated with sandy loam soils⁵. Disturbance, such as flood plain scouring, helps to keep openings that are colonized by this species⁶.</p>	<p>Member of the Asteraceae. Species variability is common within <i>Ambrosia</i> genus because of the presence of polyploid races and dysploidy⁷. San Diego ambrosia gametic (haploid) chromosome number is 72, in its vegetative stage it is an octoploid with 144 chromosomes. Recent genetic study⁸ found Mission Trails Regional Park, San Diego National Wildlife Refuge, and Skunk Hollow (Riverside Co.) occurrences were genetically distinct with 31 different genotypes. No spatial genetic structure at short distances and different clones occupy the same plots. However, at larger distances there is spatial structure with different genotypes and no overlap. This indicates that clones have a limited spatial distribution and that genetic diversity is maintained by some level of sexual reproduction. Patches within 480m of each other at San Diego National Wildlife Refuge did not appear to be interbreeding. The Mission Trails occurrence had low genetic variability that may be a result of a non-native invasive grass overstory limiting wind pollination.</p>	<p>Clonal, herbaceous, perennial plant species¹. Reproduces mainly be vegetative resprouting from underground rhizomes⁶. MSCP populations do not appear to produce many seeds⁹. Presumed to be able to self-pollinate like other species of <i>Ambrosia</i>, however it remains to be determined if self-pollination produces viable seeds.</p>	<p>Amount of above ground biomass fluctuates annually and likely depends on seasonal conditions, such as amount and timing of rainfall⁶. Flowers usually present from June through September¹.</p>	<p>Thought to be primarily wind pollinated, although the role of insects is not known⁹. Mode of seed dispersal is unknown, does not have specialized structures for dispersal by wind or animals. May disperse in flooding events.</p>	<p>Non-native plants are a significant threat to San Diego ambrosia^{9,10}. Mowing and discing for fuel modification can impact populations, although mowing if done at the right time of year can help to reduce non-native plant cover. Trampling by humans, bikes, horses, and off-highway vehicles can damage plants. Fragmentation of occurrences can reduce wind pollination and result in smaller populations that are more vulnerable to loss of genetic diversity and environmental and demographic stochasticity. Altered hydrology may reduce flood scouring events that maintain open habitats colonized by San Diego ambrosia. Feral pigs were introduced into the upper San Diego River in 2006¹¹ and could pose a threat if they move downstream.</p>

Special considerations: Large occurrences are necessary to maintain genetic diversity⁸. Based on genetic results, it was estimated that at a minimum unique genets represent one order of magnitude less than the total number of stems growing in a population with the San Diego National Wildlife Refuge Par 4 occurrences estimated at 5,000 genets and the Mission Trails Regional Park at 1,000 genets. Because of the localized nature of genets, it is recommended that seed collection and removal of transplants for establishing new occurrences be done widely across a population to obtain the greatest number of different genets. However, caution is needed as potential differences in chromosome numbers could cause problems with reduced fitness and sterility if individuals from one population are transplanted with individuals from another population if there is chromosome incompatibility¹². Work has been conducted to determine BMPs for controlling non-native plants with some success from Fusilade herbicide and hand weeding^{13,14}, although *Vulpia myurus* increased with Fusilade. Further testing of methods is needed and is ongoing at Mission Trails Regional Park¹⁵. There have been seven translocation projects but it is uncertain whether environmental conditions at translocation sites are suitable for sustained populations, so further research on viability of translocated populations is needed⁹.

San Diego Ambrosia Sources

1. Munz, P.A. 1974. *A Flora of Southern California*. University of California Press, Berkeley, California.
2. Reiser, C. 1994. *Rare Plants of San Diego County*. <http://sandiego.sierraclub.org/rareplants/> Accessed 2012 and 2013.
3. MSP-MOM. 2013. *Management Strategic Plan Master Occurrence Matrix*. <http://www.sdmmp.com/Home.aspx>
4. County of San Diego. 2010. *North County Plan Conservation Analysis*. Draft.
5. Dudek & Associates, Inc. August 26, 1999. *City of San Diego Mission Trails Regional Park, San Diego Ambrosia Management Plan*. Unpublished report, 36 pp. + appendices.
6. McEachern, K., B. Pavlik, J. Rebman and R. Sutter. 2006. *San Diego Multiple Species Conservation Program (MSCP) rare plant monitoring review and revision*. Final report prepared for the City of San Diego.
7. Payne, W. W., Peter H. Raven and D. W. Kyhos. 1964. Chromosome Numbers in Compositae. IV. Ambrosieae. *American Journal of Botany* 51:4 pp 419-424.
8. McGlaughlin, M.E. and E.A. Friar. 2007. Clonality in the endangered *Ambrosia pumila* (Asteraceae) inferred from RAPD markers; implications for conservation and management. *Conservation Genetics* 8:319-330.
9. USFWS. 2010. *Ambrosia pumila (San Diego Ambrosia) 5-Year Review: Summary and Evaluation*. Prepared by the U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office, Carlsbad, California.
10. Hierl, Lauren A., Janet Franklin, Douglas H. Deutschman, and Helen M. Regan. 2007. *Developing Conceptual Models to Improve the Biological Monitoring Plan for San Diego's Multiple Species Conservation Plan*. Prepared for the California Department of Fish and Game.
11. USFS and BLM. 2012. *Environmental Assessment: Feral Pig Damage Control Project on Cleveland National Forest and Bureau of Land Management Lands*. http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/72857_FSPLT2_148901.pdf
12. Severns, P.M. and A. Liston. 2008. Intraspecific chromosome number variation: a neglected threat to the conservation of rare plants. *Conservation Biology* 22:1641-1647.
13. Kelly, Mike, Cindy Burrascano, and Melanie Johnson Rocks. 2008. *Spraying over the top of Ambrosia pumila, a federally listed species to control weeds*. Powerpoint presentation.
14. Hasselquist, Niles, Eliza Maher Hasselquist, and Deborah Rogers. 2009. *Final Report: Comparison of Vegetation Management Techniques to Support Recovery of the Federally Endangered Ambrosia pumila*. Prepared by the Center for Natural Lands Management.
15. City of San Diego. 2013. *Mission Trails Regional Park Sensitive Habitat Field Notes*.

Golden eagle (*Aquila chrysaetos*)

Current Distribution Rangewide	List Status	Habitat Affinities	Taxonomy and Genetics	Seasonal Activity	Life History/ Reproduction	Diet and Foraging	Dispersal	Threats
Holarctic distribution (Eurasia, N. Africa, and N. America); in N. America breeds locally from northern Alaska eastward to Labrador southward to N. Baja Calif., N. Mexico, and Maine; winters from S. Alaska and S. Canada southward through the breeding range. ¹	BEPA/FP	Uses a variety of habitats; nests in cliffs or trees, forages over plains, grasslands, or low and open shrublands including chaparral and coastal sage scrub. ²	Five or 6 recognized subspecies differentiated by geographic distribution, size and coloration; only one subspecies, <i>Aquila chrysaetos canadensis</i> is found in N. America. ³	Year-long, diurnal activity. ⁴ Spends most of the day perched (78 to 85%) and the rest of the day in flight. ⁵ Breeds from late January through August, with peak in March through July ⁹	About 80% of nests built in SD Co. have been on cliff ledges and 20% in trees, usually on steep slopes. ² Pairs may build more than one nest and attend them prior to laying eggs; large platform nests are built of sticks, twigs, and greenery; clutch size is 1-3 eggs; eggs are laid in early February to mid-May; incubation lasts 43-45 days, and the nestling period usually is 65-70 days. ^{2, 9, 10}	Eats mostly lagomorphs and rodents; it also takes other medium to large mammals, birds, reptiles, and some carrion. ^{6,7} Forages over large areas of grassland and open chaparral or coastal sage scrub. ⁸	Home range sizes vary with season and quality of habitat; during the breeding season, in the western U.S. home ranges vary from 20 to 33 square km; some eagles are sedentary while others are migratory. ³	Human disturbance of nest areas leading to desertion of the nest in early incubation, urbanization, poaching, and electrocution from high tension wires, direct mortality from wind turbines. ^{11, 12}

Special considerations: excerpted from the *Western Riverside Co. MSHCP (see Riverside County 2003 and citations within)* - The golden eagle is sensitive to human disturbance and to land use changes that disrupt natural food supplies and nesting sites. Human activities are known to impact raptors by means such as: physically harming or killing eggs, young or adults; by altering habitat; and by disrupting normal behavior (Richardson and Miller 1997). Due to the broad range of direct and indirect human-associated impacts, establishment of buffer zones created around a nest location provide protection and work best if they include both a spatial and temporal restriction (Richardson and Miller 1997). A specific determination of the buffer distance required to prevent disturbance of nest sites has not been determined empirically for the golden eagle (Dave Bittner 1998 pers. comm.; Newton 1979). In one study, home ranges adjoining developed sections of an area were shown to be abandoned more often than interior areas; however, there is no distinct relationship between the proximity of nests to development and their probability or year of abandonment (Scott 1985). The loss of a nesting area could not be attributed to the loss of a specified amount of any vegetation type within 2.5 kilometers of nests (Scott 1985). In addition, the loss of suitable foraging habitat around active nests was equal to, or in some cases greater than, the loss around abandoned areas. In a study of golden eagles in San Diego County, the count of residences was the only variable measured that showed a significant correlation to the number of abandoned areas. A significantly larger number of active areas had no dwelling units within a radius of 1.6 kilometers while a significantly larger number of abandoned areas contained 50 or more dwelling units within the same radius (Scott 1985). In agreement with this species-specific study, an analysis by various biologists concluded that for the golden eagle, a spatial buffer of 200 meters to 1.6 kilometers was recommended (Richardson and Miller 1997). Temporal buffers provide additional support to the spatial buffer and have been recommended to encompass all nesting activities and extend at least from the arrival of the adult birds in the nesting areas through the first few weeks of nestling development (Richardson and Miller 1997).

Golden Eagle Sources

1. Brown, L., and D. Amadon. 1968. Eagles, hawks and falcons of the world. 2 Vols. Country Life Books, London. 945pp.
2. Scott, T. A. 1985. Human impacts on the golden eagle population of San Diego County from 1928 to 1981. Ph.D. Thesis, San Diego State University 98 pp.
3. Kochert, M., K. Steenhof, C. McIntyre, E. Craig. 2002. Golden Eagle (*Aquila chrysaetos*). PP. 1-44. *In*: A. Poole, F. Gill (Eds.), The Birds of North America, Vol. 684. Philadelphia: The Birds of North America.
4. Zeiner, D. C., W., F. Laudenslayer, Jr., K. E. Mayer, M. White. Editors. 1990. California's Wildlife. Volume 2. Birds. State of California, Department of Fish and Game. Sacramento, California. 731 pp.
5. Collopy, M. W., and T. C. Edwards, Jr. 1989. Territory size, activity budget, and role of undulating flight in nesting golden eagles. *J. Field Ornithology* 60: 43-51.
6. Johnsgard, P.A. 1990. Hawks, eagles, and falcons of North America. Smithsonian Institution Press, Washington, D.C.
7. Olendorff, R. R. 1976. The food habits of North American golden eagles. *Amer. Midl. Nat.* 95:231-3-236.
8. Marzluff, J. M., S. T. Knick, M. S. Vekasy, L. S. Shcueck, and T. J. Zarriello. 1997. Spatial use and habitat selection of golden eagles in southwestern Idaho. *Auk* 114: 673-687.
9. McGahan, Jerry. 1968. Ecology of the Golden Eagle. *The Auk* 85: 1-12.
10. Beebe, F. L. 1974. Field studies of the Falconiformes of British Columbia. *Brit. Col. Prov. Mus. Occas. Pap. No. 17.* 163pp.
11. Remsen, J. V., Jr. 1978. Bird species of special concern in California. Calif. Dep. Fish and Game, Sacramento. Wildl. Manage. Admin. Rep. No. 78-1. 54 pp.
12. Thelander, C. G. 1974. Nesting territory utilization by golden eagles (*Aquila chrysaetos*) in California during 1974. Calif. Dept. Fish and Game, Sacramento. Wildl. Manage. Branch Admin. Rep. 74-7. 19pp.

Coastal Cactus Wren (*Campylorhynchus brunneicapillus sandiegensis*)

Current Distribution Rangewide	List Status	Habitat Affinities	Taxonomy and Genetics	Seasonal Activity	Life History/ Reproduction	Diet and Foraging	Dispersal	Threats
Resident species from S. Calif. south to S. Baja Calif., S. Nevada, SW Utah, W. and south central Arizona, S. New Mexico, and central Texas south to Mexico. ¹	CSC	Closely associated with three species of cacti and occurs almost exclusively in thickets of cholla (<i>Opuntia prolifera</i>) and prickly pear (<i>Opuntia littoralis</i> and <i>Opuntia oricola</i>) dominated stands of coastal sage scrub below 457 meters in elevation on mesas and lower slopes of the coast ranges. ²	Eight subspecies are recognized with the subspecies falling into roughly two groups the affinis group (peninsular forms) and brunneicapillus group (continental forms). ² Recent USGS genetic studies showed genetic differentiation between four distinct genetic clusters: Orange County and MCB Camp Pendleton/ Fallbrook NWS; San Pasqual Valley and Lake Hodges; San Diego and El Cajon; and Otay River. ^{3,4}	Exhibits year-long, diurnal activity. The species is not migratory. ⁵	Breeds from March into June; clutch size is 4-5 eggs, with a range of 3-7 eggs. ⁶ Two broods per season are common; incubation is 15-18 days, by the female only. ⁷ The altricial nestlings fledge at 17-23 days, with an average of 21. ⁸ The young may return to roost in the nest after fledging. The young become independent at about 1 mo after leaving the nest; sometimes the young help feed the young of later broods. ⁶ Overall adult survival rate reported as 50.6% during a six year study. ⁷	Forages on the ground and in low vegetation for insects and other small invertebrates, cactus fruits and other fruits, seeds and nectar. ^{7, 9} Fruits make up 15-20 percent of the annual diet. ¹⁰	Generally considered to have low dispersal; in Arizona, of 55 nestlings banded, 41 dispersed from the natal site by 45 days postfledging; males remain near the natal site, usually dispersing only as far as parental territorial behavior dictated ²	Primary threat is altered fire regime that causes direct mortality of birds and destroys cactus scrub, which can take many years to recover. ^{11, 12, 13, 14} Other threats include invasive plant species reducing open habitat for foraging ^{15, 16} , declines in productivity during drought, and predation by domestic cats, roadrunners, snakes, loggerhead shrikes, and especially Cooper's hawks.

Special considerations: excerpted from the Western Riverside Co. MSHCP (see Riverside County 2003 and citations within) – Cactus wrens that are confined to isolated patches of habitat in urbanizing areas are subject to increased levels of predation pressures as larger predators are replaced by greater population levels of smaller predators and domestic animals. This species is especially vulnerable to stochastic events, especially wildland fires. Because of its narrow habitat requirements, sedentary behavior, and low dispersal characteristics, cactus wrens are subject to loss by fires and, if they disperse, may not find suitable habitat to survive. Intense fires may actually kill cactus plants and eliminate habitat for the cactus wren. As a result of competition from invasive plant competition, grazing, weather patterns and other natural and human-influenced disturbances, the reestablishment of cactus patches essential to this species may take many years. An increasing pattern of habitat fragmentation and isolated populations also diminishes the dispersal ability and inter-population connections of the cactus wren and reduces the overall genetic viability of the species (Ogden Environmental and Energy Services 1993).

Coastal Cactus Wren Sources

1. Terres, J. K. 1980. The Audubon Society Encyclopedia of North American Birds. Alfred A. Knopf, New York, New York. 1109pp.
2. Proudfoot, G. A. , D. A. Sherry, and S. Johnson. 2000. Cactus wren (*Campylorhynchus brunneicapillus*) No. 558. In The Birds of North America, A. Poole and F. Gill, Eds. Cornell laboratory of Ornithology, New York, and The Academy of Natural Sciences, Washington D.C.
3. Barr, Kelly R., Amy G. Vandergast and Barbara E. Kus. 2012. Genetic Connectivity in the Coastal Cactus Wren. Data summary report prepared for the San Diego Management and Monitoring Program and the San Diego Association of Governments (SANDAG).
4. Barr, Kelly R., Amy G. Vandergast, and Barbara E. Kus. 2013. Genetic Structure in the Cactus Wren in Coastal Southern California. Data summary report prepared for the California Department of Fish and Wildlife.
5. Zeiner, D. C., W., F. Laudenslayer, Jr., K. E. Mayer, M. White. Editors. 1990. California's Wildlife. Volume 2. Birds. State of California, Department of Fish and Game. Sacramento, California. 731 pp.
6. Harrison, C. 1978. A field guide to the nests, eggs and nestlings of north American birds. W. Collins Sons and Co., Cleveland, OH. 416pp.
7. Anderson, A. H., and A. Anderson. 1960. Life history of the cactus wren. Part III: The nesting cycle. Condor 62:351-369.
8. Hensley, M. M. 1959. Notes on the nesting of selected species of birds of the Sonoran Desert. Wilson Bull. 71:86-92.
9. Bent, A.C. 1968. Life histories of North American Nuthatches, Wrens, Thrashers, and their allies. U.S. National Museum Bulletin 195. U.S. Government Printing Office. Washington, D.C.
10. Ehrlich, P. R., D. S. Dobkin, and D. Wheye. 1988. The birder's handbook. Simon and Schuster, New York. 785pp.
11. Bontrager, D. R., R. A. Erickson, and R. A. Hamilton. 1995. Impacts of the October 1993 Laguna Canyon fire on California Gnatcatchers and Cactus Wrens. Pp. 69-76 In Brushfires in California wildlands: ecology and resource management (J. E. Keeley and T. Scott, eds.). Int. Assoc. Wildland fire, Fairfield, WA.
12. Mitrovich, Milan J. and Robert A. Hamilton. 2007. Status of the Cactus Wren (*Campylorhynchus brunneicapillus*) within the Coastal Subregion of Orange County, California. Prepared for the Nature Reserve of Orange County.
13. Hamilton, Robert A. 2008. 2008 Surveys Cactus Wrens and California Gnatcatchers San Dieguito River Valley, San Diego County. Report prepared for Conservation Biology Institute.
14. Leatherman BioConsulting, Inc. 2009. Central Reserve Cactus Wren Habitat Assessment and Study 2008. Prepared for the Nature Reserve of Orange County.
15. Preston, Kristine L. and Dana Kamada. 2012a. Nature Reserve of Orange County: Monitoring Coastal Cactus Wren Reproduction, Dispersal and Survival, 2009-2011. Report prepared for California Department of Fish and Game, Local Assistance Grant #PO982013.
16. Kamada, Dana and Kristine Preston. 2013. Nature Reserve of Orange County: Coastal Cactus Wren Dispersal and Survival Surveys, Genetics and Parasite Sampling, and Arthropod Foraging Ecology in 2012. Annual Memorandum of Understanding report prepared for California Department of Fish and Wildlife.

2.4. SS Species Profiles

Sticky Dudleya (*Dudleya viscida*)

Current Distribution Rangewide	List Status	Habitat Affinities	Taxonomy and Genetics	Life History/ Demography	Seasonal Phenology	Pollination/ Seed Dispersal	Threats
Endemic to southwestern California occurring in southeastern Orange, southwestern Riverside, and northwestern San Diego Counties ¹ . Most occurrences are in the Santa Ana Mountains. There are 4 occurrences in MU 6 ² .	None	Found on steep rocky north facing slopes in chaparral and coastal sage scrub ¹ . Often found on gabbroic rock and growing in very shallow soils or from vertical rock.	In the family Crassulaceae. <i>Dudleya</i> is a difficult genus with much hybridization and closely related species ⁴ . The original base chromosome number in Crassulaceae is thought to be 8 and polyploidy has played an important role in the evolution of clades. The genus <i>Dudleya</i> belongs to clade <i>Leucosedum</i> which is widespread in the southwest United States, Mexico and Europe with most taxa having base chromosome numbers of 6 or 7. However, the meiotic chromosome number of sticky dudleya is n=17.	Herbaceous perennial ³ .	Blooms May through June ⁵ .	No information.	Threatened by the release of water from upstream reservoirs, trampling by hikers and climbers, and invasive plants, especially those escaped from cultivation in the urban-wildland interface ^{6,7} .
Special considerations: Sticky dudleya has been successfully translocated and seeded into cut and fill slopes above Highway 76 ⁸ .							

Sticky Dudleya Sources

1. Reiser, C. 1994. *Rare Plants of San Diego County*. <http://sandiego.sierraclub.org/rareplants/> Accessed 2012 and 2013.
2. MSP-MOM. 2013. *Management Strategic Plan Master Occurrence Matrix*. <http://www.sdmmp.com/Home.aspx>
3. Calflora. 2013. *Sticky Dudleya*. www.clflora.org/
4. Mort, M.E., D. E. Soltis, P.S. Soltis, J. Francisco-Ortega and A. Santos-Guerra. 2001. Phylogenetic relationships and evolution of Crassulaceae inferred from matK sequence data. *Journal of Botany* 88:76-91.
5. Munz, P.A. 1974. *A Flora of Southern California*. University of California Press, Berkeley, California.
6. Doder, M. 2013. *Personal Communication*.
7. Spiegelberger, M. 2013. *Personal Communication*.
8. Doder, M.W. and M.G. Simpson. 1995. *Work Summary July 1, 1994-30 June 1995: Dudleya viscida Restoration Project, Highway 76 Extension*.

Small-leaved Rose (*Rosa minutifolia*)

Current Distribution Rangelwide	List status	Habitat Affinities	Taxonomy and Genetics	Life History/ Demography	Seasonal Phenology	Pollination/ Seed Dispersal	Threats
Distributed primarily along mesas and canyons near the coast in Baja California, Mexico, although it extends north into the very southern part of San Diego County ¹ . There is a transplanted occurrence and one potentially extant natural occurrence in MU3 in the MSPA ² .	None	In the U.S. occurs in Diegan coastal sage scrub and in Baja California occurs in mesas and arroyos near the coast ¹ . Found on rocky to heavy clay soils ³ .	Member of Rosaceae but does not belong to the same clade that includes most North America taxa and Asian and European taxa ⁴ . Most rose species in North America are the result of multiple introductions from European and Asian taxa. It is not determined if small-leaved rose originated in North America or in Europe or Asia.	Dicot shrub. Seeds collected from small-leaved rose plants in Baja California had low viability and were slow to germinate ³ .	Generally blooms March to July ⁵ , although flowering is unpredictable based on observations of the transplanted shrubs and appears to be dependent on the amount and timing of rainfall ³ .	Potential pollinators include bees ³ .	Lack of genetic diversity as transplanted occurrence consists of clones from a single plant. Vulnerable to loss from MSPA from a catastrophic event such as fire. Over the long-term the transplanted occurrence may be impacted by shrub overgrowth ⁶ .
<p>Special considerations: Originally, one shrub was located on Otay Mesa and was salvaged and divided into plants and cuttings that were transplanted to Dennery Canyon area³. Transplant success was high and occurrence appears stable over the short-term and relatively protected from threats. In 2009, two rose bushes were reported at the Otay Ranch Preserve's San Ysidro parcel, although these plants have not been found during subsequent surveys^{7,8}.</p>							

Small-leaved Rose Sources

1. Reiser, C. 1994. *Rare Plants of San Diego County*. <http://sandiego.sierraclub.org/rareplants/> Accessed 2012 and 2013.
2. MSP-MOM. 2013. *Management Strategic Plan Master Occurrence Matrix*. <http://www.sdmmp.com/Home.aspx>
3. Scheid, Gerald A. and Jennifer J. McAller. 2005. *Year 5 Final Mitigation Monitoring Report for the Small-leaved Rose Translocation Project on the Ocean View Hills Property (Formerly California Terraces and Otay Corporate Center)*. Prepared for Pardee Homes.
4. Bruneau, A., J.R. Starr, and J. Simon. 2007. Phylogenetic relationships in the genus *Rosa*: new evidence from chloroplast DNA sequences and an appraisal of current knowledge. *Systematic Botany* 32:366-378.
5. Calflora. 2013. *Small-leaved Rose*. www.calflora.net/bloomingplants/smallleavedrose.html
6. Greer, K. 2013. *Personal Communication*.
7. Dudek and Associates. 2010. *Baseline Biodiversity Survey for the Otay Ranch Preserve*. Prepared for the County of San Diego.
8. Doder, M. 2013. *Comment on the draft Management Strategic Plan version 01-07-13*.

2.5. VF Species Profiles

Coastal California Gnatcatcher (*Poliioptila californica californica*)

Current Distribution Rangewide	List Status	Habitat Affinities	Taxonomy and Genetics	Seasonal Activity	Life History/ Reproduction	Diet and Foraging	Dispersal	Threats
Occurs on coastal slopes of S. Calif., ranging from S. Ventura southward through Palos Verdes Peninsula in Los Angeles Co. through Orange, Riverside, San Bernardino and San Diego Cos. into Baja Calif. to El Rosario, Mexico. ¹	FT/CSC	Typically occurs in or near coastal sage scrub habitat; plants of this community include California sagebrush (<i>Artemisia californica</i>), various species of sage (<i>Salvia</i> sp.), California buckwheat (<i>Eriogonum fasciculatum</i>), lemonadeberry (<i>Rhus integrifolia</i>), California encelia (<i>Encelia californica</i>), and <i>Opuntia</i> spp. Ninety-nine percent of all gnatcatcher locality records occur at or below an elevation of 984 feet. ¹	Mitochondrial DNA sequencing confirmed the species-level recognition of the Coastal Calif. gnatcatcher, which was calculated to differ from the black-tailed gnatcatcher (<i>P. melanura</i>) by 4.0 percent, similar to differences calculated in the black-capped gnatcatcher (<i>P. nigriceps</i>) and white-lored gnatcatcher (<i>P. albiloris</i>). ¹⁰ A recent genetic study casts doubt on the subspecies status for the northern coastal population that occurs in CSS. ¹¹	Most active and vocal during the morning; a lull in activity usually occurs during mid-day and activity increases again late in the day. ²	Breeding season extends from mid February through mid-August, with the peak of nesting activity occurring from mid-March through mid-May; nest is a small, cup-shaped basket usually found one to three feet above the ground in a small shrub or cactus; clutch sizes range between 3 and 5 eggs, with the average being 4; Juvenile birds associate with their parents for several weeks (sometimes months) after fledging. ¹ Gnatcatchers typically live for two to three years, although ages of up to five years have been recorded for some banded birds. ³	Diet is primarily leaf- and plant hoppers and spiders; also included in smaller amounts are true bugs, wasps, bees, and ants. ⁴	Year-round resident. ² The home range size of the gnatcatcher varies seasonally and geographically, with winter season home ranges being larger than breeding season ranges ⁷ and inland populations having larger home ranges than coastal. ⁸ The mean dispersal distance of gnatcatchers banded as nestlings for males was 2.85 km and for females was 3.33 km. ⁹	Habitat destruction, fragmentation, adverse modification, nest parasitism, agricultural use, such as grazing and field crops, urbanization, air pollution, increases in fire frequency and the introduction of exotics; high fire frequencies and the lag period associated with recovery of the vegetation may significantly reduce the viability of affected subpopulations of the gnatcatcher. ^{5,6}

Special considerations: *excerpted from the Western Riverside Co. MSHCP (see Riverside County 2003 and citations within) – [NOTE: this section refers to habitat and conditions in Riverside County, but it is known that these factors are also important in San Diego County]* Structure of the perennial vegetation within coastal sage scrub seems to be an important component leading to successful gnatcatcher reproduction (Braden, 1997). Any disturbance that affects perennial structure and homogeneity within gnatcatcher territories, such as fire or grazing, also may affect gnatcatcher fitness (Braden, 1997). In fact, areas of the Southwestern Multiple Species Reserve that were occupied by gnatcatchers previous to a 1993 fire have not recovered enough to warrant occupation by gnatcatchers to date (Shaughnessy 1999 pers. comm.). In general, recently burned areas are not used by gnatcatchers except on an occasional basis, and five to seven years of recovery may be necessary before gnatcatchers will nest in burned areas (Atwood et al. 1998, Beyers et al. 1994). This slow recovery of CSS in western Riverside county may be due to invasion of exotic annuals after any disturbance. CSS in the County has been reduced by frequent fire, grazing, and invasion of exotic annuals, as well as air pollution (O'Leary and Westman 1988; O'Leary (1990). The frequency of fires in wildland areas tends to increase as fragmentation increases due to urbanization and agricultural activity. Because of the CSS to grass conversion, protection of coastal sage scrub on gabbro basalts may be required to protect this habitat and the gnatcatcher in Riverside County (Minnich and Dezzani 1998).

Fire may be an important factor to consider in MSHCP Conservation Area design for this species and management plans may be necessary to provide a strategic framework for merging the needs for the species with the challenges of fire control (Mackey et al. 1994). Consideration of habitat refugia, burn frequency, and recolonization of recovering burn areas will be necessary for designing reserves for this species (Atwood, et al. 1998). Observations after a major fire of coastal sage scrub reveal that a large proportion of the gnatcatchers within the burned area were displaced to adjacent habitat rather than killed outright and were packed more densely into remaining areas of intact coastal sage scrub (Atwood, et al. 1998). On unburned areas within San Diego and Riverside counties, two pairs per hectare were found, but only 0.02 pair per hectare were found on burned areas (Mayer and Wirtz 1995). However, the gnatcatchers that are able to establish territories on burned areas appear to breed at rates very similar to those on unburned sites (Wirtz and Mayer 1995). The extent and timing of vegetation recovery may determine the habitat suitability for breeding pairs (Wirtz and Mayer 1995).

California Gnatcatcher Sources

1. Atwood, J. 1991. Subspecies limits and geographic patterns of morphological variation in California gnatcatchers (*Polioptila californica*). Bulletin Southern California Academy of Sciences 90 (3):118-133.
2. Mock, P.J., B. L. Jones, and J. Konecny. 1990. California Gnatcatcher Survey Guidelines. ERC Environmental and Energy Services Co.
3. Braden, G.T., McKernan, R.L., Powell, S.M. 1995. Life History of *Polioptila californica californica* in western Riverside County, CA. Paper delivered at the Symposium on the Biology of the California Gnatcatcher held 15-16 September 1995, University of California, Riverside.
4. Burger, J. C., M. A. Patten, J. T. Rotenberry, and R. A. Redak. 1999. Foraging ecology of the California gnatcatcher deduced from fecal samples. *Oecologia* (Berlin) 120: 304-310.
5. USFWS. 2010. Coastal California gnatcatcher (*Polioptila californica californica*) 5-year Review: Summary and Evaluation. Carlsbad. September 29.
6. USFWS 1993. Threatened coastal California gnatcatcher; final rule and proposed special rule. Federal Register 58, number 59.
7. Bontrager, D.R. 1991. Habitat requirements, home range and breeding biology of the California gnatcatcher (*Polioptila californica*) in south Orange County, California. Unpublished technical report prepared for the Santa Margarita Company, Rancho Santa Margarita, CA. 19 pp.
8. Atwood, J.L., and D.R. Bontrager. 2001. California gnatcatcher (*Polioptila californica*). In Poole, A., and F. Gill (eds.). The birds of North America, No. 574. 32 pp.

9. Atwood, J. L., S. H. Tsai, and A. M. L. Miller. 1996. California gnatcatchers, cactus wrens, and conservation of coastal sage scrub on the Palos Verdes Peninsula. Progress Report No. 4. Unpublished technical report, Manomet Observatory for Conservation Sciences, Manomet, Massachusetts. 15 pp. + appendices.
10. Zink, R. M., and R. C. Blackwell. 1998. Molecular systematics and biogeography of arid land gnatcatchers (Genus *Polioptila*) and evidence supporting species status of the California gnatcatcher (*Polioptila californica*). *Molecular Phylogenetics and Evolution* 9: 26-32.
11. Zink, R.M., J.G. Groth, H. Vazquez-Miranda, and G.F. Barrowclough. 2013. Phylogeography of the California gnatcatcher (*Polioptila californica*) using multilocus DNA sequences and ecological niche modeling: implications for conservation. *The Auk*, Vol. 130, No. 3, pp. 449-458.

2.6. VG Species Profiles

Southern Mule Deer (*Odocoileus hemionus fuliginata*)

Current Distribution Rangewide	List Status	Habitat Affinities	Taxonomy and Genetics	Seasonal Activity	Life History/ Reproduction	Diet and Foraging	Dispersal	Threats
Range from the Southern Yukon and Mackenzie south through the western U.S. to western Texas, and throughout Baja Calif. and N. Mexico. ¹	None	Riparian and oak woodlands, coniferous forest, coastal sage scrub and chaparral; suitable habitat is a mosaic of vegetation, with clearings interspersed by dense brush or tree thickets; brushy areas and thickets are important for cover and thermal regulation; deer require sources of water throughout the year. ¹	Ten valid subspecies of <i>O. hemionus</i> are recognized. <i>O. hemionus fuliginata</i> is found in southernmost California and Baja Calif. Mexico. ³	Primarily active in mornings, evenings, and on moonlit nights, but may also be active at mid-day in winter. ¹	Serially polygynous; rutting season occurs in autumn; a dominant buck tends an estrous doe until matings are completed, or the buck is displaced by another buck; gestation period is 195 to 212 days; fawns are born from early April to midsummer; males and females are mature sexually in their second year; twins are common after the first or second fawning; triplets are rare; mule deer may live more than 10 years in the wild. ¹	Prefers to browse on tender new growth of various shrubs such as ceanothus, mountain mahogany, and bitterbrush; forbs and grasses are important in spring; they feed heavily on acorns where available, primarily in autumn; they also dig out subterranean mushrooms and commonly frequent salt or mineral licks. ¹	Most of the Calif. population is migratory, moving to lower elevations in the fall. However, mule deer in San Diego Co. are non-migratory; typical home ranges are fairly small, about 1.9 mi ² for males, and 0.6 mi ² for females; does may defend small areas in late spring and early summer when caring for newborn fawns. ¹	Fragmentation by private property and urbanization could result in local extirpation without appropriate conservation measures. Roads are a significant source of direct mortality and habitat fragmentation. ² In a study of deer genetics in San Diego Co., a graduate student at SDSU (Anna Mitelberg) found evidence for limited dispersal, a population structure that corresponds to major freeways, and population bottlenecks within the past 60 years. ⁴
<p>Special considerations: <i>excerpted from the San Diego MHCP, Volume 2 (see AMEC and CBI 2003 and citations within)</i> - Migration and dispersal corridors that minimize the potential for roadkill are an important component of a preserve design and will benefit mule deer. Mule deer are an important prey for mountain lions. New or realigned roads should be removed from riparian corridors, and properly designed road undercrossings, with wildlife fencing along roadways, should be installed at natural crossing locations to minimize vehicle-deer encounters.</p>								

Southern Mule Deer Sources

1. Ogden Environmental and Energy Services Co., Inc., The Rick Alexander Company, Onaka Planning & Economics, Douglas Ford & Associates, Sycamore Associates, SourcePoint, and CESAR. 1995. Multiple Species Conservation Program (MSCP) Volume 1: Resource Document. Prepared for the City of San Diego. March 1.
2. AMEC Earth & Environmental, Inc. and Conservation Biology Institute. 2003. Volume II: Final MHCP Plan, Biological Analysis and Permitting Conditions. Prepared for Multiple Habitat Conservation Program. March.
3. Wilson, D. E.; Reeder, D. M., eds. (2005). Mammal Species of the World (3rd ed.). Johns Hopkins University Press. ISBN 978-0-8018-8221-0. OCLC 62265494.
4. Bohonak, A.J. 2012. Social Structure and Genetic Connectivity in the Southern Mule Deer: Implications for Management. San Diego State University. Scope of Work. January 27.

Section 3.0 Best Management Practices

This section includes a list of existing best management practices (BMPs) that may be used to implement management actions identified in the MSP, with links to the documents on the SDMMMP website. Additional BMPs will be posted as they are developed and tested.

3.1. CACTUS RESTORATION

1. Dodero, M. 1998. Guidelines for Cactus Salvage and Propagation. Prepared by Mark Dodero - RECON Environmental Inc. 10/20/08. PDF. 4 pages.

This paper was prepared with the intent to provide land managers with a general “How to” for cactus salvage, propagation and habitat management. Topics include: timing of cactus salvage, storage and propagation, recommended planting densities and planting locations, watering schedule, site preparation, and follow-up weed control-long-term management issues.

SDMMMP website link to document:

http://www.sdmmmp.com/Libraries/BMPS/Cactus_Propagation_Dodero_1998.sflb.ashx

2. Hamilton, R. 2009. Restoration Guidelines for “Coastal” Cactus Wrens. Updated 5-04-09. Prepared by Robert A. Hamilton, Hamilton Biological. Commissioned by the Conservation Biology Institute and The Nature Conservancy. PPT. 84 slides.

These guidelines pull together and summarize life history information relevant to specialists in the region planning restoration projects intended to benefit “coastal” Cactus Wrens (CACW). Ten “parameters to consider” when restoring cactus habitat are presented. These include: CACW dispersal, size and extent of cactus scrub needed, distance between patches, number and density of plants, other plant species to include, configuration of plants, elevational limits, and physical considerations.

SDMMMP website link to document:

http://www.sdmmmp.com/Libraries/BMPS/Hamilton-CACW_Restoration_Guidelines-CBI_and_TNC-5-16-09.sflb.ashx

3.2. SEED COLLECTION

1. Way, M. and K. Gold. 2008. Assessing a Potential Seed Collection. Millennium Seed Bank Project KEW. Technical Information Sheet_02. Board of Trustees of the Royal Botanic Gardens, Kew. West Sussex. PDF. 2 pages.

This information sheet provides guidelines and a tool – the pre-collection checklist - to help collectors carry out that assessment and ensure that seed collections arriving at the seed bank are of the highest possible quality and quantity for long-term conservation. Topics include: prospecting, identification of the target species, assessing the population, what is a population, timing of seed collections, assessing readiness for collecting, assessing the physical quality of the seeds, assessing seed availability, cut-test to assess seed quality, and an example of a pre-collection checklist.

SDMMP website link to document:

http://www.sdmmp.com/Libraries/BMPS/KEW_Assess_Pot_Collect_HO.sflb.ashx

2. Way, M. and K. Gold. 2008. Seed Collecting Techniques. Millennium Seed Bank Project KEW. Technical Information Sheet_03. Board of Trustees of the Royal Botanic Gardens, Kew. West Sussex. PDF. 2 pages.

This information sheet outlines the manual techniques most commonly used to make seed collections of adequate quality and quantity, for long term conservation. Topics include: hand-picking of whole fruit, pruning clusters of fruit, shaking branches, collecting fleshy fruit, stripping entire seed heads, bagging seed heads, collecting from the ground, containers, and data.

SDMMP website link to document:

http://www.sdmmp.com/Libraries/BMPS/KEW_Seed_Collect_Tech_HO.sflb.ashx

3. Kew. 2001. Field Manual for Seed Collectors: Seed Collecting for the Millennium Seed Bank Project, Royal Botanic Gardens, Kew. PDF. 21 pages.

This Manual of Seed Collecting is part of the Millennium Seed Bank Project's (MSBP) information-sharing process, and is designed to provide general guidelines regarding seed collecting practice and to provide specific practical details relevant to the collection of seed for the MSBP. Topics include: planning a seed collecting expedition, collecting in the field, and shipping collections to Kew

SDMMP website link to document:

http://www.sdmmp.com/Libraries/BMPS/KEW_Seed_Collection_Guide.sflb.ashx

4. Wall, Michael. 2009. Seed Collection Guidelines for California Native Plant Species. Prepared for Rancho Santa Ana Botanic Garden. PDF. 25 pages.

This document provides instructions for making high quality seed collections. Topics include: Why – defining the purpose and use of the seed collection, What – defining high

quality seed collections, Where – being at the right place, When – at the right time, and How – making high quality collections. Seed storage guidelines are also included.

SDMMP website link to document:

http://www.sdmmp.com/Libraries/BMPS/RSABG_Seed_Collecting_and_Storage_Guidelines.sflb.ashx

3.3. WEED REMOVAL

1. Tu, M., Hurd, C. and J.M. Randall. 2001. Weed Control Methods Handbook, The Nature Conservancy, <http://tncweeds.ucdavis.edu>, version: April 2001. PDF. 219 pages.

This handbook provides detailed information about the tools and techniques available for controlling invasive plants, or weeds, in natural areas. It is divided into eight chapters, covering a range of different control methods.

SDMMP website link to document:

http://www.sdmmp.com/Libraries/BMPS/Weed_Control_methods_handbook_2001.sflb.ashx

2. DiTomaso, J.M., G.B. Kyser, and M.J. Pitcairn. 2006. Yellow Starthistle Management Guide. Cal-IPC Publication 2006-03. California Invasive Plant Council: Berkeley, CA. 78 pp. Available: www.cal-ipc.org.

This book provides a guide to the management of yellow starthistle (*Centaurea solstitialis* L.). Chapters on the biology, impact, and spread of yellow starthistle are included along with numerous control strategies.

SDMMP website link to document:

http://www.sdmmp.com/Libraries/BMPS/YSTMgmtweb_2006.sflb.ashx

Section 4.0 Implementation Plan Format

4.1. OVERVIEW

The Implementation Plan (IP) format provided in this section is meant to be an example of the types of information that should be included to inform the stakeholders of the actions to be implemented for the objective in question, for use in contracting with other entities, if necessary, and for tracking the completion of objectives and actions. Other information not presented below may be included if needed. A separate IP should be developed for each objective; an IP may include numerous actions. Data and reports should be sent to SC-MTX.

An IP includes four sections:

- Section I. Contact Information – This section provides contact information for the IP developer, provides names of the stakeholders involved and meeting dates.
- Section II. MSP Goal and Objectives Addressed – This section provides the goal and objective being addressed. A separate IP should be developed for each objective.
- Section III. Overview of Actions – This section provides an overview of the actions to be implemented.
- Section IV. Detailed Actions – This section provides the details for each action and is completed for each action to be implemented. The scope of work, budget, and schedule sections may be used in contracts needed to implement actions.
- Attachment 1 is included as an example of select sections of the current 2013 SANDAG grant application form for a *TransNet* land management grant. Only the scope of work, budget, and schedule sections are provided as an example of information needed by SANDAG for contracting purposes.
- Attachment 2 is included as an example of select sections from a completed grant application for a *TransNet* land management grant. Only the scope of work, budget, and schedule sections are provided as an example of information needed by SANDAG for contracting purposes. Note that this example follows the 2010 grant application form.

4.2. IP SECTIONS

Section I. Contact Information

1. Date IP completed, plus any revision dates
2. Name(s) and contact info for who completed the IP
3. Name and contact info for Implementation Entity/Organization taking lead for objective
4. Names of Stakeholders and Meeting Dates
 - a. List stakeholders and their role
 - b. List meeting dates

- c. Attach agenda and meeting notes

Section II. MSP Goal and Objective Addressed

1. MSP volume and page number
2. Species/Vegetation Community/Threat/Stressor Addressed
3. Copy/paste the goal(s) and objective into the IP

Section III. Overview of Actions

1. List management Actions to be taken to implement objective (details on each action to be provided in Section IV). Attach protocols to be followed, if needed
2. Fund source to be used for each Action
3. Who will implement actions and by what method (e.g. contract/agreement, in-house staff, volunteers, etc.)
4. Where the action will be conducted (study area and geographic scale)
5. Whether the action will utilize an adaptive management approach or a BMP; attach the BMP
6. General schedule for actions
7. List any issues that need to be resolved before moving forward with management actions
8. Provide citations for any literature cited

Section IV. Detailed Actions

1. For each Action, provide the following information:
 - a. Scope of Work by Action and Task
 - i. Description of each action and task
 - ii. Expected results and deliverables and estimated dates of completion
 1. List who will be providing Project Status Report(s) and when
 2. Describe data that will be submitted through the SC-MTX web portal and when
 3. Describe what monitoring will be done, and the pre-project power analysis used to evaluate the proposed monitoring protocol, if applicable
 4. Provide details on how will interim data be managed and who will be doing data analyses, if any
 5. List any other products anticipated
 - iii. Personnel needed
 - iv. Budget
 - v. Schedule

ATTACHMENT 1: EXAMPLE OF SANDAG SCOPE OF WORK, BUDGET, AND SCHEDULE SECTIONS FROM GRANT APPLICATION FORM FOR FISCAL YEAR 2013 FUNDING FOR LAND MANAGEMENT

B. Scope of Work by Task

Please break down the proposal into discrete tasks with a task name, description of each task, quantify expected results, and discrete deliverables for each task. Note: make sure to include tasks for both quarterly reporting on the status of the grant project and a final report on the outcome of the grant project. The applicant should choose one of the three eligible activities, described in the Call for Projects that best characterizes their project for consideration under this grant program. You may add or subtract rows as needed.

Exhibit A – Scope of Work

Task #	Task Name	Task Description	Deliverables
1	Name of Task	Describe Task	List the deliverables
2			
3			
4			
5			
....			
....	Administrative		

C. Budget by Task

Please include a specific budget for each task described in the Scope of Work (section B above). This should include both requested SANDAG funds and any matching funds proposed. If matching funds are proposed, please distribute the match commitment proportionately throughout the project budget to ensure that matching funds and grant funds are proportionately distributed throughout the life of the project. For projects requesting funding for more than one year, please indicate the requested funding and match for each year. Applicants are encouraged to identify phasing in their proposal in case full funding for the project is not available. You may add or subtract rows and columns as needed.

Exhibit B - Project Budget

Task #	Task Name	Year 1 Grant Request	Year 1 Matching Funds ¹	Year 2 Grant Request	Year 2 Matching Funds ¹	Year 3 Grant Request	Year 3 Matching Funds ¹	Total Project Cost	Total Grant Request	Total Matching Funds ¹
1		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
3		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
4		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
5		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
....										
....	Administrative	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Sub Total	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Indirect Cost (_%)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	TOTAL	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

¹ Throughout the Project, Matching Funds must be proportionate to TOTAL Project Costs (Grant Request and Matching Funds combined)

D. Project Schedule

Please include start date as Notice to Proceed and end date for each task described in the Scope of Work (section B above). Please include tasks for both quarterly reporting on the status of the grant project and a final report on the outcome of the grant project. You may add or subtract rows as needed.

Exhibit C - Project Schedule

Task #	Task Name	Proposed Start Date	Months Needed to Complete Task	Task End Date
1		"n" Months from NTP	"n" Months from NTP	MM/DD/YYYY
2		"n" Months from NTP	"n" Months from NTP	MM/DD/YYYY
3		"n" Months from NTP	"n" Months from NTP	MM/DD/YYYY
4		"n" Months from NTP	"n" Months from NTP	MM/DD/YYYY
5		"n" Months from NTP	"n" Months from NTP	MM/DD/YYYY
...		"n" Months from NTP	"n" Months from NTP	MM/DD/YYYY
...	Administrative	"n" Months from NTP	"n" Months from NTP	MM/DD/YYYY

ATTACHMENT 2: EXAMPLE OF SCOPE OF WORK, BUDGET, AND SCHEDULE SECTIONS FROM PAST LAND MANAGEMENT GRANT APPLICATION SUBMITTED TO SANDAG (NOTE: THIS FOLLOWS 2010 APPLICATION FORMAT)

B. Scope of Work by Task

Task 1. Invasive Plant Control

Non-native, invasive plants pose one of the greatest threats to the biological integrity of preserve lands because of their ability to displace native species, degrade wildlife habitat, and alter ecosystem processes¹. Both South Crest and CER are surrounded by urban and rural development and thus, are susceptible to recurrent invasive plant infestations. The 2003 Cedar Fire exacerbated the spread and establishment of invasive plants. To date, post-fire invasive species mapping has been conducted opportunistically, rather than comprehensively, and only on CER. Further, the post-fire status of MSCP covered plant species has not been evaluated on South Crest with respect to extent or condition, and many of these covered plant species may be directly threatened by invasive species. Accurate mapping of these species is necessary so they can be avoided during invasive plant control actions. The following task components are designed to inform and prioritize management actions, as well as prevent future invasions. Specific actions, results, recommendations, and issues will be documented in quarterly reports and summarized in a final report.

1.1 Invasive species mapping (May 2010 [or contract initiation] – September 2010)

Mapping will be conducted on South Crest and portions of CER that have not been assessed, using a GPS, focusing on invasives that pose the greatest threat to covered species and habitats, and for which control efforts are likely to be effective. Selection and prioritization of species for mapping will be coordinated with the regional invasive species mapping program being conducted under a separate Transnet grant. The mapping proposed herein will focus on species that are problematic at the preserve-level, but which are not considered a high mapping priority region-wide. Conversely, this effort will communicate information regarding high priority invasive species detected onsite to the regional mapping program.

Expected results/Deliverables: Mapped location and extent of selected invasive species/GIS data layer of invasive species; risk assessment of invasive species that pose the greatest threat to covered species and habitats; recommendations for invasive control actions.

1.2. Covered plant species mapping (May 2010 [or contract initiation] – September 2010)

This effort is specific to South Crest, which has not been assessed since the 2003 Cedar Fire. CBI and contractors will map the location and extent of MSCP covered plant species using a GPS, and identify threats to species populations from invasive plants. [note: This effort is proposed for spring/early summer 2010; however, if conditions do not allow for this schedule, then surveys for some species be deferred until spring 2011].

Expected results/Deliverables: Mapped location and extent of MSCP covered species on South Crest/GIS data layer of covered species; assessment of threats and management actions.

¹ California Invasive Plant Council.

1.3. Invasive plant control (January 2011 – June 2011)

On South Crest, five highly invasive and seven moderately invasive species were documented onsite prior to the 2003 Cedar Fire. Based on results of the first two components of this task, control measures will be implemented for those invasives determined to pose the greatest risk to covered species and habitats.

On CER, invasive control (primarily, herbicides) is proposed in 1) San Diego thornmint habitat, 2) a 10-acre grassland restoration site, 3) 5 acres of coastal sage scrub undergoing post-fire restoration, and 4) 5 acres of a coast live oak/Engelmann oak grove. Since the 2003 Cedar Fire, thornmint habitat has been invaded heavily by the nonnative grass species, *Brachypodium distachyon*, and control of this invasive is critical to persistence of thornmint onsite. The grassland restoration and coastal sage scrub sites occur within the narrowest portion of CER, and thus are most susceptible to invasive species from adjacent properties. Finally, invasives control within the oak grove will focus on a relatively small (and still manageable) infestation of a species that is spreading rapidly in southern California, *Erharta longiflora*.

Expected results/Deliverables: Minimize threats to covered species and habitats/Specific invasive species cover thresholds, expected to range from <15-25%, for each treatment area prior to implementation; post-treatment assessments.

1.4 'Early detection' invasive control plan (January 2011 – June 2011)

Because South Crest and CER are in proximity to development and open to recreational use, invasive species are anticipated to be an ongoing issue. This task includes establishing protocols and initial field reconnaissance (expected to continue on a quarterly or semi-annual basis) to detect early invasions along trails and other disturbed areas so they can be treated in a timely fashion. This task would be initiated after completion of the first 3 components, above.

Expected results/Deliverables: Detection of new invasive plant infestations/Mapped location and extent of invasive species; risk assessment of detected species; recommendations for control.

Task 2. Access Control/Management and Garbage Removal

Human-related disturbances on South Crest and CER are ongoing and include unauthorized motor vehicles and uncontrolled access (including off-leash dogs) into natural areas, resulting in habitat degradation, erosion, garbage, and the potential loss of wildlife corridor functions. Specific actions, results, recommendations, and issues will be documented in quarterly reports and summarized in a final report.

2.1 Coordination with law enforcement (July 2010 – June 2011)

EDI and EHC will coordinate with CDFG wardens for serious issues such as poaching; San Diego County Sheriff's Department for vehicle violations, and San Diego County Animal Services for off-leash violations.

Expected Results/Deliverables: Decrease the incidents of serious or damaging violations on the properties/Incident reports for each violation.

2.2 Volunteer patrol (July 2010 – June 2011)

EDI will recruit, train, and support volunteer patrols for CER. Patrol members will receive at least 8 hours of training and quarterly support meetings. The volunteer patrols will provide an onsite presence, communicate with visitors regarding safe and allowable uses, and observe and report on both maintenance and violation issues.

Expected Results/Deliverables: Decrease in unauthorized access and uses; improved capacity to identify maintenance issues at an early stage; public outreach/Incident reporting system on the EDI/CER website.

2.3 Gate and fencing improvements (August 2010 – June 2011)

On South Crest, the existing gate and fencing will be maintained and new fencing installed to discourage off-road vehicle activity and guide hikers to existing trails. On CER, existing gates and fencing will be maintained and additional structures installed to prevent off-road vehicle activity. Boundaries will be surveyed, as needed, and an access plan developed.

Expected Results/Deliverables: Protection from illegal activities and recovery of habitat and species/Installation or repair of gates or fencing on both properties; boundary surveys and a plan to address access issues for CER.

2.4 Garbage removal (July 2010 – June 2011)

A one-time removal of large debris will be conducted on the South Crest properties, followed by monthly maintenance. In addition, regular garbage removal (trash cans, recycle bins) will occur weekly on both sites.

Expected Results/Deliverables: Improved habitat quality/An initial trash removal effort for large debris from dumping, followed by monthly maintenance; weekly garbage removal for bins.

2.5 Erosion control (July 2010 – June 2011)

Erosion control is necessary on South Crest adjacent to the access roads through the properties, as well as on a partially damaged dirt road (now closed), which receives use by hikers, equestrians, and mountain bike riders who are trespassing on the properties.

Expected Results/Deliverables: Reduction of potential threats to covered species and habitat from erosion/Improvements are proposed for an estimated 3-4 miles of trails and roads.

2.6 Signs (July 2010 – June 2011)

Signs will be installed at primary access points to discourage trespassing, describe compatible uses, and explain the value of biological monitoring and management. Law enforcement requires appropriate postings to prosecute violators. Use of South Crest for recreation will be discouraged; signs will underscore the fact that the South Crest properties are privately owned lands and trespassing is not permitted.

Expected Results/Deliverables: Improved compliance with regulations and authorized uses and increased visitor appreciation of protected lands/An estimated 25 signs on South Crest (rules signs), and 40 signs (30 rules signs and 10 interpretive signs) on CER.

2.7 Public education/outreach (August 2010 – June 2011)

EHC will coordinate with neighbors living adjacent to the properties, particularly the three residences at the center of the conserved South Crest lands. EDI will staff the visitor kiosk on CER and prepare public outreach and educational materials for distribution.

Expected Results/Deliverables: Increased cooperation with neighbors regarding access, acceptable land uses, and compatible plantings; increased sense of community stewardship/Monthly CER newsletter, annual mailings regarding fire safety and compatible uses on and adjacent to the reserve, and rules and habitat information brochures; CER website for outreach, education, and incident reporting.

C. Budget by Task

Task # and Name	Total Project Cost	Grant Request	Total Match	Year 1 Grant Request	Year 1 Match
South Crest Properties					
1. Invasive Plant Control					
1.1 Invasive Plant Mapping	\$13,575	\$13,575	--	\$13,575	--
1.2 Covered Species Mapping	\$14,630	\$14,630	--	\$14,630	--
1.3 Invasive Plant Control*	\$27,705	\$27,705	--	\$27,705	--
1.4 Early Detection Invasive Control Plan	\$4,600	\$4,600	--	\$4,600	--
2. Access Control/Management & Garbage Removal					
2.1 Law Enforcement Coordination	\$1,808	\$1,808	--	\$1,808	--
2.2 Volunteer Patrol	--	--	--	--	--
2.3 Gate and Fencing Improvements	\$14,210	\$14,210	--	\$14,210	--
2.4 Garbage Removal	\$3,544	\$3,544	--	\$3,544	--
2.5 Erosion Control	\$15,220	\$12,970	\$2,250	\$12,970	\$2,250
2.6 Signs	\$3,668	\$3,668	--	\$3,668	--
2.7 Public Education/Outreach	\$2,428	\$2,428	--	\$2,428	--
TOTAL, SOUTH CREST	\$101,388	\$99,138	\$2,250	\$99,138	\$2,250
Crestridge ER					
1. Invasive Plant Control					
1.1 Invasive Plant Mapping	\$15,341	\$15,341	--	\$15,341	--
1.2 Covered Species Mapping	--	--	--	--	--
1.3 Invasive Plant Control	\$57,405	\$54,805	\$2,600	\$54,805	\$2,600
1.4 Early Detection Invasive Control Plan	\$4,600	\$4,600	--	\$4,600	--
2. Access Control/Management & Garbage Removal					
2.1 Law Enforcement Coordination	\$2,120	\$1,870	\$250	\$1,870	\$250
2.2 Volunteer Patrol	\$12,366	\$11,116	\$1,250	\$11,116	\$1,250
2.3 Gate and Fencing Improvements	\$25,995	\$25,245	\$750	\$25,245	\$750
2.4 Garbage Removal	\$4,091	\$3,629	\$462	\$3,629	\$462
2.5 Erosion Control	--	--	--	--	--

2.6 Signs	\$6,087	\$5,712	\$375	\$5,712	\$375
2.7 Public Education/Outreach	\$20,674	\$4,474	\$16,200	\$4,474	\$16,200
TOTAL, CRESTRIDGE	\$148,679	\$126,792	\$21,887	\$126,792	\$21,887
TOTAL	\$250,067	\$225,930	\$24,137	\$225,930	\$24,137

*Cost assumes 15-20 acres of habitat will be treated.

D. Project Schedule

Task # and Name	Proposed Start Date	Proposed End Date
1. Invasive Plant Control		
1.1 Invasive Plant Mapping	5/1/2010*	9/1/2010
1.2 Covered Species Mapping	5/1/2010*	9/1/2010
1.3 Invasive Plant Control	1/1/2011	6/30/2011
1.4 Early Detection Invasive Control Plan	1/1/2011	6/30/2011
2. Access Control/Management & Garbage Removal		
2.1 Law Enforcement Coordination	7/1/2010	6/30/2011
2.2 Volunteer Patrol	7/1/2010**	6/30/2011
2.3 Gate and Fencing Improvements	8/1/2010	6/30/2011
2.4 Garbage Removal	7/1/2010	6/30/2011
2.5 Erosion Control	7/1/2010	6/30/2011
2.6 Signs	7/1/2010	6/30/2011
2.7 Public Education/Outreach	8/1/2010	6/30/2011

* Optimal start date; proposed end date contingent upon start date but may be extended to Spring 2011 for some species if climatic conditions are sub-optimal or start date is delayed.

** Training and organization will commence in July 2010; on-the-ground patrols are expected to begin in September or October 2010.

Section 5.0 Additional Details

This section is in progress.

**Appendix 3A
Draft MSP (1/7/2013) Goals and
Objectives for Species-Specific
Management Species.**

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Draft MSP (1/7/2013) Goals and Objectives for Species-Specific Management Species. To be revised by September 2014.

Management Category SO Species

4.2.1.1 Nuttall's Lotus (*Acmispon prostratus*)

Nuttall's Lotus Overall Management Goal:

Maintain and enhance all large populations (≥ 500 individuals) of Nuttall's lotus to increase resilience to environmental stochasticity, maintain genetic diversity, and ensure persistence over the long term (>100 years) in native plant communities.

Nuttall's Lotus Management Group Designation: SPECIES-SPECIFIC

Nuttall's lotus warrants species-level management as it is restricted to beaches and sand dunes along the coast in San Diego County and northern Baja California. Most populations within the MSPA are small (<500 individuals), threatened by invasive nonnative plants and could be extirpated.

Management Units with Known Conserved Populations of Nuttall's Lotus:

Populations of Nuttall's lotus are known to occur in MUs 1 and 7. See Appendix Table 1 for a complete listing of all known conserved locations.

Nuttall's Lotus Stressors on Conserved Lands:

- Invasive nonnative plants
- Trampling
- Loss of sand
- High nutrient levels

Rationale for Management Objectives:

Management Units 2, 3, 4, 5, 6 and 8: There are no known populations of Nuttall's lotus in MUs 2, 3, 4, 5, 7 and 8 so no management goals and objectives have been prepared for these management units.

Management Units 1 and 7: In MU 1 there are two very large Nuttall's lotus populations ($> 10,000$ individuals), two large populations (500–10,000 individuals), six small populations (< 500 individuals) and three populations of unknown size. MU 7 has two large populations and two small populations. The large populations should be maintained free of threats and the small populations should be expanded to enhance chances of long-term viability.

5.2.1.1 Nuttall's Lotus (*Acmispon prostratus*)

Nuttall's Lotus Known Conserved Locations in MU 1:

MU 1 includes two very large populations ($> 10,000$ individuals) of Nuttall's lotus, two large (500-10,000 individuals), six small (< 500 individuals) populations, and three populations of unknown size (Figure 1).

Nuttall's Lotus Stressors on Conserved Lands in MU 1:

There is no information on stressors for over 60% of the populations in MU 1. Those populations with threat information are impacted by invasive nonnative plants, including ice plant, garland chrysanthemum and Sahara mustard. Other threats include trampling and high nutrient levels.

Nuttall's Lotus MU 1 Management Goal:

Maintain very large and large populations of Nuttall's lotus to increase resilience to environmental stochasticity, maintain genetic diversity, and ensure persistence over the long term (>100 years) in native plant communities in MU 1.

Nuttall's Lotus MU 1 Management Objectives:

First Priority MU 1 Management Objectives

- F1. Beginning in 2014, maintain very large populations (>10,000 individuals; i.e., Silver Strand State Beach and Silver Strand Elementary) at no less than 20% of their recent (2009-2011) population levels (see table below).
- F2. Beginning in 2014, for populations between 500 and 10,000 individuals (see table below; i.e., Mission Bay's Fiesta Island and Hospitality Point) enhance populations so that by 2017 they have increased to > 10,000 individuals.

Actions to Achieve First Priority MU 1 Management Objectives

- Prepare site specific management directives for each population to achieve the MU 1 management objectives. The management objectives should include the following criteria:
 - Maintain or create sandy substrate openings (20-50%) to provide areas for Nuttall's lotus expansion. For occupied patches that overlap with California least tern nesting areas, the sandy substrate should be 70-90% of the site.
 - Eliminate/reduce nonnative plant species within each site to $\leq 10\%$ absolute cover.
 - Enhance/establish native plant species that naturally co-occur with Nuttall's lotus.
- Implement the site specific management directives for each population that would achieve the MU 1 management objectives and monitor the results to inform subsequent year management actions and modify as necessary.

Second Priority MU 1 Management Objectives

- S1. For sites that support < 500 individuals, reduce nonnative plant cover to < 20% of the site's total cover, increase the population to > 500 individuals in locations where adequate areas of appropriate substrate for the species exist.

Actions to Achieve Second Priority MU 1 Management Objectives

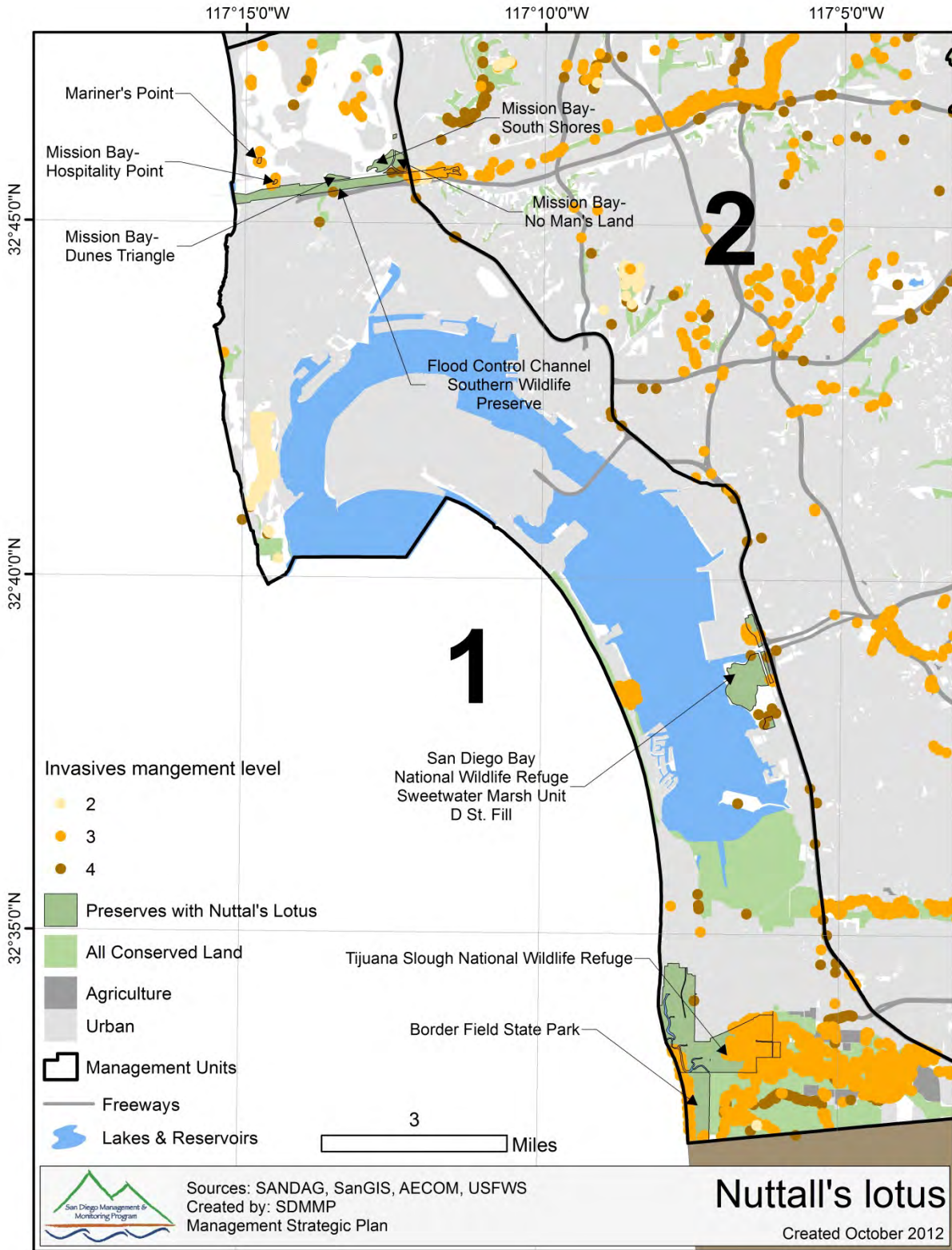
- Evaluate each occupied site to determine the management actions required to maintain the populations at existing levels and achieve the MU 1 management objectives.
- Evaluate each site occupied site to determine if increased management could provide habitat (spatial area and appropriate conditions) for > 500 individuals.

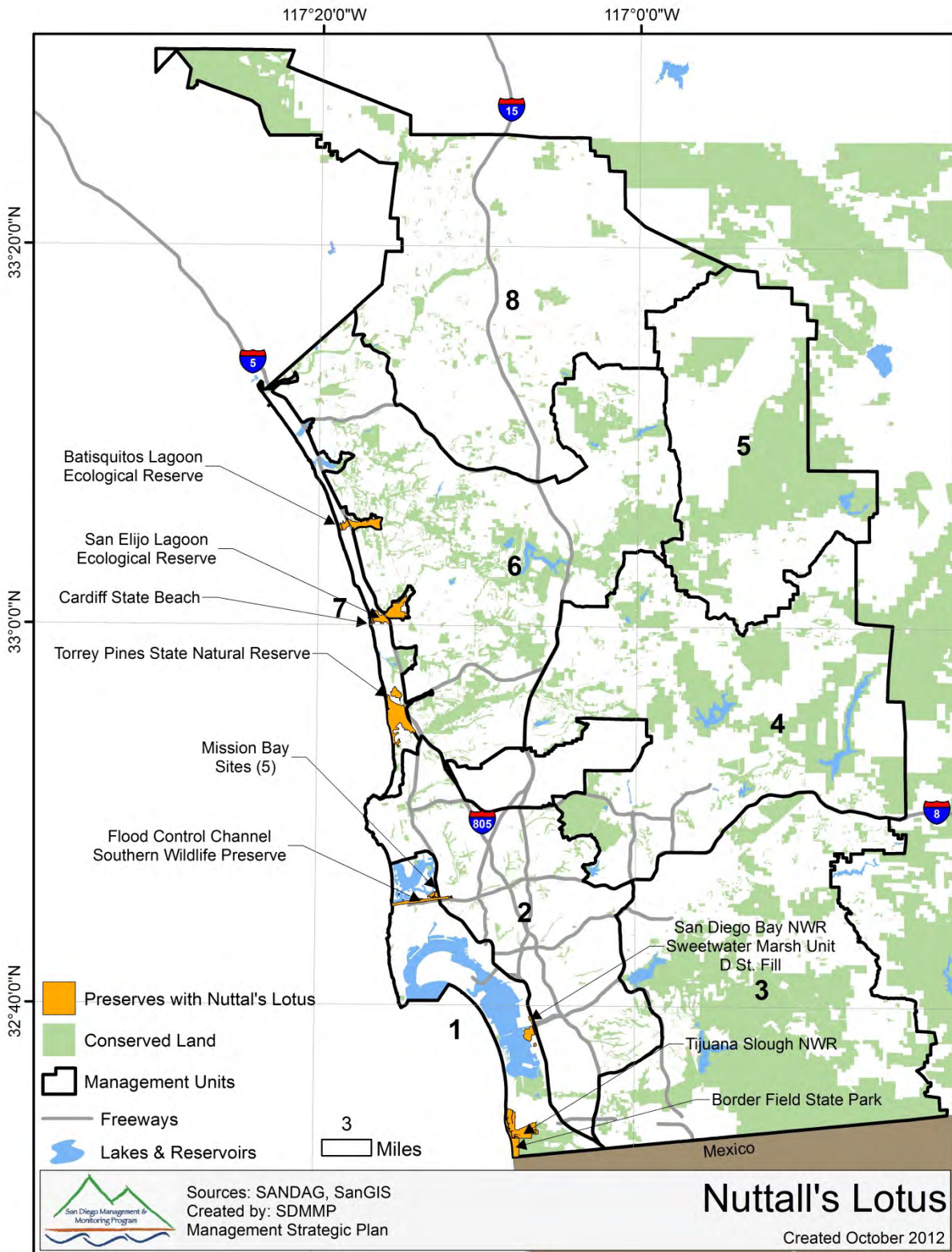
Conserved Nuttall's lotus populations in MU 1.

MU	Population	Land Owner/ Manager*	Pop Mgmt Status**	Est. No. of Indiv.	Survey Year	Threats	Source
<i>Very Large Populations (>10,000 individuals)</i>							
1	Silver Strand State Beach	CDPR	UM	18,000-24,000	2011	No information.	CNPS 2011
1	Silver Strand Elementary	?	UM	16,000-17,000	2011	No information.	CNPS 2011
<i>Large Populations (500-10,000 individuals)</i>							
1	Mission Bay – Fiesta Island	City San Diego	M	1,234	2011	No information.	CNPS 2011
1	Mission Bay – Hospitality Point	City San Diego	M	614	2012	Invasive nonnative plants, management is reducing cover	City San Diego 2012
<i>Small Populations (<500 individuals)</i>							
1	School Site 5	City San Diego?	UM	150	2005	No information	McEachern et al. 2007
1	Mission Bay – No Man's Land	City San Diego	UM	110	2010	High cover of invasive nonnative plants, especially garland chrysanthemum and Sahara mustard	City San Diego 2010
1	San Diego River – Rip Rap	City San Diego	UM	100	2009	None identified.	City San Diego 2009
1	Mission Bay – South Shores	City San Diego	M	70	2012	High cover of ice plant is being removed	City San Diego 2012
1	Mission Bay – Mariner's Point	City San Diego	NM	50	2008	Area fenced for least terns so access to manage is limited	City San Diego 2008
1	Mission Bay – Dune Triangle	City San Diego	UM	1	2012	High cover of invasive nonnative plants, particularly garland chrysanthemum	City San Diego 2012
<i>Populations of Unknown Status</i>							
1	Tijuana Slough National Wildlife Refuge	USFWS	UM	?		No information.	
1	San Diego Bay Wildlife Refuge – D Street Fill	USFWS	UM	?		No information.	
1	Border Field State Park	CDPR	UM	?		No information	

*Land Owner/Manager Codes: CDPR = California Department of Parks and Recreation; USFWS = United States Fish and Wildlife Service.

**Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.





11.2.1.1 Nuttall's Lotus (*Acmispon prostratus*)

Nuttall's Lotus Known Conserved Locations in MU 7:

MU 7 supports two large populations of Nuttall's lotus (500 – 10,000 individuals) at San Elijo Lagoon and Torrey Pines State Reserve and two small populations at Cardiff State Park and Batiquitos Lagoon (Figure 1).

Nuttall's Lotus Stressors on Conserved Lands in Mu 7:

Stressors to Nuttall's lotus populations in MU 7 include invasive nonnative annual and perennial plants, trampling and eroding sand.

Nuttall's Lotus MU 7 Management Goal:

Maintain and enhance all large populations with > 500 individuals to increase resilience to environmental stochasticity, maintain genetic diversity, and ensure persistence over the long term (>100 years) in native plant communities in MU 7.

Nuttall's Lotus MU 7 Management Objectives:

First Priority MU 7 Management Objectives

- F1. Beginning in 2014, for populations with < 2,000 individuals (see table below; i.e., San Elijo Lagoon) enhance and expand populations so that increase to $\geq 2,000$ individuals with a minimum patch size of at least one acre by 2017.
- F2. Establish one new population of $\geq 2,000$ individuals within ≥ 1 acre area and with a matrix of native plants.

Actions to Achieve First Priority MU 7 Management Objectives

- Prepare site specific management directives for each population to achieve the MU 7 management objectives. The management objectives should include the following criteria:
 - Maintain or create sandy substrate openings (20-50%) to provide areas for Nuttall's lotus expansion. For occupied patches that overlap with California least tern nesting areas, the sandy substrate should be 70-90% of the site.
 - Eliminate/reduce nonnative plant species within each site to $\leq 10\%$ absolute cover.
 - Enhance/establish native plant species that naturally co-occur with Nuttall's lotus.
- Implement the site specific management directives for each population that would achieve the MU7 management objectives and monitor the results to inform subsequent year management actions and modify as necessary.

Second Priority MU 7 Management Objectives

- S1. For sites that support < 500 individuals, reduce nonnative plant cover to < 20% of the site's total cover, increase the population to > 500 individuals in locations where adequate areas of appropriate substrate for the species exist.

Actions to Achieve Second Priority MU 7 Management Objectives

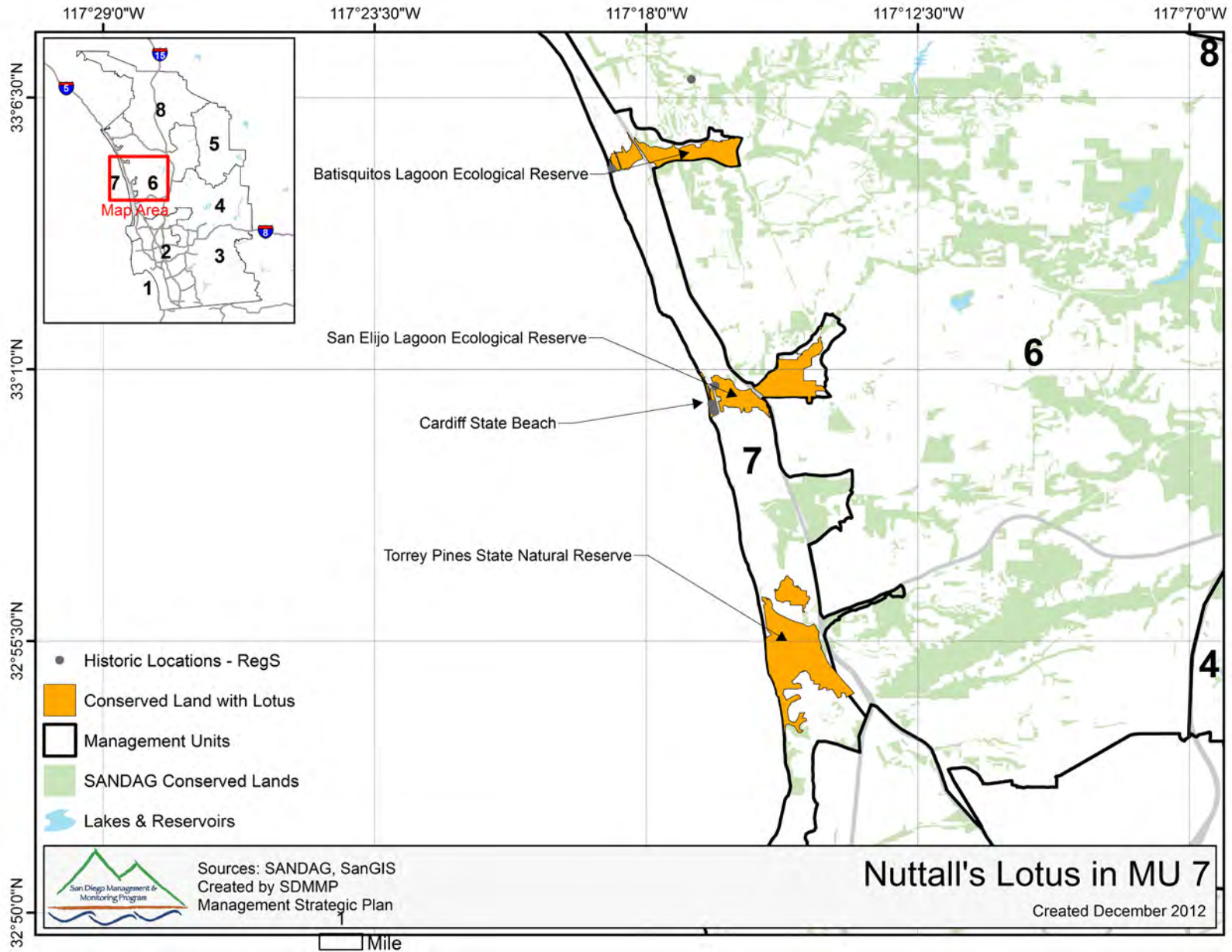
- Evaluate each occupied site to determine the management actions required to maintain the populations at existing levels and achieve the MU7 management objectives.
- Evaluate each site occupied site to determine if increased management could provide habitat (spatial area and appropriate conditions) for > 500 individuals.

Conserved Nuttall's lotus populations in MU 7.

MU	Population	Land Owner/ Manager	Pop. Mgmt. Status*	Est. No. of Indiv.	Survey Year	Threats	Source
<i>Large Populations (≤500 individuals)</i>							
7	San Elijo Lagoon	DFW/San Elijo Lagoon Conservancy	UM	5,000	2011	No information.	CNPS 2011
7	Torrey Pines State Reserve	CDPR	UM	>500	2011	No information.	CNPS 2011
<i>Small Populations (<500 individuals)</i>							
7	Cardiff State Park	CDPR	UM	29	2011	No information.	CNPS 2011
7	Batiquitos Lagoon	DFW/Batiquitos Lagoon Foundation	UM	4	2011	No information.	CNPS 2011

*Land Owner/Manager Codes: CDPR = California Department of Parks and Recreation; DFW = California Department of Fish and Wildlife.

**Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



4.2.1.6 Orcutt's Brodiaea (*Brodiaea orcuttii*)

Orcutt's Brodiaea Overall Management Goal:

Maintain large populations and enhance and expand small populations of Orcutt's brodiaea to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

Orcutt's Brodiaea Management Group Designation: SPECIES-SPECIFIC

This endemic species when not associated with a vernal pool complex should be managed at a species-specific level due to its limited distribution in southwestern California and northwestern Baja California, Mexico. Where this species occurs within a complex of vernal pools, it should be managed as part of vernal pool habitat management. Most Orcutt's brodiaea populations are small and threatened by invasive nonnative plants and require management to ensure their persistence in the MSPA.

Management Units with Known Conserved Populations of Orcutt's Brodiaea:

Conserved populations of Orcutt's brodiaea are known to occur in MUs 2, 3, 4, 6 and 8. See Appendix Table 1 for a complete listing of all locations where this species has been detected.

Orcutt's Brodiaea Stressors on Conserved Lands

- Invasive nonnative plants
- Altered fire regimes leading to conversion of native habitats to nonnative grassland
- Non-motorized recreation

Rationale For Management Objectives

Management Units 1, 5 and 7: There are no known populations of Orcutt's brodiaea in MUs 1, 5, and 7 and there are no goals and objectives for this species in these MUs.

Management Units 2, 3, 4, 6 and 8: There are 12 conserved populations of Orcutt's brodiaea distributed throughout the MSPA (see figure below). This species occurs at two sites in each of MUs 2, 3, and 4, at five sites in MU 6, and one site in MU 8. Only 25% of the populations are considered to be large (>1,000 individuals). It is essential to maintain large populations and enhance smaller populations within each of the MUs so they are more likely to persist over the long term.

6.2.1.1 Orcutt's Brodiaea (*Brodiaea orcuttii*)

Orcutt's Brodiaea Known Conserved Locations in MU 2:

There is one large populations and one small conserved populations of Orcutt's brodiaea in MU 2 (see table below, figure below). Both populations are associated with vernal pool complexes. Estimating Orcutt's brodiaea population size is difficult as the proportion of corms that grow and flower depends on growing conditions and can vary significantly from year to year due to the timing and amount of rainfall. In low rainfall years, there may be no vegetative growth or flowering. As a result of this interannual variation, it is difficult to determine true population size.

Orcutt's Brodiaea Stressors on Conserved Lands in MU 2:

The most important stressor for conserved populations of Orcutt's brodiaea in MU 2 is invasive nonnative plant species, particularly annual grasses and forbs.

Orcutt’s Brodiaea MU 2 Management Goal:

Maintain the large population and enhance and expand the small populations of Orcutt’s brodiaea to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

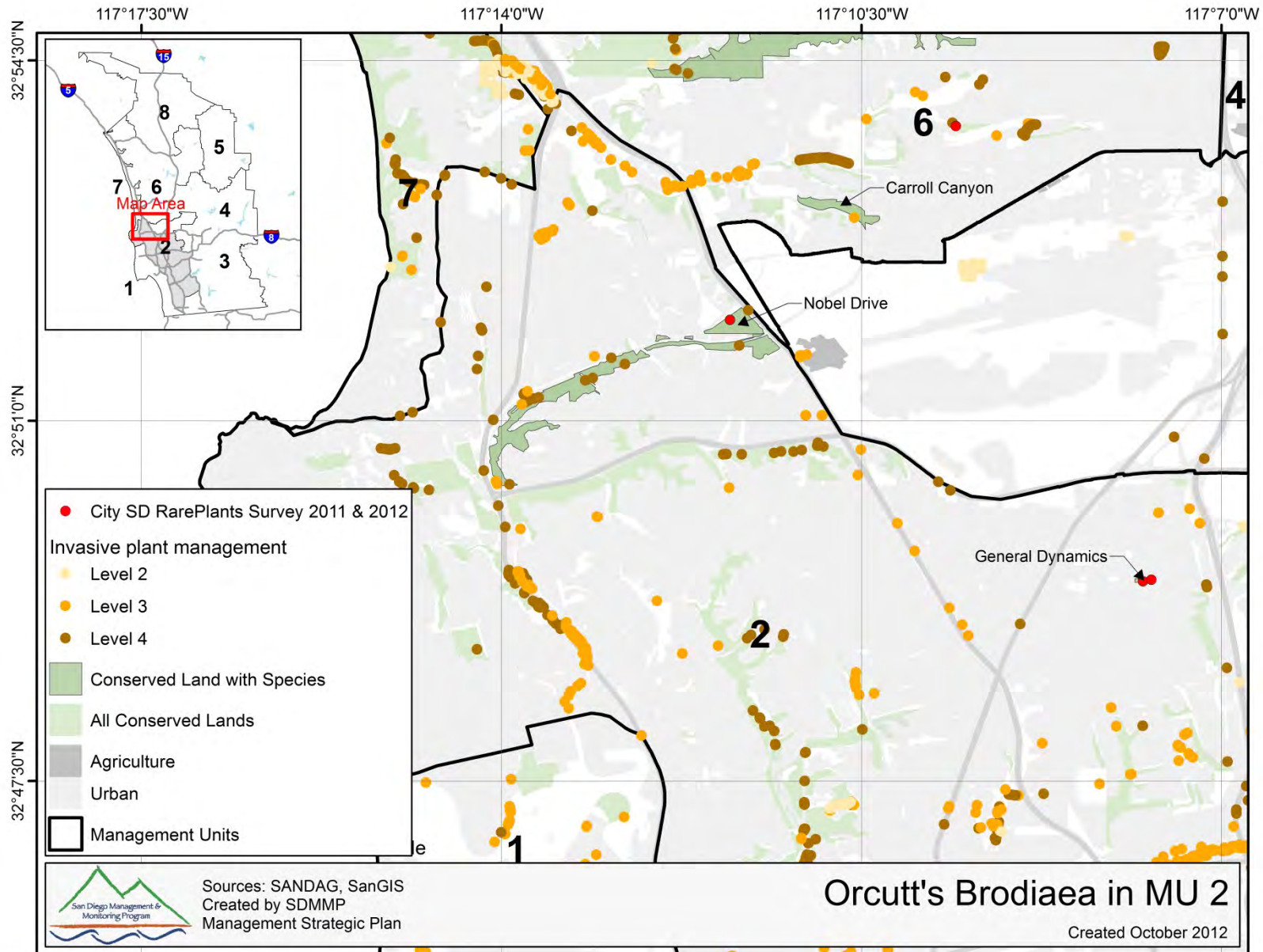
Orcutt’s Brodiaea Management Objectives:

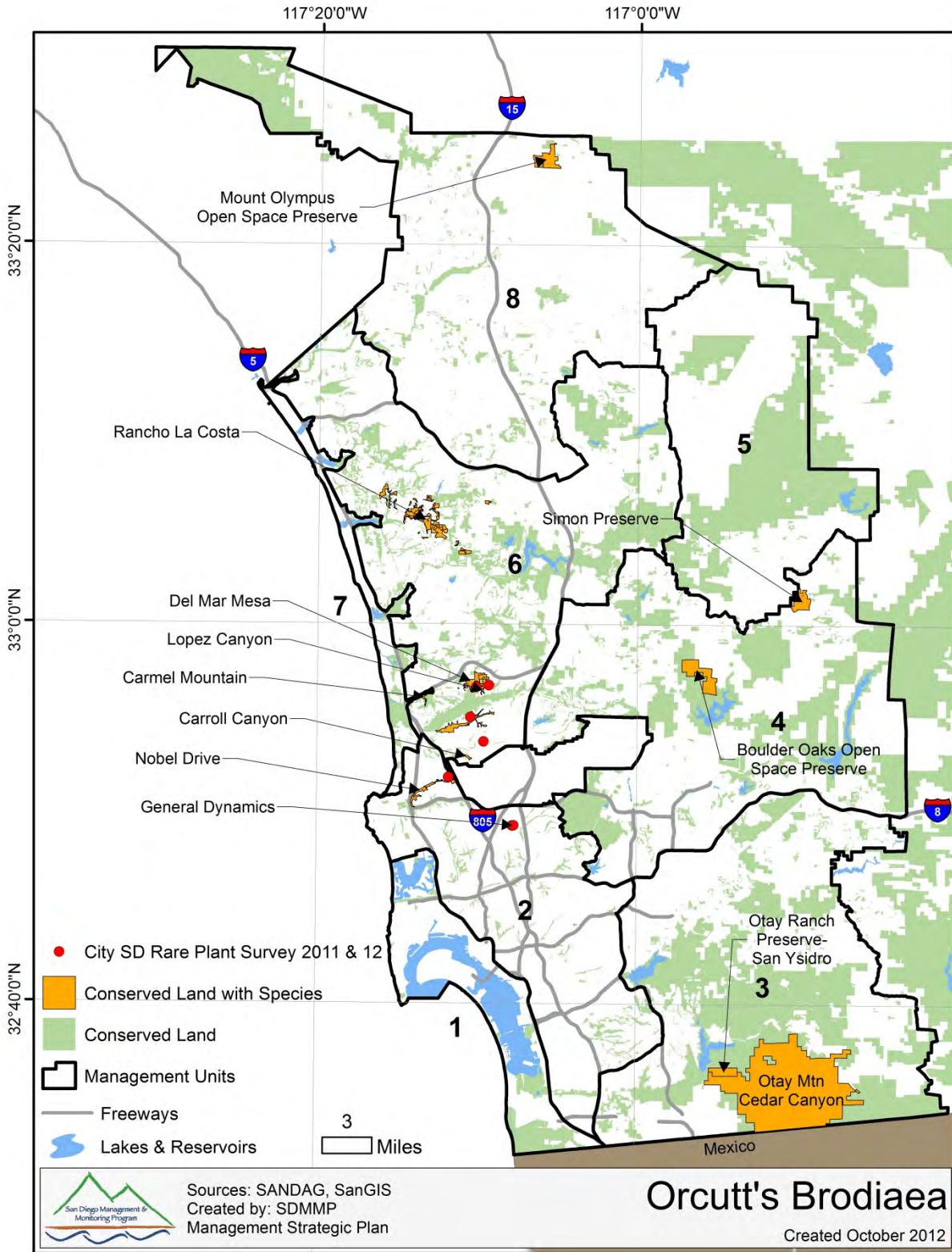
In MU 2, this species should be managed as part of the vernal pool habitat management.

Known conserved populations of Orcutt’s brodiaea at vernal pool complexes in MU 2.

MU	Population	Land Owner/ Manager	Pop Mgmt Status*	No. of Indiv	Survey Year	Threats	Source
2	General Dynamics	Private	M	30,000	2011	Invasive nonnative plants.	City San Diego 2012
2	Nobel Drive	City San Diego	M	0	2012	78 plants in 2011. Moderate level invasive nonnative plants.	City San Diego 2012

*Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.





7.2.1.3 Orcutt's Brodiaea (*Brodiaea orcuttii*)

Orcutt's Brodiaea Known Conserved Locations in MU 3:

There are two small conserved populations of Orcutt's brodiaea in MU 3 (see table below, figure below). A third population recently disappeared. Estimating population size is difficult as the proportion of corms that grow and flower depends on growing conditions. The proportion of growing and flowering plants can vary significantly from year to year due to the timing and amount of rainfall. In low rainfall years, there may be no vegetative growth or flowering. As a result of this interannual variation, it is difficult to determine true population size.

Orcutt's Brodiaea Stressors on Conserved Lands in MU 3:

Three known Orcutt's brodiaea populations in MU 3 burned in 2003 and 2007, with one population disappearing after 2001 and another becoming substantially reduced in the number of locations. An altered fire regime and invasion of nonnative plants following the fires pose a significant threat to the two remaining populations in MU 3.

Orcutt's Brodiaea MU 3 Management Goal

Expand the two small populations of Orcutt's brodiaea in MU 3 to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

Orcutt's Brodiaea MU 3 Management Objectives:

First Priority MU 3 Management Objectives

- F1. By 2016, identify and map suitable habitat adjacent to the two Orcutt's brodiaea populations in MU 3 (see figure below, table below) and determine the boundaries in which the population could feasibly be expanded.
- F2. By 2017, begin enhancing and expanding the two Orcutt's brodiaea populations to occupy $\geq 50\%$ of suitable habitat within the boundaries identified for population expansion. The populations should be maintained so that there is no trampling and invasive annual grasses and thatch are reduced to $\leq 10\%$ absolute cover and total non-native plant cover to $\leq 25\%$ absolute cover within the population's occupied extent and adjacent suitable habitat. If the population does not expand after three consecutive years of invasive plant control, then additional management actions could be implemented to enhance and expand the population.
- F3. By 2016, develop and implement measures to protect Orcutt's brodiaea from too frequent fire and that promote natural fire return intervals.

Actions to Achieve First Priority MU 3 Management Objectives

- Identify and map suitable habitat adjacent to the two Orcutt's brodiaea populations in MU 3. This mapping should take into account soil type, soil moisture, slope, aspect, native plant community composition and structure, and other environmental attributes at locations where the plants occur and identify adjacent areas with similar characteristics where the population may be expanded with management. Delineate boundaries for potential population expansion.

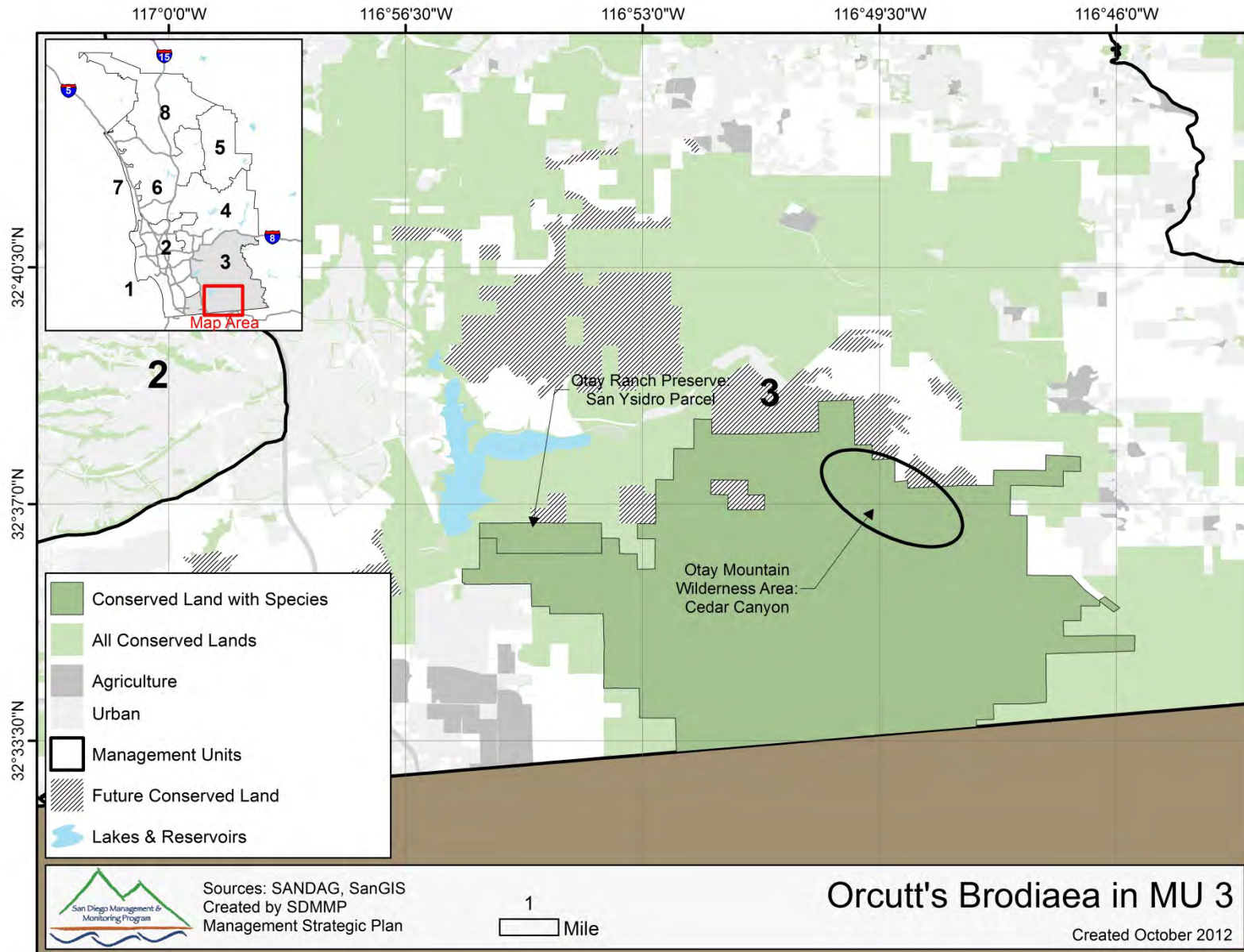
- Invasive plant control should be conducted based upon the best management practices used for other corm producing species with similar life histories (e.g., thread-leaved brodiaea) until success criteria are met and then as needed thereafter.
- If an Orcutt’s brodiaea population is affected or potentially affected by trampling, off-highway vehicle activity or other ground disturbance, then fencing, signage, closing of trails, and enforcement patrols should be implemented to reduce impacts.
- If a population is not meeting expansion criteria, then more intensive management could be undertaken, such as population augmentation (seeding or planting).
- By 2016, develop and implement measures to protect Orcutt’s brodiaea from too frequent fire and that promotes natural fire return intervals. These should include measures to reduce fire risk, suppression measures to reduce impact to the population if a fire should occur and post-fire recovery measures to reduce impacts to populations of Orcutt’s brodiaea.

Known conserved populations of Orcutt’s brodiaea in MU 3.

MU	Population	Land Owner/ Manager*	Pop Mgmt Status**	No. of Indiv	Survey Year	Threats	Source
3	Otay Ranch Preserve – Northern San Ysidro	County San Diego	NM	2	2011	Altered fire regime and invasive nonnative plants.	RECON 2012
3	Otay Mountain – Cedar Canyon	BLM	NM	?	2001	Altered fire regime and invasive nonnative plants.	McEachern et al. 2007 & compiled data

* Owner/Manager Codes: BLM = Bureau of Land Management

**Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management statu



8.2.1.3 Orcutt's Brodiaea (*Brodiaea orcuttii*)

Orcutt's Brodiaea Known Conserved Locations in MU 4:

There is a large population and a small population of Orcutt's brodiaea conserved in MU 4 (see table below, figure below). Estimating population size is difficult as the proportion of corms that grow and flower depends on growing conditions and flowering plants can vary significantly from year to year due to the timing and amount of rainfall. In low rainfall years, there may be no vegetative growth or flowering. As a result of this interannual variation, it is difficult to determine true population size.

Orcutt's Brodiaea Stressors on Conserved Lands in MU 4:

The most important stressors for conserved populations of Orcutt's brodiaea in MU 4 are an altered fire regime with too frequent fire and invasive nonnative plant species, particularly annual grasses.

Orcutt's Brodiaea MU 4 Management Goal:

Maintain the two populations of Orcutt's brodiaea in MU 4 to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

Orcutt's Brodiaea MU 4 Management Objectives:

First Priority MU 4 Management Objectives

- F1. Starting by 2018, maintain the Orcutt's brodiaea populations in MU 4 at Boulder Oaks Open Space Preserve and Simon Preserve (see table below) so that trampling is prevented and invasive annual grasses and thatch are reduced to $\leq 10\%$ absolute cover and total nonnative plants to $\leq 25\%$ absolute cover within the population's maximum occupied extent and a surrounding buffer area equal to 25% of this extent. If the population is reduced to $< 75\%$ of the maximum occupied extent for more than three consecutive years, then additional management actions could be implemented to expand and enhance the population.
- F2. By 2018, develop a fire management plan to protect Orcutt's brodiaea from too frequent fire and that promotes natural fire return intervals.

Actions to Achieve First Priority MU 4 Management Objectives

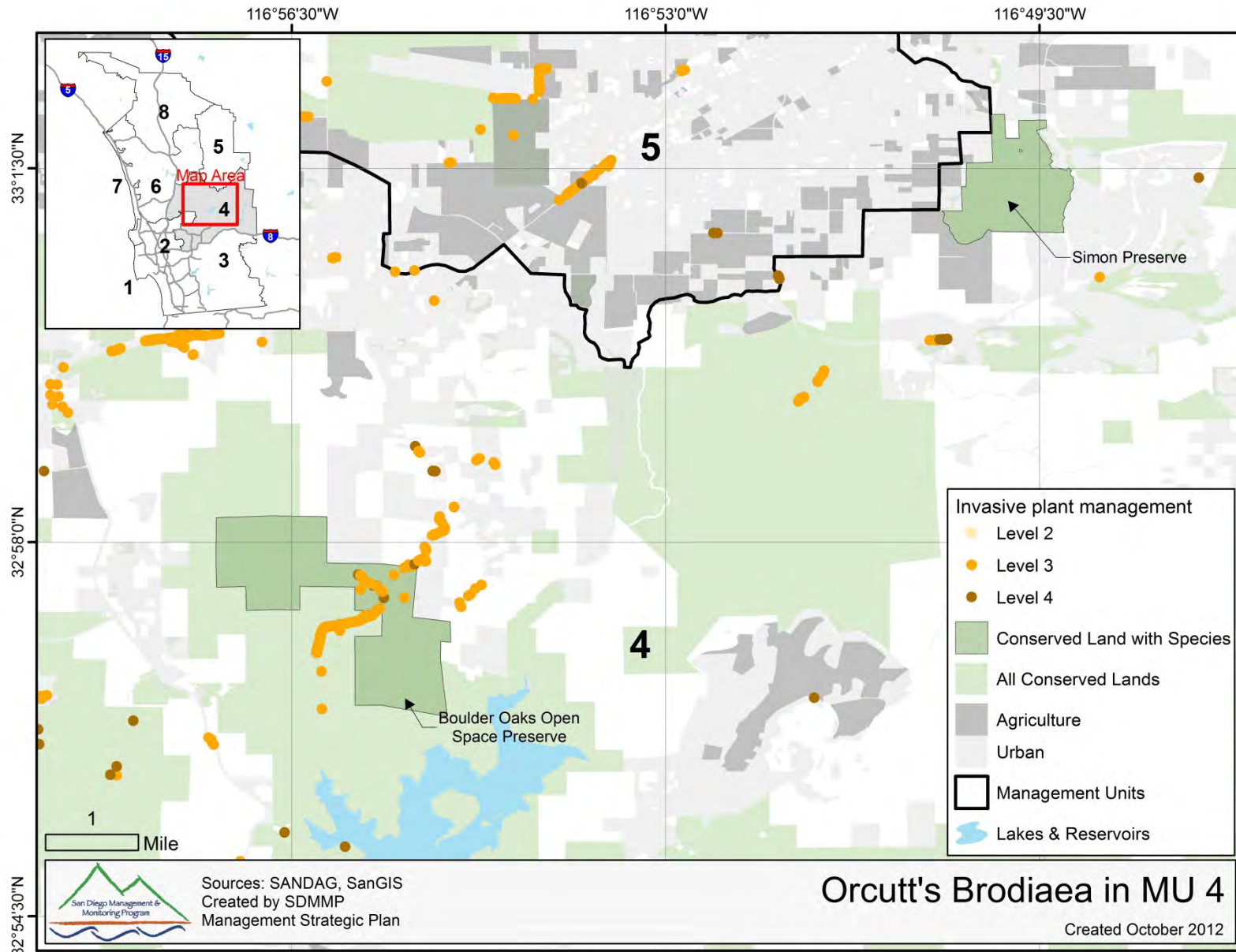
- Invasive plant control should be conducted based upon the best management practices used for other corm producing species with similar life histories (e.g., thread-leaved brodiaea) until success criteria are met and then as needed thereafter.
- If an Orcutt's brodiaea population is affected or potentially affected by trampling, off-highway vehicle activity or other ground disturbance, then fencing, signage, closing of trails, and enforcement patrols should be implemented to reduce impacts.
- If a maintained Orcutt's brodiaea population is $< 75\%$ of the maximum occupied extent for more than three years, then the benefits of further management actions should be considered if the population appears to be in threat of eventual extirpation. These measures can include more intensive invasive plant control efforts and population augmentation (seeding or planting).

- By 2018, develop and implement measures to protect Orcutt’s brodiaea from too frequent fire and that promotes natural fire return intervals. These should include measures to reduce fire risk, suppression measures to reduce impact to the population if a fire should occur and post-fire recovery measures to reduce impacts to populations of Orcutt’s brodiaea.

Known conserved populations of Orcutt’s brodiaea in MU 4.

MU	Population	Land Owner/ Manager	Pop Mgmt Status*	No. of Individ	Survey Year	Threats	Source
4	Boulder Oaks Open Space Preserve	County San Diego	NM	>200	2007	Site burned in 2003 and threats include invasive nonnative plants.	Jones and Stokes 2007
4	Simon Preserve	County San Diego	NM	1000’s	2009	Site burned in 2003 and 2007. Threatened by altered fire regime and invasive nonnative plants.	Dudek 2010

*Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



10.2.1.4 Orcutt's Brodiaea (*Brodiaea orcuttii*)

Orcutt's Brodiaea Known Conserved Locations in MU 6:

There are five conserved populations of Orcutt's brodiaea in MU 6 (see table below, figure below). Populations at Carroll Canyon, Del Mar Mesa, Lopez Ridge and Carmel Mountain are associated with vernal pool complexes. Estimating Orcutt's brodiaea population size is difficult as the proportion of corms that grow and flower depends on growing conditions. The proportion of growing and flowering plants can vary significantly from year to year due to the timing and amount of rainfall. In low rainfall years, there may be no vegetative growth or flowering. As a result of this interannual variation, it is difficult to determine true population size.

Orcutt's Brodiaea Stressors on Conserved Lands in MU 6:

The most important stressor for conserved populations of Orcutt's brodiaea in MU 6 is invasive nonnative plant species, particularly annual grasses and forbs.

Orcutt's Brodiaea MU 6 Management Goal:

Maintain populations of Orcutt's brodiaea at four vernal pool complexes to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

Orcutt's Brodiaea Management Objectives:

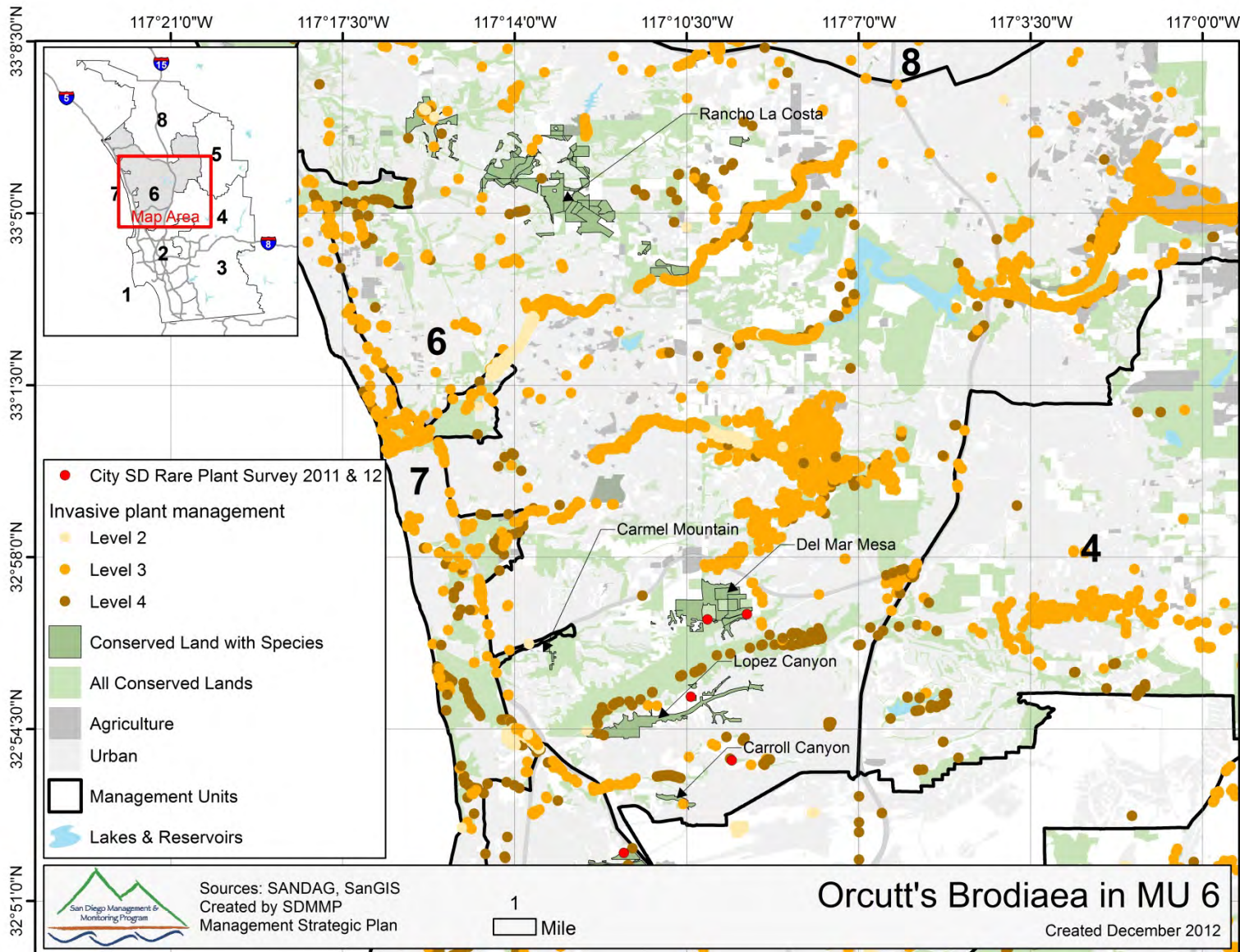
In MU 6, this species should be managed as part of the vernal pool habitat management.

Known conserved populations of Orcutt's brodiaea in MU 6.

MU	Population	Land Owner/ Manager*	Pop Mgmt Status**	No. of Indiv	Survey Year	Threats	Source
6	Carroll Canyon	City San Diego	M	6,692	2011	None identified.	City San Diego 2011
6	Rancho La Costa Habitat Conservation Area	CNLM	M	1,050	2005	None identified. This population was transplanted in 2002.	CLNM 2005
6	Del Mar Mesa	City San Diego	M	750	2011	Non-motorized recreation.	City San Diego 2011
6	Lopez Ridge	City San Diego	M	42	2012	Invasive nonnative plants.	City San Diego 2012
6	Carmel Mountain	City San Diego	M	?	2001	Unknown.	McEachern et al. 2007 & compiled data

* Owner/Manager Codes: CNLM = Center for Natural Land Management

**Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



12.2.1.2 Orcutt's Brodiaea (*Brodiaea orcuttii*)

Orcutt's Brodiaea Known Conserved Locations in MU 8:

There is one small conserved populations of Orcutt's brodiaea in MU 8 (see table below, figure below). Estimating population size is difficult as the proportion of corms that grow and flower depends on growing conditions. The proportion of growing and flowering plants can vary significantly from year to year due to the timing and amount of rainfall. In low rainfall years, there may be no vegetative growth or flowering. As a result of this interannual variation, it is difficult to determine true population size.

Orcutt's Brodiaea Stressors in MU 8:

The primary threat to the Orcutt's brodiaea population in MU 8 is the presence of invasive yellow starthistle in the vicinity.

Orcutt's Brodiaea MU 8 Management Goal:

Maintain the population of Orcutt's brodiaea in MU 8 to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

Orcutt's Brodiaea MU 8 Management Objectives:

First Priority MU 8 Management Objectives

- F1. Starting by 2014, maintain the Orcutt's brodiaea populations in MU 8 at Mount Olympus Preserve (see table below) so that yellow starthistle is eradicated from the preserve, invasive annual grasses and thatch are reduced to $\leq 10\%$ absolute cover and total nonnative plants to $\leq 25\%$ absolute cover within the population's maximum occupied extent and a surrounding buffer area equal to 25% of this extent. If the population is reduced to $< 75\%$ of the maximum occupied extent for more than three consecutive years, then additional management actions could be implemented to expand and enhance the population.

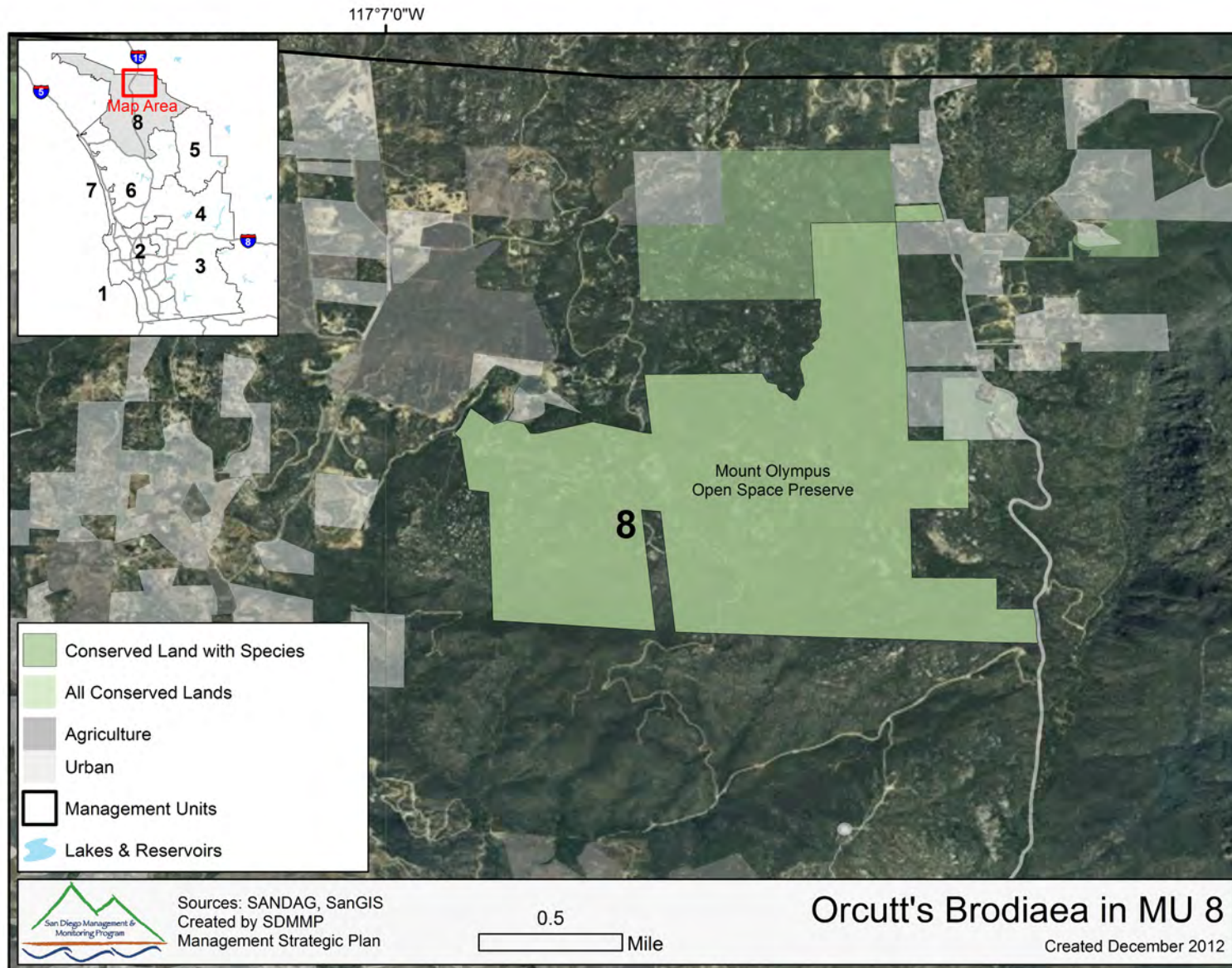
Actions to Achieve First Priority MU 8 Management Objectives

- Invasive plant control should be conducted based upon the best management practices used for other corm producing species with similar life histories (e.g., thread-leaved brodiaea) until success criteria are met and then as needed thereafter. Eradicating yellow starthistle should be implemented as part of the Invasive Strategic Management Plan (CBI 2012).
- If an Orcutt's brodiaea population is affected or potentially affected by trampling, off-highway vehicle activity or other ground disturbance, then fencing, signage, closing of trails, and enforcement patrols should be implemented to reduce impacts.
- If a maintained Orcutt's brodiaea population is $< 75\%$ of the maximum occupied extent for more than three years, then the benefits of further management actions should be considered if the population appears to be in threat of eventual extirpation. These measures can include more intensive invasive plant control efforts and population augmentation (seeding or planting).

Known conserved populations of Orcutt's brodiaea in MU 8.

MU	Population	Land Owner/ Manager	Pop Mgmt Status*	No. of Indiv	Survey Year	Threats	Source
8	Mount Olympus Preserve	County San Diego	NM	150-200	2009	Invasive nonnative plants, especially Sahara mustard.	Michael Brandmant Assoc. 2011

*Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



4.2.1.19 Dehesa Nolina (*Nolina interrata*)

Dehesa Nolina Overall Management Goal:

Maintain populations of Dehesa nolina to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

Dehesa Nolina Management Group Designation: SPECIES-SPECIFIC

Dehesa nolina is restricted to a small area of southern San Diego County and to three populations in northern Baja California, Mexico. This species was designated for species-specific management due to its limited distribution and vulnerability to catastrophic disturbance.

Management Units with Known Conserved Populations of Dehesa Nolina:

Within the MSPA all conserved Dehesa nolina populations are in MU 3 (figure below). See Appendix Table 1 for a complete listing of all locations where it has been detected.

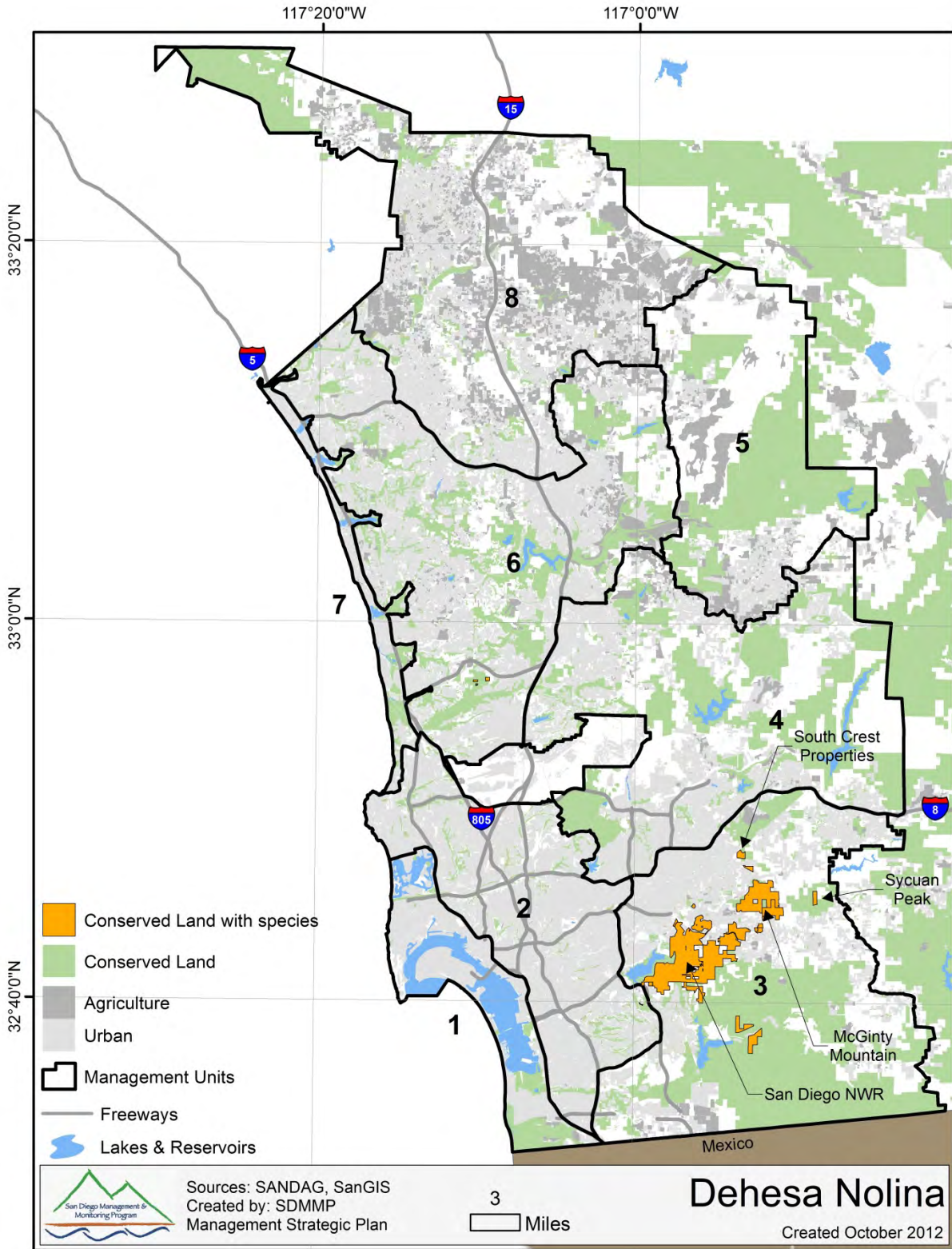
Dehesa Nolina Stressors on Conserved Lands:

- Invasive nonnative plants, including false purple brome and sweet fennel
- Altered fire regime
- Dehesa nolina has low genetic diversity, potentially from low levels of sexual reproduction
- Recreational activity, including legal and illegal trails and off-highway vehicle activity
- Destruction of flowers by beetles

Rationale for Management Objectives:

Management Units 1, 2, 4, 5, 6, 7, and 8: There are no occurrences of Dehesa nolina in MUs 1 and 2 thru 8 and no goals and objectives were prepared for this species in these MUs.

Management Unit 3: Within the MSPA, there are six known conserved natural populations in MU 3 (figure below). These populations should be maintained to increase chances of long term persistence. Seed collection, bulking and storage will help preserve genetic diversity, ensure populations are not extirpated from the MSPA by a catastrophic disturbance, and provide propagules for population enhancement.



7.2.1.10 Dehesa Nolina (*Nolina interrata*)

Dehesa Nolina Known Conserved Locations in MU 3:

There are six conserved populations of Dehesa nolina in MU 3 (see figure below, table below).

Dehesa Nolina Stressors in MU 3:

The most important stressors to Dehesa nolina are an altered fire regime (either too frequent or too infrequent and intense), invasive nonnative plants, low genetic diversity, and disturbance from recreation including legal and illegal trails and off-highway vehicle activity. Extensive flower predation by beetles has been observed, although it is unknown whether this is a cyclic event or a threat of serious magnitude.

Dehesa Nolina MU 3 Management Goal:

Maintain populations of Dehesa nolina to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

Dehesa Nolina MU 3 Management Objectives:

First Priority MU 3 Management Objectives

- F1. Collect covariate data on Dehesa nolina population status, invasive nonnative forbs and grasses, and other threats at the six populations in MU 3, which include South Crest, San Diego National Wildlife Refuge (Doegnes Mexican Canyon and Immenschue Grassland areas), McGinty Mountain, Sycuan Peak and Dehesa Mountain (table below). Evaluate status and threat information to select two populations for management by 2015.
- F2. Beginning by 2015, maintain two selected populations of Dehesa nolina so that invasive plants, including annual grasses and thatch are reduced to $\leq 15\%$ absolute cover by 2020 within the population's maximum occupied extent and a surrounding buffer area equal to 25% of this extent. If the population is reduced to $< 75\%$ of the maximum occupied extent for more than three consecutive years, then additional management actions could be implemented to expand and enhance the population.
- F3. By 2016, prepare and begin implementing a plan to collect Dehesa nolina seed, determine its viability and how to best obtain adequate seed to establish a permanent seed source (seed bank) at a qualified institution (e.g., Rancho Santa Ana Botanical Gardens). The plan should incorporate the results of the ongoing genetic study and seed should be stored along maternal lines to preserve genetic diversity and allow for population recovery and/or enhancement in case of catastrophic or other disturbances.

Actions to Achieve First Priority MU 3 Management Objectives

- Determine the population status and magnitude of threats at Dehesa nolina populations in MU 3. These data should include cover of invasive nonnative grasses and forbs and threats such as flower predation, trampling, off-highway vehicles, and dumping. Using these data, prioritize and select two populations for active management by 2015.
- Develop and implement site-specific management actions to address stressors at the two priority populations. Implement identified priority actions starting in 2016.

- If a *Dehesa nolina* population is < 75% of maximum occupied extent for more than three years, then the benefits of further management actions should be considered if the population appears to be in threat of eventual extirpation. These measures can include population augmentation (seeding or planting).
- Develop and implement a seed banking plan for *Dehesa nolina* that incorporates information from the ongoing genetic study to determine those individuals from which seed should be collected. The plan should take into consideration that plants primarily flower following a fire with few plants flowering annually in the absence of fire and that plants are dioecious and it is unknown the extent to which both male and female plants bloom simultaneously in the absence of fire. This means that collecting sufficient seed could take some time to accomplish. Given the life history strategy of this species, the feasibility of seed bulking should be investigated and recommendations included in the plan. Seed should be collected from populations using best management practices, including collecting seed in a manner that avoids impacting the population's genetic diversity and maintains a sufficient onsite seed bank.

Second Priority MU 3 Management Objectives

- S1. By 2018, integrate identified stressor management actions into fire plans for all preserves where the species occurs.

Actions to Achieve First Priority MU 3 Management Objectives

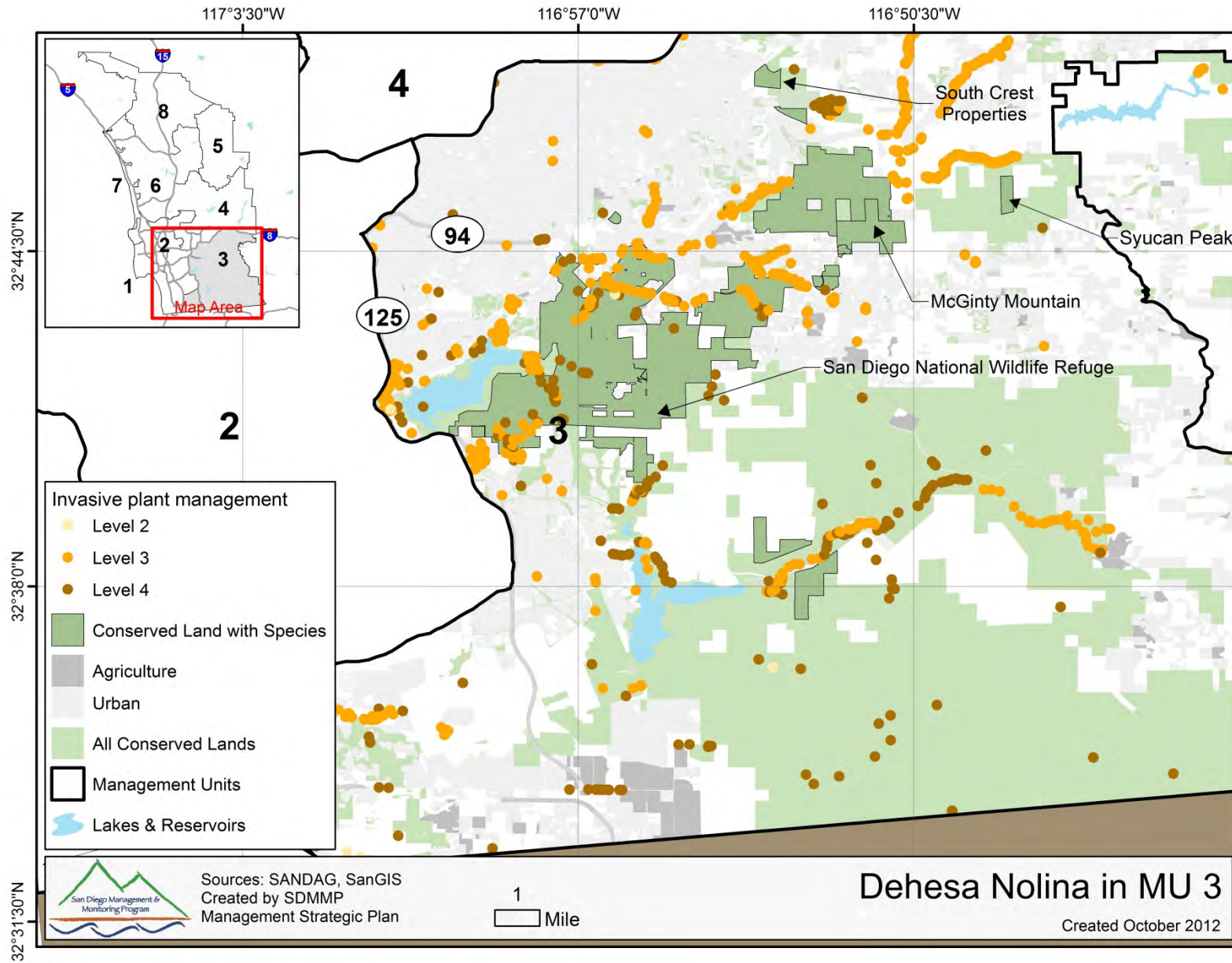
- Incorporate measures to reduce the impacts of altered fire regimes on *Dehesa nolina* into fire management plans for preserves with populations of this species. The preserve fire plan should include measures to reduce fire risk in frequently burned areas and include suppression measures and post-fire recovery measures (e.g., invasive plant control) to reduce impacts to the population if a fire should occur.

Known conserved populations of *Dehesa nolina* in MU 3.

MU	Population	Land Owner/ Manager*	Pop Mgmt Status**	No. of Rosettes	Survey Year	Threats	Source
3	South Crest Properties	DFW/ EHC	M	1,773	2011-12	Invasive nonnative plants, altered fire regime, low genetic diversity, disturbance from recreational activities including illegal trails and off-highway vehicles. In one year all flowers on the single blooming plant at the site were destroyed by beetles.	CBI 2012, P Gordon-Reedy pers comm
3	San Diego National Wildlife Refuge – Doegnes Mexican Canyon	USFWS	UM	Present	2004	Low genetic diversity, other threats not known.	McEachern et al. 2007 & compiled data
3	San Diego National Wildlife Refuge – Immenschue Grassland	USFWS	UM	Present	2004	Low genetic diversity, other threats not known.	McEachern et al. 2007 & compiled data
3	McGinty Mountain	TNC/ USFWS/ DFW	UM	1,000	2001	Low genetic diversity, other threats not known.	McEachern et al. 2007 & compiled data
3	Sycuan Peak	DFW	UM	Present	1998	Low genetic diversity, other threats not known.	USFWS 1998
3	Dehesa Mountain	Private?	UM	Present	1998	Low genetic diversity, other threats not known.	USFWS 1998

* Land Owner/Manager Codes: DFW = California Department of Fish and Wildlife; EHC = Endangered Habitats Conservancy; TNC = The Nature Conservancy; USFWS = United States Fish and Wildlife Service.

**Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



Management Category SS Species

4.2.1.4 San Diego Goldenstar (*Bloomeria clevelandii*)

San Diego Goldenstar Overall Management Goal:

Maintain large populations and enhance and expand small populations of San Diego goldenstar to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

San Diego Goldenstar Management Group Designation: SPECIES-SPECIFIC

This endemic species should be managed at a species-specific level due to its limited distribution in southwestern San Diego County and northwestern Baja California, Mexico. Most San Diego goldenstar populations are threatened by invasive plants, requiring management to ensure the species persistence on Conserved Lands in the MSPA.

Management Units with Known Conserved Populations of San Diego Goldenstar:

Conserved populations of San Diego goldenstar are known to occur in MUs 3, 4, and 6. See Appendix Table 1 for a complete listing of all locations where the species has been detected.

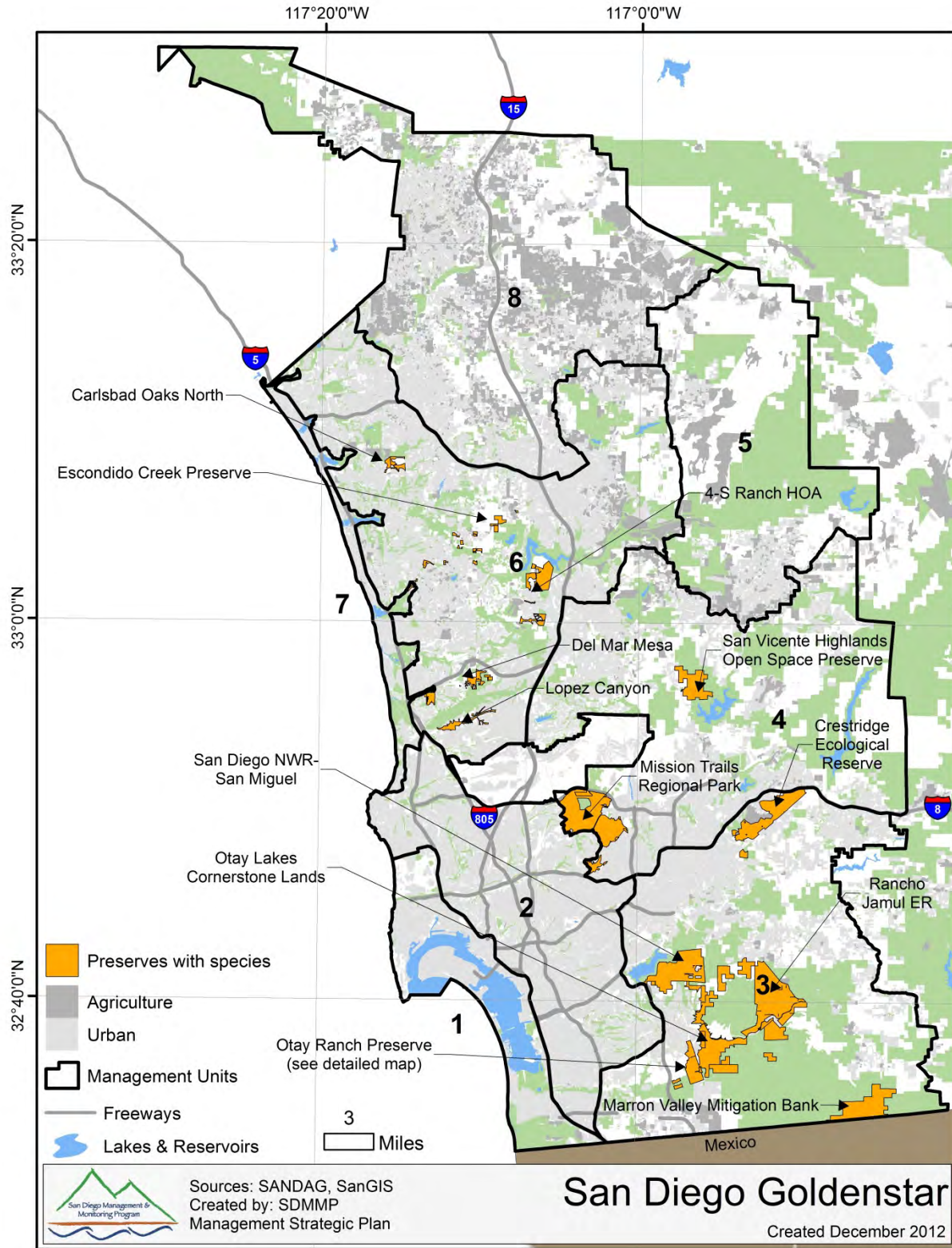
San Diego Goldenstar Stressors on Conserved Lands:

- Invasive annual plants
- Altered fire regimes leading to conversion of native habitats to nonnative grassland

Rationale for Management Objectives:

Management Units 1, 2, 5, 7 and 8: There are no known populations of San Diego goldenstar in MUs 1, 2, 5, 7 and 8 and there are no goal and objectives for this species in these MUs.

Management Units 3, 4 and 6: Within the MSPA there are 17 known conserved populations of San Diego goldenstar (figure below). There are eight populations in MU 3, two in MU 4, and seven in MU 6. Many populations have burned at least once in the last decade and are threatened by invasive nonnative plants, particularly annual grasses. It is essential to maintain large populations within each of the MUs so the species is likely to persist over the long term in the MSPA.



7.2.1.2 San Diego Goldenstar (*Bloomeria clevelandii*)

San Diego Goldenstar Known Conserved Locations in MU 3:

There are seven large (>1,000 individuals; Ogden 1995) conserved populations and one small population of San Diego goldenstar in MU 3 (see table below, figure below). Estimating population size is difficult as the proportion of corms that grow and flower depends on growing conditions. The proportion of growing and flowering plants can vary significantly from year to year due to the timing and amount of rainfall. In low rainfall years, there may be no vegetative growth or flowering. As a result of this interannual variation, it is difficult to determine true population size.

San Diego Goldenstar Stressors on Conserved Lands in MU 3:

The most important stressor for conserved populations of San Diego goldenstar in MU 3 is invasive nonnative plant species, particularly annual grasses.

San Diego Goldenstar MU 3 Management Goal

Maintain large populations of San Diego goldenstar to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities in MU 3.

San Goldenstar MU 3 Management Objectives:

First Priority MU 3 Management Objectives

- F1. Collect covariate data on San Diego goldenstar population status, invasive nonnative forbs and grasses, and other threats at the seven large populations in MU 3, which include Rancho Jamul Ecological Reserve, Marron Valley, Otay Ranch Preserve (San Ysidro, Dulzura, and Little Cedar Canyon parcels), Otay Lakes, and the San Diego National Wildlife Refuge (table below). Evaluate status and threat information to select three populations for management by 2018.
- F2. Starting by 2018, maintain the three selected San Diego goldenstar populations so that invasive annual grasses and thatch are reduced to $\leq 10\%$ absolute cover and total nonnative plants to $\leq 25\%$ absolute cover within the population's maximum occupied extent and a surrounding buffer area equal to 25% of this extent. If the population is reduced to $< 75\%$ of the maximum occupied extent for more than three consecutive years, then additional management actions could be implemented to expand and enhance the population.

Actions to Achieve First Priority MU 3 Management Objectives

- Determine the population status and magnitude of threats at large populations of San Diego goldenstar in MU 3. These data should include cover of invasive nonnative grasses and forbs and threats such as trampling, off-highway vehicles, and dumping. Using these data, prioritize and select three populations for active management by 2018. When feasible, management should be conducted at locations with other ongoing management projects (e.g., vernal pools, Orcutt's brodiaea) to reduce management costs.
- Invasive plant control should be conducted at selected populations based upon the best management practices used for other corm producing species with similar life histories (e.g., thread-leaved brodiaea) until success criteria are met and then as needed thereafter.

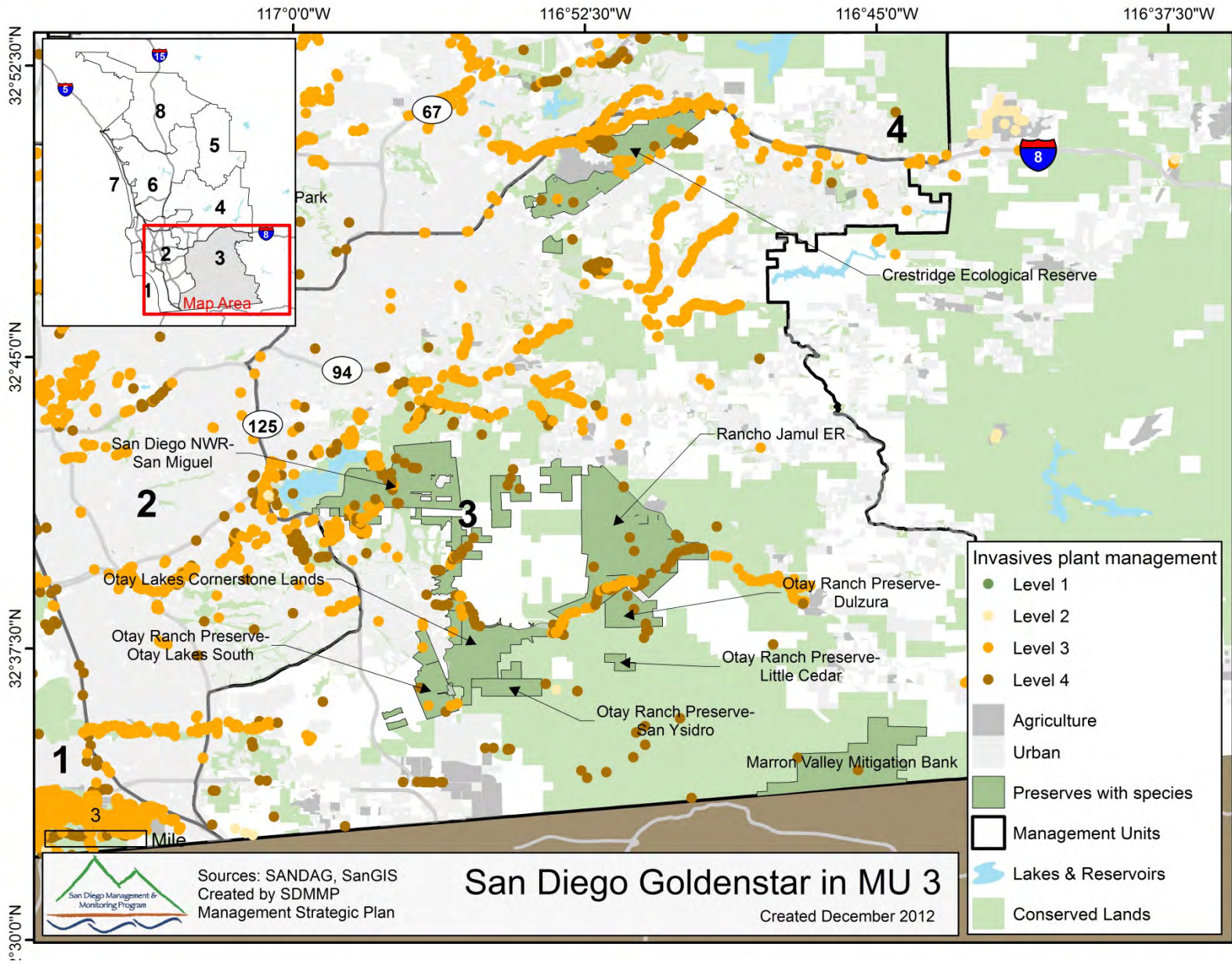
- If a San Diego goldenstar population is affected or potentially affected by trampling, off-highway vehicle activity or other ground disturbance, then fencing, signage, closing of trails, and enforcement patrols should be implemented to reduce impacts.
- If the San Diego goldenstar population is < 75% of maximum occupied extent for more than three years, then the benefits of further management actions should be considered if the population appears to be in threat of eventual extirpation. These measures can include more intensive invasive plant control efforts and population augmentation (seeding or planting).

Known conserved populations of San Diego goldenstar in MU 3.

MU	Population	Land Owner/ Manager*	Pop Mgmt Status**	No. of Locations (Multiple Plants)	Survey Year	Threats	Source
<i>Large (>1,000 individuals) Populations for Maintenance</i>							
3	Rancho Jamul Ecological Reserve	USFWS	SM	24 (>100,000 plants)	2001	Altered fire regime and invasive nonnative plants	USGS 2002
3	Marron Valley	City San Diego	SM	4 (25,000 plants)	2012	Altered fire regime and invasive nonnative plants	City San Diego 2012
3	Otay Ranch Preserve – San Ysidro	County San Diego	NM	1 (1,000's of plants)	2009	Altered fire regime and invasive nonnative plants. Site burned in 2003 and 2007. There were 2 populations with 3,175 plants in 2001.	County of San Diego 2002, RECON 2012
3	Otay Ranch Preserve – Dulzura	County San Diego	NM	9	2010	Altered fire regime and invasive nonnative plants	RECON 2011
3	Otay Ranch Preserve – Little Cedar Canyon	County San Diego	NM	4	2011	Altered fire regime and invasive nonnative plants	RECON 2012
3	San Diego National Wildlife Refuge	USFWS	SM	3 (dense populations)	2002	Altered fire regime and invasive nonnative plants	USFWS 2003
3	Otay Lakes – Southeast of Lower Lake	City San Diego	SM	2	2012	Altered fire regime and invasive nonnative plants.	City San Diego 2012
<i>Small Populations of San Diego Goldenstar</i>							
3	Crestridge Ecological Reserve	EHC	SM	1	2012	Altered fire regime and invasive nonnative plants	P. Gordon-Reedy pers. Comm.

* Owner/Manager Codes: CNLM = Center for Natural Lands Management; DFW = California Department of Fish and Wildlife; EHC = Endangered Habitats Conservancy; USFWS = United States Fish and Wildlife Service

**Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



8.2.1.2 San Diego Goldenstar (*Bloomeria clevelandii*)

San Diego Goldenstar Known Conserved Locations in MU 4:

There is a large (>1,000 individuals; Ogden 1995) population and a second smaller population of San Diego goldenstar in MU 4 (see table below, figure below). Estimating population size is difficult as the proportion of corms that grow and flower depends on growing conditions. The proportion of growing and flowering plants can vary significantly from year to year due to the timing and amount of rainfall. In low rainfall years, there may be no vegetative growth or flowering. As a result of this inter-annual variation, it is difficult to determine true population size.

San Diego Goldenstar Stressors on Conserved Lands in MU 4:

The most important stressor for conserved populations of San Diego goldenstar in MU 4 is invasive nonnative plant species, particularly annual grasses.

San Diego Goldenstar MU 4 Management Goal:

Maintain populations of San Diego goldenstar in MU 4 to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

San Goldenstar MU 4 Management Objectives:

First Priority MU 4 Management Objectives

- F1. Starting by 2018, maintain the San Diego goldenstar populations at East Elliot and San Vicente Highlands Open Space Preserve so that invasive annual grasses and thatch are reduced to $\leq 10\%$ absolute cover and total nonnative plants to $\leq 25\%$ absolute cover within the population's maximum occupied extent and a surrounding buffer area equal to 25% of this extent. If the population is reduced to $< 75\%$ of the maximum occupied extent for more than three consecutive years, then additional management actions could be implemented to expand and enhance the population.

Actions to Achieve First Priority MU 4 Management Objectives

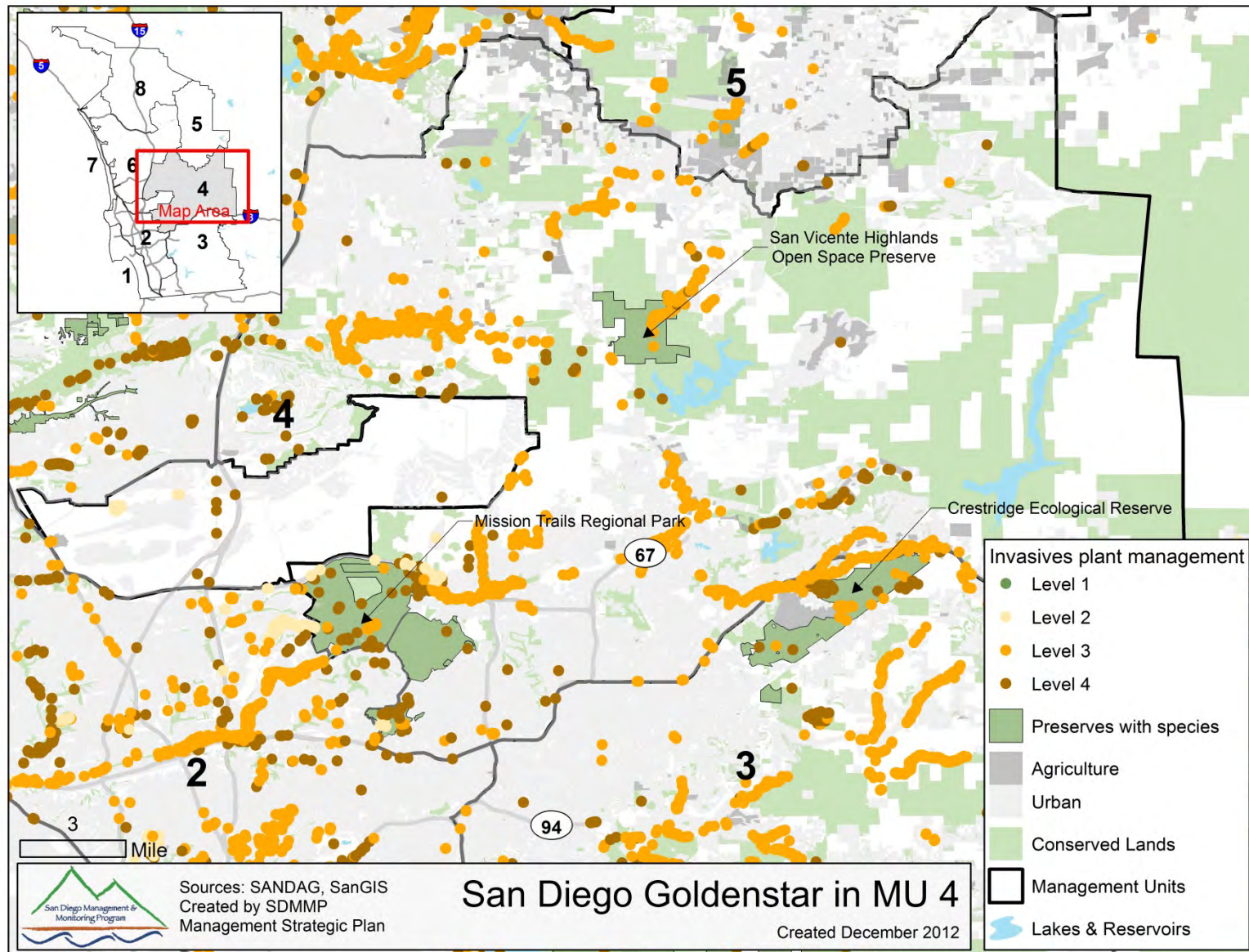
- Invasive plant control should be conducted based upon the best management practices used for other corm producing species with similar life histories (e.g., thread-leaved brodiaea) until success criteria are met and then as needed thereafter.
- If a San Diego goldenstar population is affected or potentially affected by trampling, off-highway vehicle activity or other ground disturbance, then fencing, signage, closing of trails, and enforcement patrols should be implemented to reduce impacts.
- If a San Diego goldenstar population is $< 75\%$ of maximum occupied extent for more than three years, then the benefits of further management actions should be considered if the population appears to be in threat of eventual extirpation. These measures can include more intensive invasive plant control efforts and population augmentation (seeding or planting).

Known conserved populations of San Diego goldenstar in MU 4.

MU	Population	Land Owner/ Manager*	Pop Mgmt Status**	No. of Locations (Multiple Plants)	Survey Year	Threats	Source
<i>Large (>1,000 individuals) Populations for Maintenance</i>							
4	East Elliot	City San Diego	M	5 (6,000 plants)	2012	Altered fire regime and invasive nonnative plants	City San Diego 2012
<i>Small Population</i>							
4	San Vicente Highlands Open Space Preserve	CDFW	SM?	? (>800 plants)	2001	Unknown	McEachern et al. 2007 & compiled data

* Owner/Manager Codes: CDFW = California Department of Fish and Wildlife

**Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



10.2.1.2 San Diego Goldenstar (*Bloomeria clevelandii*)

San Diego Goldenstar Known Conserved Locations in MU 6:

There are two large (>1,000 individuals; Ogden 1995) conserved populations of San Diego goldenstar in MU 6 (see table below, figure below). There are five other populations that are small or of unknown size. Estimating population size is difficult as the proportion of corms that grow and flower depends on growing conditions. The proportion of growing and flowering plants can vary significantly from year to year due to the timing and amount of rainfall. In low rainfall years, there may be no vegetative growth or flowering. As a result of this inter-annual variation, it is difficult to determine true population size.

San Diego Goldenstar Stressors on Conserved Lands in MU 6:

The most important stressor for conserved populations of San Diego goldenstar in MU 6 is invasive nonnative plant species, particularly annual grasses.

San Diego Goldenstar MU 6 Management Goal:

Maintain large populations and enhance and expand small populations of San Diego goldenstar to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

San Goldenstar MU 6 Management Objectives:

First Priority MU 6 Management Objectives

- F1. Starting by 2018, maintain the San Diego goldenstar populations in MU 6 at 4S Ranch and Escondido Creek Preserve (table below) so that trampling is prevented and invasive annual grasses and thatch are reduced to $\leq 10\%$ absolute cover and total nonnative plants to $\leq 25\%$ absolute cover within the population's maximum occupied extent and a surrounding buffer area equal to 25% of this extent. If the population is reduced to $< 75\%$ of the maximum occupied extent for more than three consecutive years, then additional management actions could be implemented to expand and enhance the population.
- F2. By 2017, collect and compile data on San Diego goldenstar population status, threats and potential for expansion in the following MU 6 preserves: Carmel Mountain Preserve; 4S Ranch Specific Plan Area; Lopez Ridge; Del Mar Mesa; and Carlsbad Oaks North Habitat Conservation Area (Table 1). Identify and map adjacent suitable habitat and determine the boundaries in which populations could be feasibly expanded. Prioritize and select two populations for expansion. When feasible, management should be conducted at locations with other ongoing management projects (e.g., vernal pools, Orcutt's brodiaea) to reduce management costs.
- F3. By 2018, begin enhancing and expanding the two selected San Diego goldenstar populations to $\geq 50\%$ occupancy within the boundaries of suitable habitat identified for population expansion. The populations should be maintained so there is no trampling and invasive annual grasses and thatch are reduced to $\leq 10\%$ absolute cover and total non-native plant cover to $\leq 25\%$ absolute cover within the population's occupied extent and adjacent suitable habitat. If the population does not expand after three consecutive years of invasive plant control, then additional management actions could be implemented to enhance and expand the population

Actions to Achieve First Priority MU 6 Management Objectives

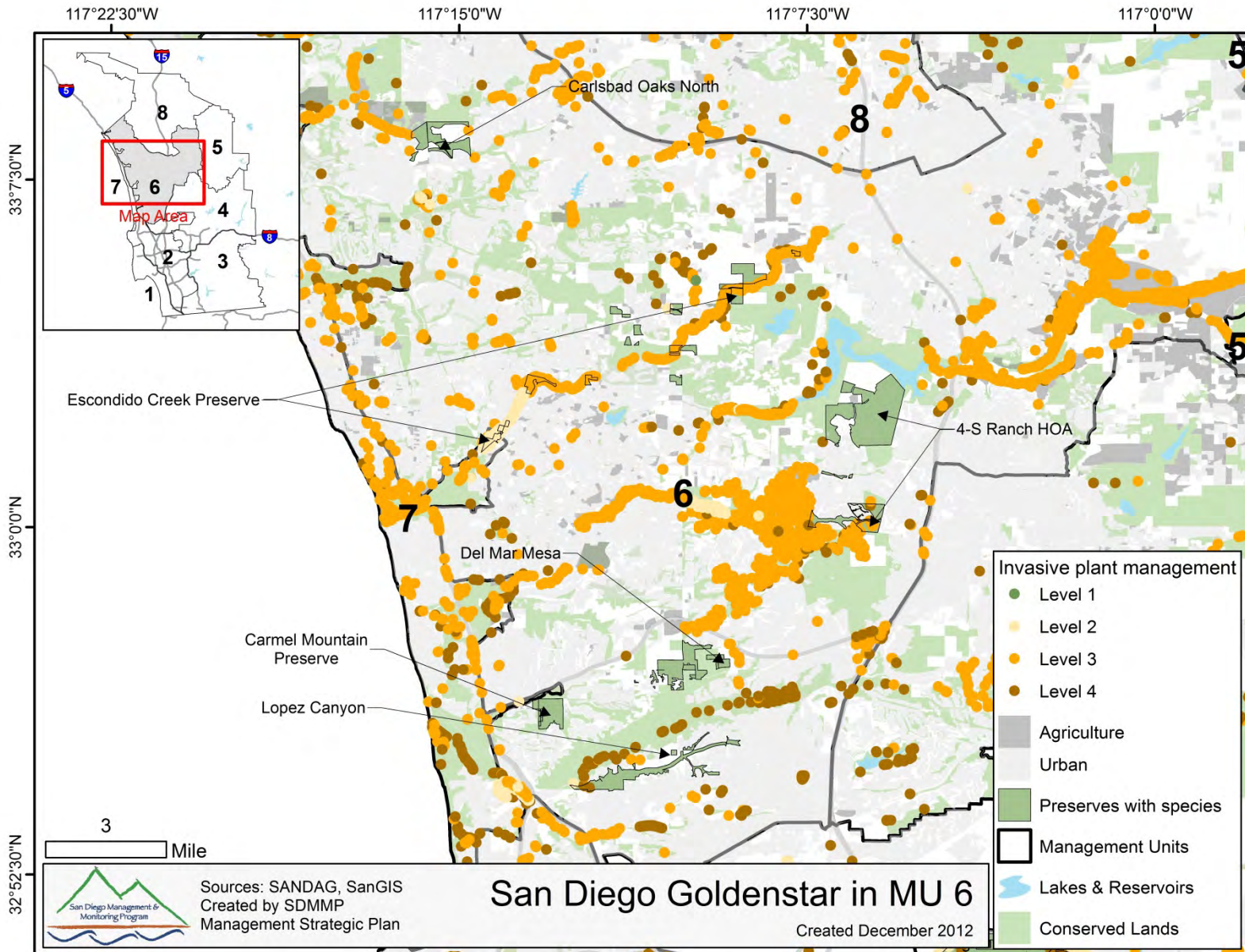
- Invasive plant control should be conducted based upon the best management practices used for other corm producing species with similar life histories (e.g., thread-leaved brodiaea) until success criteria are met and then as needed thereafter.
- If a San Diego goldenstar population is affected or potentially affected by trampling, off-highway vehicle activity or other ground disturbance, then fencing, signage, closing of trails, and enforcement patrols should be implemented to reduce impacts.
- If a maintained San Diego goldenstar population (Priority F1) is < 75% of the maximum occupied extent for more than three years, then the benefits of further management actions should be considered if the population appears to be in threat of eventual extirpation. Management actions can include measures such as population augmentation (seeding or planting).
- Determine the population status, magnitude of threats and potential for San Diego goldenstar population expansion at those preserves in MU 6 identified in Priority F2. Information that should be compiled includes mapping of suitable habitat adjacent to existing populations, measuring cover of invasive nonnative grasses and forbs and identifying potential for threats such as trampling, off-highway vehicles, and dumping. Prioritize populations for management based upon an assessment of population size, the potential for management to significantly reduce identified threats, and the availability of adjacent suitable habitat for population expansion. When feasible, management should be conducted at locations with other ongoing management projects (e.g., vernal pools, Orcutt's brodiaea) to reduce management costs.
- If a population selected for management in Priority F3 is not meeting expansion criteria, then more intensive management could be undertaken, such as population augmentation (seeding or planting).

Known conserved populations of San Diego goldenstar in MU 6.

MU	Population	Land Owner/ Manager*	Pop Mgmt Status**	No. of Locations (Multiple Plants)	Survey Year	Threats	Source
<i>Large (>1,000 individuals) Populations for Maintenance</i>							
6	4S Ranch	County San Diego	NM	2 (1 small, other several thousand plants)	2001	Unknown	County San Diego 2002
6	Escondido Creek Preserve	County San Diego	SM	5	2010	Invasive nonnative plant species	Dudek 2011
<i>Populations of Unknown or Small Size</i>							
6	Carmel Mountain Preserve	City San Diego	M	1	2008	Unknown	RECON 2009
6	4S Ranch Specific Plan Area	Private	SM	1	2008	Altered fire regime and invasive nonnative plants	Dudek 2009
6	Lopez Ridge	City San Diego	M	1 (140 plants)	2012	Invasive nonnative plants	City San Diego 2012
6	Del Mar Mesa	City San Diego	M	0	2012	33 plants in 2011	City San Diego 2012
6	Carlsbad Oaks North Habitat Conservation Area	CNLM	SM	?	2004	Unknown	Tierra Data Inc 2005

* Owner/Manager Codes: CNLM = Center for Natural Lands Management

**Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



4.2.1.5 Thread-leaved Brodiaea (*Brodiaea filifolia*)

Thread-Leaved Brodiaea Overall Management Goal:

Maintain very large and large populations and enhance and expand small populations of thread-leaved brodiaea to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

Thread-Leaved Brodiaea Management Group Designation: SPECIES-SPECIFIC

This endemic species should be managed at a species-specific level due to its limited distribution in cismontane southwestern California. Populations in north coastal San Diego County are threatened by invasive plants, requiring management to ensure the species persistence in the MSPA.

Management Units with Known Conserved Populations of Thread-Leaved Brodiaea:

Conserved populations of thread-leaved brodiaea are known to occur in MUs 6 and 8. See Appendix Table 1 for a complete listing of all locations where it has been detected.

Thread-Leaved Brodiaea Stressors on Conserved Lands:

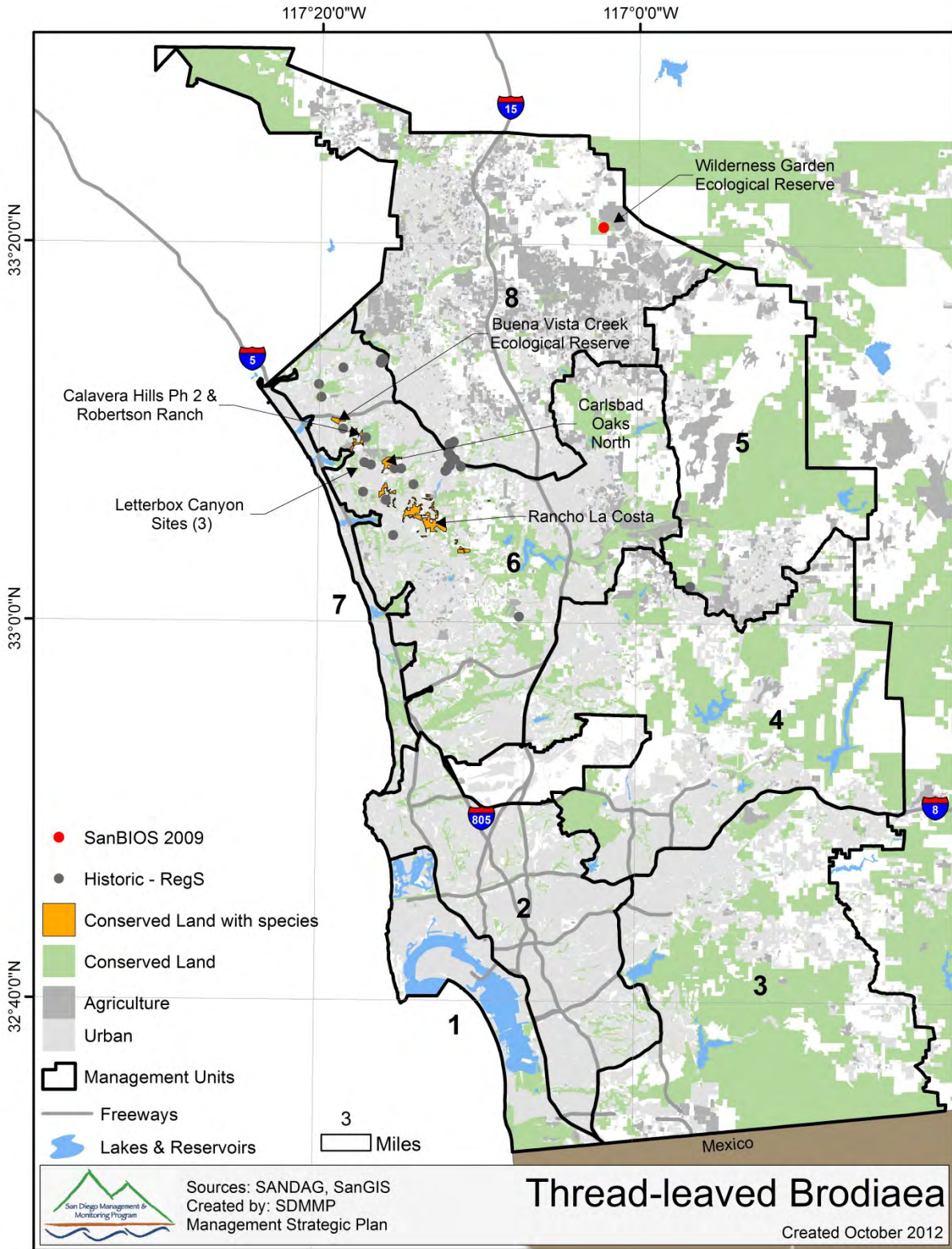
- Invasive annual plants
- Populations in urban fragments can face unusually high levels of herbivory, particularly after invasive plant control efforts reduce nonnative plant cover
- Off-highway vehicle activity
- Altered hydrology
- Loss of corms from populations due to erosion caused by tunneling animals, high stream flows and roadways
- Trampling by bikers and hikers
- Mowing/disking/herbicide application for weed abatement or fuel management
- Altered fire regime
- Reduction in pollinator function from habitat loss and fragmentation could reduce sexual reproduction and affect genetic diversity

Rationale for Management Objectives:

Management Units 1, 2, 3, 4, 5 and 7: There are no known populations of thread-leaved brodiaea in MUs 1, 2, 3, 4, 5, and 7 so no goals and objectives for this species were prepared for these MUs.

Management Units 6 and 8: There are four very large conserved populations (> 10,000 individuals) of thread-leaved brodiaea in MU 6, three large populations (> 1,000 individuals) and five small populations (see figure below). MU 8 has one isolated small population. It is important to first maintain the very large and large populations within the MSP, as these populations are most likely to persist over the long term and have greater likelihood of maintaining genetic diversity. A lower priority is to expand small

populations to enhance their chance or persistence, especially those populations located on the periphery of the species range. Best management practices for reducing invasive plant cover should be determined prior to initiating maintenance activities, as it has proven difficult to reduce invasive plant cover in thread-leaved brodiaea populations (CNLM 2012). Herbivory should also be monitored and managed if it increases as a result of reducing nonnative plant species. The Center for Natural Lands Management is conducting a study of the genetic diversity within and among thread-leaved brodiaea populations to facilitate future management of the species. If this research indicates that genetic diversity is limited, then a study should be conducted to assess sexual reproduction including seed production, viability, germination, corm growth, and percent of plants that flower annually.



10.2.1.3 Thread-leaved Brodiaea (*Brodiaea filifolia*)

Thread-Leaved Brodiaea Known Conserved Locations in MU 6:

There are multiple conserved populations of thread-leaved brodiaea varying widely in extent and abundance in MU 6 (see table below, figure below). Estimating population size is difficult as only a proportion of corms grow above ground shoots each year and only a proportion of these plants flower. This proportion varies substantially from year to year, depending on environmental conditions, such as the timing and amount of rainfall. As a result, counting the number of corms or vegetative rosettes will result in a much higher estimate of population abundance than counting flowering stalks and can differ between years depending on growing conditions.

Thread-Leaved Brodiaea Stressors on Conserved Lands in MU 6:

The most important stressor for conserved populations of thread-leaved brodiaea populations in MU 6 are invasive nonnative plant species, such as sweet fennel, black mustard, garland chrysanthemum, purple false brome, bristly ox tongue, Italian thistle, milk thistle, artichoke thistle and annual grasses. Other threats include elevated levels of herbivory by rabbits, gophers and ground squirrels and direct impacts from off-road vehicle activity, human trampling, and mowing/disking/herbicide treatment for weed abatement and fuel modification. Maintaining diverse and abundant pollinator communities is also a concern for this species.

Thread-Leaved Brodiaea MU 6 Management Goal:

Maintain very large and large populations of thread-leaved brodiaea to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities in MU 6.

Thread-Leaved Brodiaea Mu 6 Management Objectives:

First Priority MU 6 Management Objectives

- F1. By 2017, determine the most effective and cost efficient large-scale methods for reducing invasive plant cover and preventing herbivory of thread-leaved brodiaea populations under different conditions of soil, topography, invasion history and climate.
- F2. Collect covariate data on population status, invasive nonnative forbs and grasses and other threats at the seven very large and large thread-leaved brodiaea populations in MU 6, which include Letterbox Canyon (Taylor Made, Fox Miller Brodiaea Preserve, and Newton Business Center parcels), Rancho La Costa, Calavera Hills and Robertson Ranch Conservation Area, and Buena Vista Ecological Reserve (table below). Evaluate the status and threat information to select three populations for management by 2017.
- F3. Starting by 2017, maintain three of the populations selected in F2 so that invasive annual grasses and thatch are reduced to $\leq 10\%$ absolute cover and total nonnative plants to $\leq 20\%$ absolute cover within the population's maximum occupied extent and a surrounding buffer area equal to 25% of this extent. If the population is reduced to $< 75\%$ of the maximum occupied extent for three consecutive years, then additional management actions should be implemented to expand and enhance the population.

Actions to Achieve First Priority MU 6 Management Objectives

- Determine the population status and magnitude of threats for those very large and large populations for which there is little information. These data should include cover of invasive nonnative grasses and forbs, threats from trampling and off-highway vehicles, and from activities associated with weed abatement and fuel management.
- Conduct a multiple-year experimental study of thread-leaved brodiaea populations to determine the most effective methods for reducing invasive nonnative plant cover and for preventing herbivory. The experiments should include a range of population sizes, management methods, and environmental conditions to determine best management practices.
- Invasive plant control should be conducted based upon the best management practices determined in Priority F1, above, until success criteria are met and then as needed thereafter.
- If the population is < 75% of maximum occupied extent for more than three years, then enhancement measures should be taken. These measures can include more intensive invasive plant control efforts, herbivore exclusion, population augmentation (seeding or planting), or measures to reduce ground disturbance from off-highway vehicles, trampling, and weed abatement/fuels management.

Second Priority MU 6 Management Objectives

- S1. If the results of the Center for Natural Land Management's genetic study indicate there are low levels of genetic diversity, then it should be determined by 2020 whether there is adequate seed production, seed viability, corm growth and recruitment to flowering stage.

Actions to Achieve Second Priority MU 6 Management Objectives

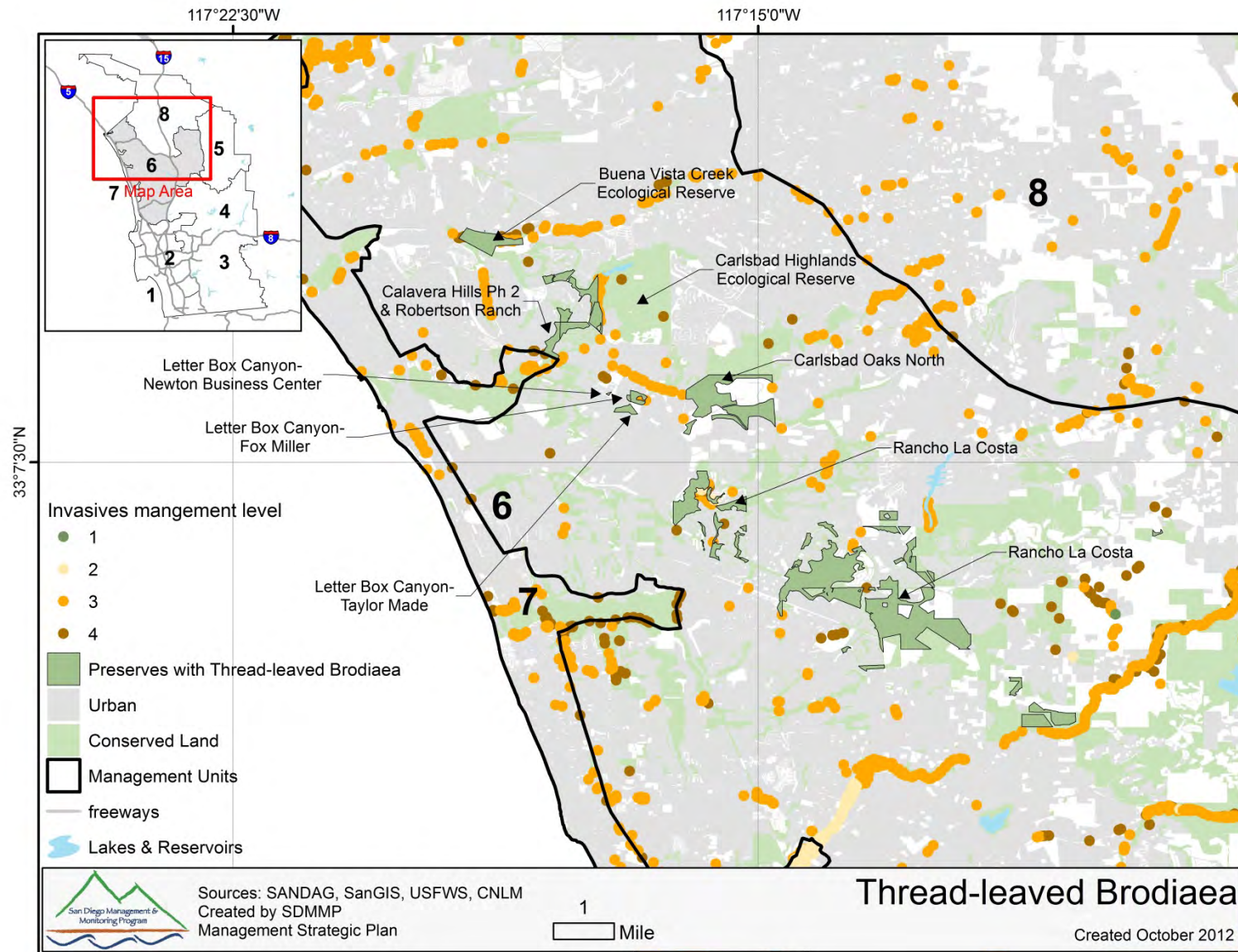
- Conduct a study of reproduction at multiple thread-leaved brodiaea populations to assess the relationship between growing season conditions and level of threats with reproduction to assess flower production, seed production, seed viability, and corm growth.

Known conserved populations of thread-leaved brodiaea in MU 6.

MU	Population	Land Owner/ Manager	Pop Mgmt Status*	Est. No. of Indiv.	Survey Year	Threats	Source
<i>Very Large Populations</i>							
6	Letterbox Canyon – Taylor Made	City Carlsbad?	UM	~1 million corms	2005	Invasive annual plants	USFWS 2009
6	Letterbox Canyon – Fox Miller Brodiaea Preserve	Fox Miller/ Helix Environmental	M	7,534,844 corms	2005	Invasive annual plants	RECON 2005
6	Letterbox Canyon – Newton Business Center	CDFW	UM	39,522 (corms?)	2005	Invasive annual grasses	USFWS 2009
6	Rancho La Costa	CNLM	M	13,000 (flowering plants)	2008	Invasive annual plants	CNLM 2005, 2009, P McConnell pers.comm.
<i>Large Populations</i>							
6	Calavera Hills & Robertson Ranch Conservation Area	CNLM	M	2,243 vegetative plants	2005	Invasive annual plants	CNLM 2008, USFWS 2009, CNLM 2010
6	Buena Vista Ecological Reserve	CDFW/CNLM	M	1,300 flowering plants	2012	Invasive annual plants	Environmental Sciences Assoc. 2011, P. McConnell pers. Comm.
M U 6	Carlsbad Highlands Ecological Reserve	CDFW	M	?		Off-highway vehicles	Environmental Sciences Assoc. 2011
<i>Small Populations</i>							
6	Carlsbad Oaks North	CNLM	M	600 vegetative plants	2008	Invasive annual plants	CNLM 2008, P. McConnel pers.comm.
6	New Millenium	Private?	UM	< 1,000 (unknown metric)	2001	Invasive annual plants, off-highway vehicles	USFWS 2009
6	Calavera Heights Mitigation Site	Private	UM	41	2000	Invasive annual plants	USFWS 2009
6	4S Ranch Specific Plan Habitat Management Area	Private/Dudek	SM	18	2008	Invasive annual and perennial plants. Transplanted population .	Dudek 2009
6	Lake Calavera	City Chula Vista	SM	Few Indiv	2010	Invasive annual plants, trails and fuel management	Tierra Data Inc 2011

* Owner/Manager Codes: CNLM = Center for Natural Lands Management; DFW – California Department of Fish and Wildlife

**Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



12.2.1.1 Thread-leaved Brodiaea (*Brodiaea filifolia*)

Thread-Leaved Brodiaea Known Conserved Locations in MU 8:

There is one small conserved population known at Wilderness Gardens in MU 8 (see table below, figure below).

Thread-Leaved Brodiaea Stressors on Conserved Lands in MU 8:

The most important stressor identified for the small, conserved population of thread-leaved brodiaea in MU 8 is invasive nonnative plants, particularly yellow starthistle (see figure below).

Thread-Leaved Brodiaea MU 8 Management Goal:

Enhance and expand small population of thread-leaved brodiaea to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in a native plant community.

Thread-Leaved Brodiaea MU 8 Management Objectives:

First Priority MU 8 Management Objectives

- F1. Identify and map suitable habitat adjacent to the small population in MU 8 (see table below, figure below) and determine the boundaries in which the population could be feasibly expanded. By 2018, begin enhancing and expanding the population to $\geq 50\%$ within the boundaries of selected suitable habitat and then maintain the population within this area. The population should be maintained so that invasive yellow star thistle is eradicated and annual grasses and thatch are reduced to $\leq 10\%$ absolute cover and total non-native plant cover to $\leq 20\%$ absolute cover within the population's occupied extent and adjacent suitable habitat. If the population does not expand after three consecutive years of invasive plant control, then additional management actions should be implemented to enhance and expand the population.

Actions to Achieve First Priority MU 8 Management Objectives

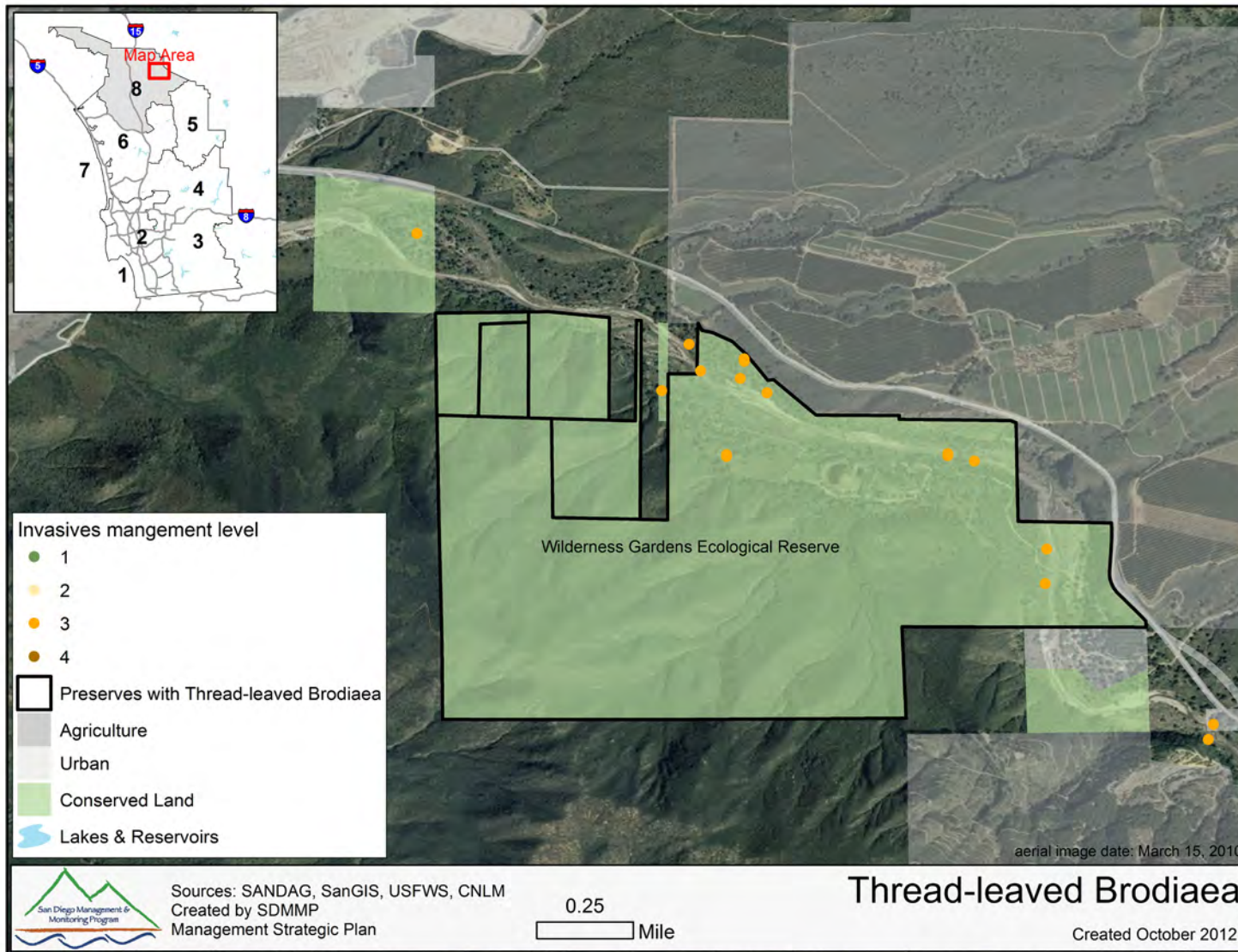
- Assess and map suitable habitat adjacent to the conserved small population in MU 8 and determine the area that could be feasibly managed for expansion of the population.
- Invasive plant control should be conducted annually based upon the best management practices (determined in MU 6 Priority F1) until success criteria are met and then as needed thereafter. Eradication of yellow starthistle should be initiated by 2014 in conjunction with implementation of the Invasive Strategic Plan.
- If for more than three consecutive years the population is $< 50\%$ of occupancy within the maintained extent of suitable habitat designated for population expansion, then other enhancement measures should be taken. These measures can include more intensive invasive plant control efforts, herbivore exclusion, population augmentation (seeding or planting), or measures to reduce disturbance from off-highway vehicles trampling, and weed abatement/fuel management activities.

Small conserved thread-leaved brodiaea population identified for management in MU 8.

MU	Population	Land	Pop	Est. No.	Survey	Threats	Source
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		Owner/ Manager	Mgmt Status*	of Individ.	Year		
8	Wilderness Gardens Preserve	County of San Diego	SM	≤ 50 (flowering plants?)	2009	Nonnative yellow star thistle in vicinity	Tierra Data Inc 2011, Michael Brandman Assoc. 2012

*Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



4.2.1.13 Variegated Dudleya (*Dudleya variegata*)

Variegated Dudleya Overall Management Goal:

Maintain large populations of variegated dudleya to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities.

Variegated Dudleya Management Group Designation: SPECIES-SPECIFIC

This endemic species should be managed at a species-specific level due to its limited distribution in southern San Diego County and northwestern Baja California, Mexico. Most variegated dudleya populations are threatened by invasive plants, requiring management to ensure the species persistence in the MSPA.

Management Units with Known Conserved Populations of Variegated Dudleya:

Conserved populations of variegated dudleya are known to occur in MUs 3, 4, and 6. See Appendix Table 1 for a complete listing of known conserved locations.

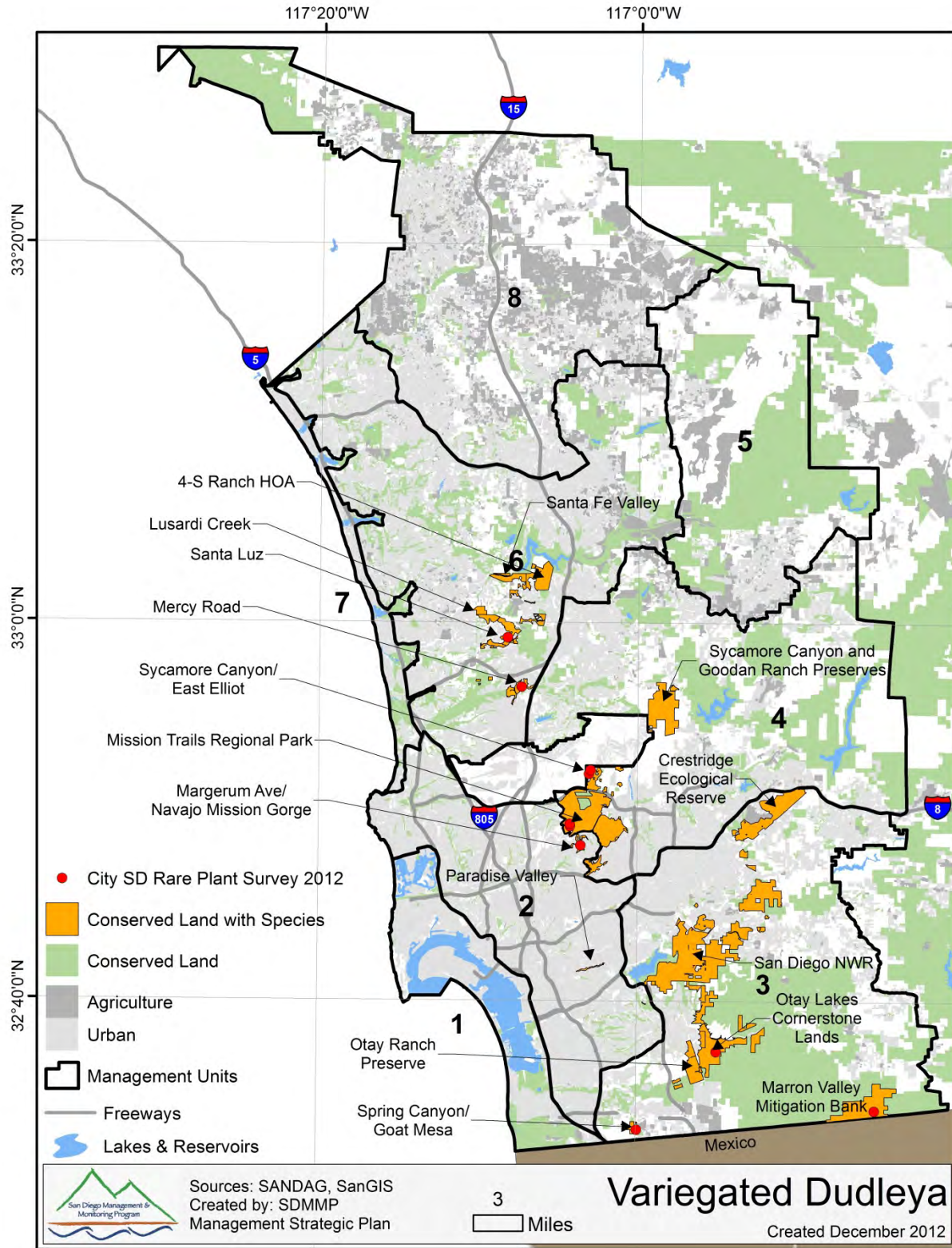
Variegated Dudleya Stressors on Conserved Lands:

- Invasive nonnative plants, particularly annual grasses
- Altered fire regimes leading to conversion of native habitats to nonnative grassland
- Off-highway vehicle activity
- Illegal trails
- Illegal goat grazing

Rationale for Management Objectives:

Management Units 1, 2, 5, 7 and 8: There are no known conserved populations of variegated dudleya in MUs 1, 2, 5, 7 and 8 so no goals and objectives were prepared for this species in these management units.

Management Units 3, 4 and 6: Within the MSPA there are 17 known conserved populations of variegated dudleya (see figure below). There are eight populations in MU 3, five in MU 4, and three in MU 6. Many populations have burned at least once in the last decade and are threatened by invasive nonnative plants, particularly purple false brome and other annual grasses. It is essential to maintain large populations within each of the MUs if the species is to persist over the long term in the MSPA.



7.2.1.7 Variegated Dudleya (*Dudleya variegata*)

Variegated Dudleya Known Conserved Locations in MU 3:

There are two large (>500 individuals; Ogden 1995) conserved populations of variegated dudleya and six other populations that are smaller or of unknown size in MU 3 (see table below, figure below). Estimating population size is difficult as the proportion of corms that grow and flower depends on growing conditions. The proportion of growing and flowering plants can vary significantly from year to year due to the timing and amount of rainfall. In low rainfall years, there may be no vegetative growth or flowering. As a result of this interannual variation, it is difficult to determine true population size.

Variegated Dudleya Stressors on Conserved Lands in MU 3:

The most important stressor for conserved populations of variegated dudleya in MU 3 is invasive nonnative plant species, particularly annual grasses. Five of the populations have burned at least once in the last decade and altered fire regimes are facilitating the increase in invasive plants. Other stressors include disturbance from illegal goat grazing and off-highway vehicle activity.

Variegated Dudleya MU 3 Management Goal:

Maintain large populations of variegated dudleya to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities in MU 3.

Variegated Dudleya MU 3 Management Objectives:

First Priority MU 3 Management Objectives

- F1. By 2017, collect covariate data on variegated dudleya population status, invasive nonnative forbs and grasses, and other threats at the seven populations in MU 3, which include Marron Valley, Otay Lakes, Otay Ranch Preserve at Salt Creek, Paradise Valley, Spring Canyon/Goat Mesa, Sunroad Centrum in East Otay Mesa, and the San Diego National Wildlife Refuge (see table below). Evaluate status and threat information and select at least two populations for management that would begin in 2018. Selection criteria would be primarily based on the need for invasive species control and the potential for increasing the abundance and areal extent of the population
- F2. Starting by 2018, maintain at least two variegated dudleya populations so that invasive annual grasses and thatch are reduced to $\leq 10\%$ absolute cover and total nonnative plants to $\leq 25\%$ absolute cover within the population's maximum occupied extent and a surrounding buffer area equal to 25% of this extent. If the population is reduced to $< 75\%$ of the maximum occupied extent for more than three consecutive years, then additional management actions could be implemented to expand and enhance the population.

Actions to Achieve First Priority MU 3 Management Objectives

- Determine the population status and magnitude of threats at conserved populations of variegated dudleya in MU 3. These data should include cover of invasive nonnative grasses and forbs and threats such as trampling, off-highway vehicles, and dumping. Using these data, prioritize and select at least two populations for active management by 2018.
- Invasive plant control should be conducted using best management practices until success criteria are met and then as needed thereafter. All variegated dudleya populations with

invasive plants should receive some treatment to reduce nonnative plant cover, even if the efforts are not as extensive as described in Priority F2.

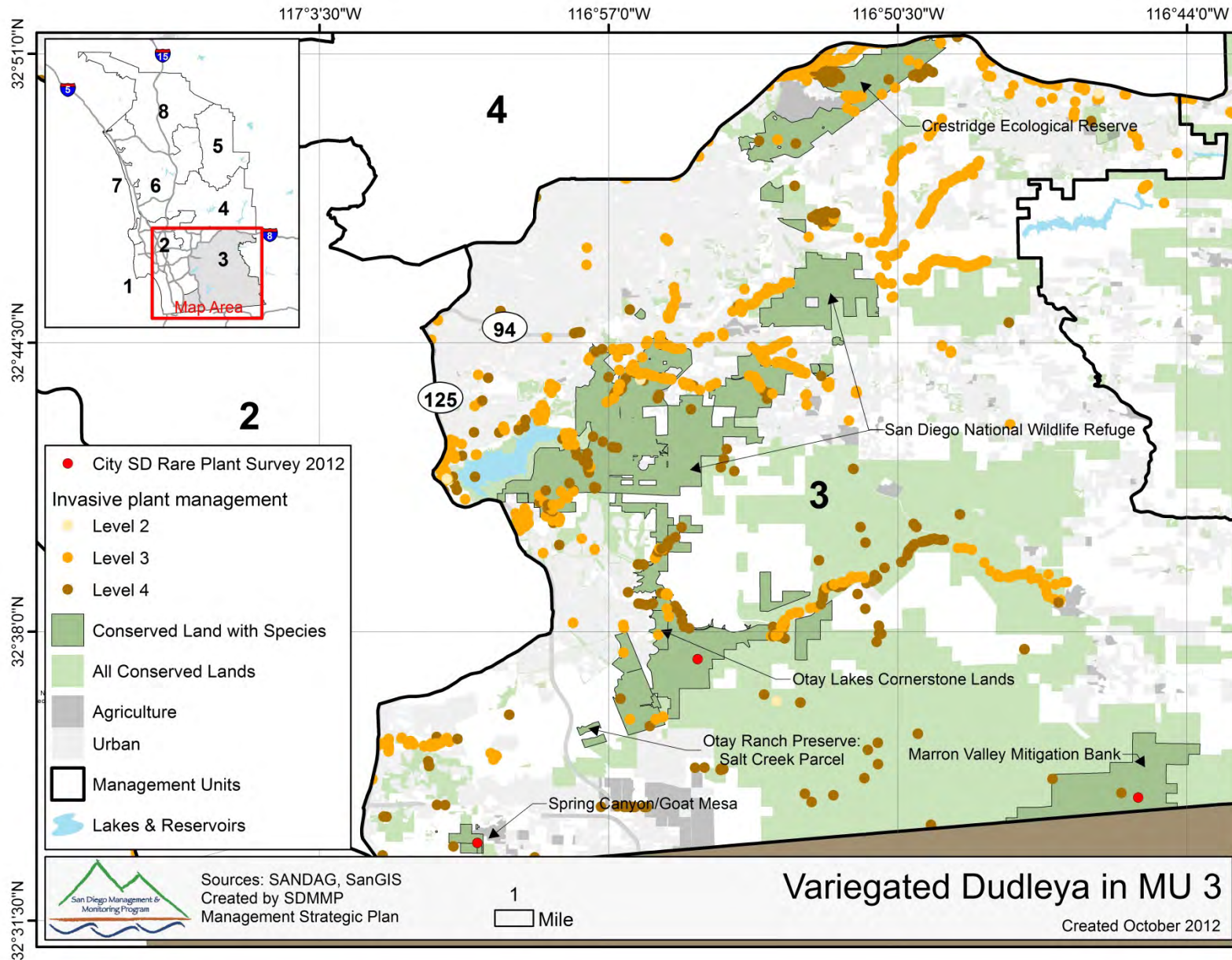
- If a variegated dudleya population is affected or potentially affected by trampling, off-highway vehicle activity or other ground disturbance, then fencing, signage, closing of trails, and enforcement patrols should be implemented to reduce impacts.
- If a maintained variegated dudleya population is < 75% of maximum occupied extent for more than three years, then the benefits of further management actions should be considered if the population appears to be in threat of eventual extirpation. These measures can include more intensive invasive plant control efforts and population augmentation (seeding or planting).

Known conserved populations of variegated dudleya in MU 3.

MU	Population	Land Owner/ Manager*	Pop Mgmt Status**	No. of Individ.	Survey Year	Threats	Source
<i>Large (>500 individuals) Populations</i>							
3	Otay Lakes – Southeast of Lower Lake	City San Diego	M	2,500	2012	Altered fire regime and invasive nonnative plants.	City San Diego 2012
3	Spring Canyon/ Goat Mesa	City San Diego	M	634	2012	Illegal goat grazing.	City San Diego 2012
<i>Small or Unknown Size Populations</i>							
3	Marron Valley	City San Diego	M	426	2012	Altered fire regime and invasive nonnative plants.	City San Diego 2012
3	Otay Ranch Preserve – Salt Creek	County San Diego	SM	100's	2009	Altered fire regime and invasive nonnative plants.	RECON 2012
3	Paradise Valley	City San Diego	M	100	2008	None identified.	City San Diego 2008
3	San Diego National Wildlife Refuge	USFWS	SM	5 populations	2003	None identified.	USFWS 2003
3	Sunroad Centrum – East Otay Mesa	County San Diego	UM	Present	2001	None identified.	County San Diego 2002
3	Crestridge Ecological Reserve	EHC	SM	> 11	2012	Altered fire regime, invasive nonnative plants and recreational activity including off-highway vehicles	CBI 2012

* Owner/Manager Codes: EHC = Endangered Habitats Conservancy; USFWS = United States Fish and Wildlife Service

**Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



8.2.1.5 Variegated Dudleya (*Dudleya variegata*)

Variegated Dudleya Known Conserved Locations in MU 4:

There are two large (>500 individuals; Ogden 1995) conserved populations and three small or unknown size populations of variegated dudleya in MU 4 (see table below, figure below). Estimating population size is difficult as the proportion of corms that grow and flower depends on growing conditions. The proportion of growing and flowering plants can vary significantly from year to year due to the timing and amount of rainfall. In low rainfall years, there may be no vegetative growth or flowering. As a result of this interannual variation, it is difficult to determine true population size.

Variegated Dudleya Stressors on Conserved Lands in MU 4:

The most important stressor for conserved populations of variegated dudleya in MU 4 is invasive nonnative plant species, particularly annual grasses. At least two of the populations burned in the 2003 Cedar Fire, with an increase in invasive grass cover following the fire. Other stressors include recreational impacts from illegal trails.

Variegated Dudleya MU 4 Management Goal:

Maintain large populations of variegated dudleya to increase resilience to environmental stochasticity, maintain genetic diversity and ensure persistence over the long term (>100 years) in native plant communities in MU 4.

Variegated Dudleya MU 4 Management Objectives:

First Priority MU 4 Management Objectives

- F1. By 2017, collect covariate data on variegated dudleya population status, invasive nonnative forbs and grasses, and other threats at the five populations in MU 4, which include Margerum Ave./Navajo, Mercy Road, Mission Trails Regional Park, Sycamore Canyon/East Elliot and Sycamore Canyon/Good Ranch Open Space Preserve (table below). Evaluate status and threat information and select at least one population for management that would begin in 2018. Selection criteria would be primarily based on the need for invasive species control and the potential for increasing the abundance and areal extent of the population.
- F2. Starting by 2018, maintain the selected variegated dudleya population so that invasive annual grasses and thatch are reduced to $\leq 10\%$ absolute cover and total nonnative plants to $\leq 25\%$ absolute cover within the population's maximum occupied extent and a surrounding buffer area equal to 25% of this extent. If the population is reduced to $< 75\%$ of the maximum occupied extent for more than three consecutive years, then additional management actions could be implemented to expand and enhance the population.

Actions to Achieve First Priority MU 4 Management Objectives

- Determine the population status and magnitude of threats at variegated dudleya populations in MU 4. These data should include cover of invasive nonnative grasses and forbs and threats such as trampling, off-highway vehicles, and dumping. Using these data, prioritize and select a population for active management by 2018.
- Invasive plant control using best management practices should be conducted at selected populations until success criteria are met and then as needed thereafter. All variegated

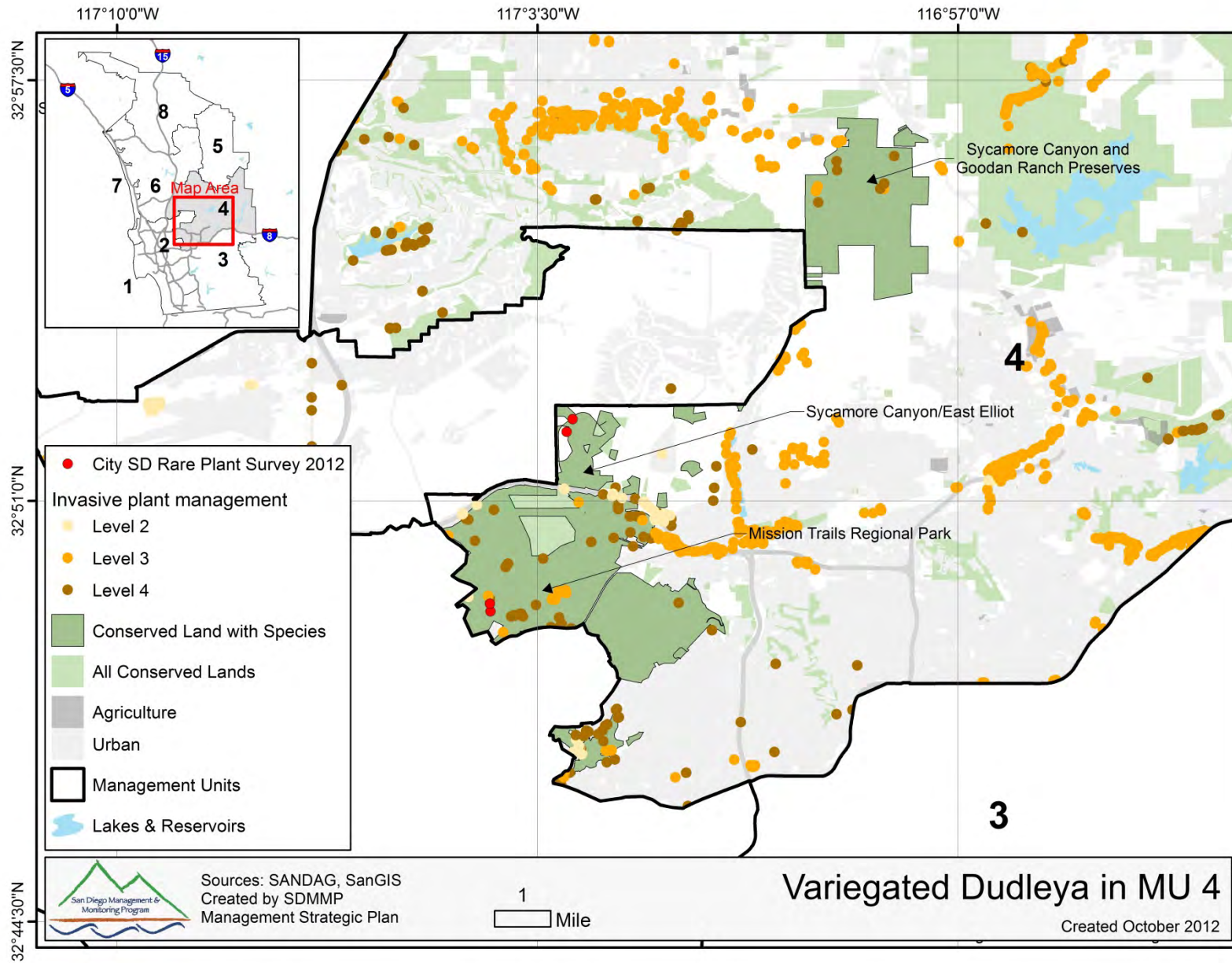
dudleya populations with invasive plants should receive some treatment to reduce nonnative plant cover, even if the efforts are not as extensive as described in Priority F2.

- If a variegated dudleya population is affected or potentially affected by trampling, off-highway vehicle activity or other ground disturbance, then fencing, signage, closing of trails, and enforcement patrols should be implemented to reduce impacts.
- If a maintained variegated dudleya population is < 75% of maximum occupied extent for more than three years, then the benefits of further management actions should be considered if the population appears to be in threat of eventual extirpation. These measures can include more intensive invasive plant control efforts and population augmentation (seeding or planting).

Known conserved populations of variegated dudleya in MU 4.

MU	Population	Land Owner/ Manager	Pop Mgmt Status*	No. of Indiv.	Survey Year	Threats	Source
<i>Large (>500 individuals) Populations</i>							
4	Mission Trails Regional Park	City San Diego	M	2,621	2012	None identified.	City San Diego 2012
4	Margerum Ave./Navajo	City San Diego	M	505	2012	Invasive nonnative plants.	City San Diego 2012
<i>Small or Unknown Size Populations</i>							
4	Mercy Road	City San Diego	M	130	2012	Invasive nonnative plants.	City San Diego 2012
4	Sycamore Canyon/East Elliot	City San Diego	M	28	2012	Burned in 2003. Recreation impacts, illegal trail.	City San Diego 2012
4	Sycamore Canyon/Goodan Ranch	County San Diego	NM	Present	2007	Burned in 2003.	McEachern et al. 2007

*Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



10.2.1.7 Variegated Dudleya (*Dudleya variegata*)

Variegated Dudleya Known Conserved Locations in MU 6:

There is one large (>500 individuals; Ogden 1995) conserved population of variegated dudleya and three small or unknown size populations in MU 6 (see table below, figure below). Estimating population size is difficult as the proportion of corms that grow and flower depends on growing conditions. The proportion of growing and flowering plants can vary significantly from year to year due to the timing and amount of rainfall. In low rainfall years, there may be no vegetative growth or flowering. As a result of this inter-annual variation, it is difficult to determine true population size.

Variegated Dudleya Stressors on Conserved Lands in MU 6:

The most important stressor for conserved populations of variegated dudleya in MU 6 is invasive nonnative plant species, particularly annual grasses. At least two of the populations burned in the 2007 Witch Fire, with much of the burned area showing an increase in invasive plants following the fire. Other stressors include recreational impacts from illegal trails.

Variegated Dudleya MU 6 Management Objectives:

First Priority MU 6 Management Objectives

- F1. By 2017, collect covariate data on variegated dudleya population status, invasive nonnative forbs and grasses, and other threats at the four populations in MU 6, which include 4S Ranch, Lusardi Creek, Santa Fe Valley and Santa Luz (table below). Evaluate status and threat information and select at least one population for management that would begin in 2018. Selection criteria would be primarily based on the need for invasive species control and the potential for increasing the abundance and areal extent of the population.
- F2. Starting by 2018, maintain the selected variegated dudleya population so that invasive annual grasses and thatch are reduced to $\leq 10\%$ absolute cover and total nonnative plants to $\leq 25\%$ absolute cover within the population's maximum occupied extent and a surrounding buffer area equal to 25% of this extent. If the population is reduced to $< 75\%$ of the maximum occupied extent for more than three consecutive years, then additional management actions could be implemented to expand and enhance the population.

Actions to Achieve First Priority MU 6 Management Objectives

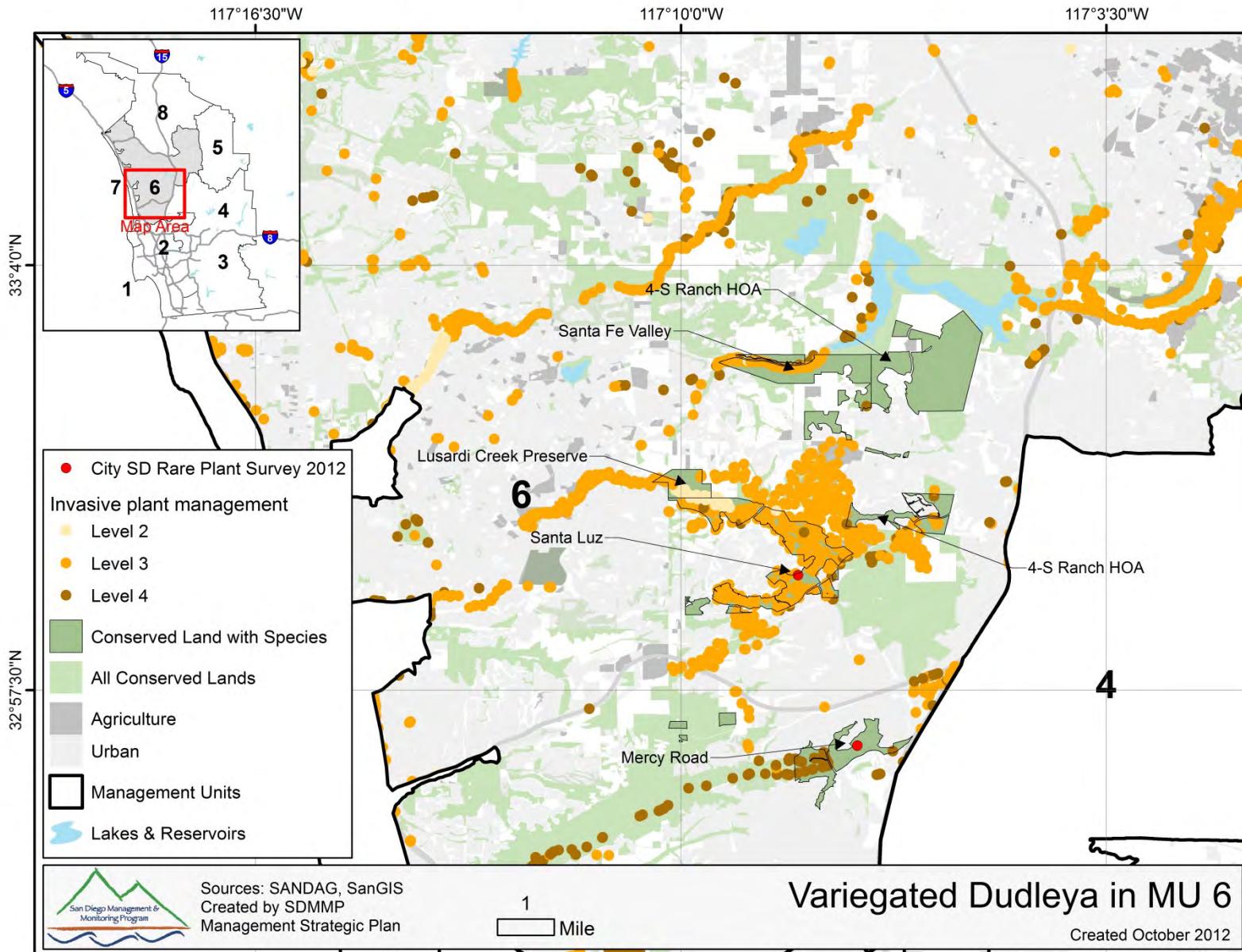
- Determine the population status and magnitude of threats at variegated dudleya populations in MU 6. These data should include cover of invasive nonnative grasses and forbs and threats such as trampling, off-highway vehicles, and dumping. Using these data, prioritize and select a population for active management by 2018.
- Invasive plant control using best management practices should be conducted at selected populations until success criteria are met and then as needed thereafter. All variegated dudleya populations with invasive plants should receive some treatment to reduce nonnative plant cover, even if the efforts are not as extensive as described in Priority F2.

- If a variegated dudleya population is affected or potentially affected by trampling, off-highway vehicle activity or other ground disturbance, then fencing, signage, closing of trails, and enforcement patrols should be implemented to reduce impacts.
- If a maintained variegated dudleya population is < 75% of maximum occupied extent for more than three years, then the benefits of further management actions should be considered if the population appears to be in threat of eventual extirpation. These measures can include more intensive invasive plant control efforts and population augmentation (seeding or planting).

Known conserved populations of variegated dudleya in MU 6.

MU	Population	Land Owner/ Manager	Pop Mgmt Status*	No. of Indiv.	Survey Year	Threats	Source
<i>Large (>500 individuals) Populations</i>							
6	4S Ranch	County San Diego	NM	500	2007	Burned in 2007.	McEachern et al. 2007
<i>Small or Unknown Size Populations</i>							
6	Lusardi Creek	County San Diego	NM	Present	2008	Burned in 2007. 1,694 individuals in 2001.	County San Diego 2012, ICF Jones and Stokes 2008
6	Santa Fe Valley	County San Diego	NM	295	2001	Unknown.	County San Diego 2002
6	Santa Luz	City San Diego	M	0	2012	Invasive nonnative plants. Last detected in 2010.	City San Diego 2012

*Management Status Codes: M = Population or habitat is fully managed; SM = Site is managed but population or habitat is not managed; PM = Partial management of population or habitat; NM = No management; UM = Unknown management status.



Appendix 3B

References for MSP Volumes 1, 2, and 3

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Adams, I., T. Antifeau, M. Badry, L. Campbell, A. Dibb, O. Dyer, W. Erickson, C. Hoodicoff, L. Ingham, A. Jackson, K. Larsen, T. Munson, N. Newhouse, B. Persello, J. Surgenor, K. Sutherland, J. Steciw, and R. Weir. 2002. *Draft National Recovery Strategy for American Badger, jeffersonii subspecies, (Taxidea taxus jeffersonii)*. Recovery of Nationally Endangered Wildlife, Ottawa, Ont.

Adams, Rick A. and Mark A. Hayes. 2008. Water availability and successful lactation by bats as related to climate change in arid regions of western North America. *Journal of Animal Ecology* 77:1115-1121.

AECOM and Ascent Environmental. 2010. *Year 8 Mitigation Implementation and Monitoring Report for the Statewide Lethal Electrified Fence Project 2009-2010*. Prepared for Facility Planning, Construction, and Management, California Department of Corrections and Rehabilitation.

AECOM. 2011. *Vegetation Classification Manual for Western San Diego County*. Prepared by AECOM, the California Department of Fish and Game, and the Conservation Biology Institute. Prepared for the San Diego Association of Governments.

AECOM. 2012. *Western San Diego County Invasive Plant Species GIS Shapefile*. Prepared for the San Diego Association of Governments.

AECOM. 2012. *Western San Diego County Vegetation Map GIS Shapefile*. Prepared for the San Diego Association of Governments.

Allen, E.G., P.E. Padgett, A. Bytnerowicz, and R. Minnich. 1999. Nitrogen deposition effects on coastal sage scrub vegetation of southern California. Pp. 131-139 in Bytnerowicz, A., M.J. Arbaugh, and S.L. Schilling (technical coordinators). *Proceedings of the International Symposium on Air Pollution and Climate Change Effects on Forest Ecosystems*. General Technical Report PSW-GTR-166. U.S. Department of Agriculture, Forest Service.

Allen, E.B., S.A. Eliason, V.J. Marquez, G.P. Schultz, N.K. Storms, C.D. Stylinski, T.A. Zink, and M.F. Allen. 2000. What are the limits to restoration of coastal sage scrub in southern California? Pp. 253-262 in Keeley, J.E., M. Baer-Keeley, and C.J. Fotheringham (eds.). *2nd Interface Between Ecology and Land Development in California*. U.S. Geological Survey Open-File Report 00-62.

Allen, Edith B., Leela E. Rao, Robert J. Steers, Andrzej Bytnerowicz, and Mark E. Fenn. 2009. Impacts of atmospheric nitrogen on vegetation and soils in Joshua Tree National Park. Pages 78-100 in R. H. Webb, L. F. Fenstermaker, J. S. Heaton, D. L. Hughson, E. V. McDonald, and D. M. Miller, editors. *The Mohave Desert: Ecosystem Processes and Sustainability*. University of Nevada Press, Las Vegas, Nevada, USA.

Barr, Kelly R., Amy G. Vandergast and Barbara E. Kus. 2012. *Genetic Connectivity in the Coastal Cactus Wren*. Data summary report prepared for the San Diego Management and Monitoring Program and the San Diego Association of Governments (SANDAG).

Barr, Kelly R., Amy G. Vandergast, and Barbara E. Kus. 2013. *Genetic Structure in the Cactus Wren in Coastal Southern California*. Data summary report prepared for the California Department of Fish and Wildlife.

Barry, S., S. Larson, and M. George. 2006. California native grasslands: A historical perspective, a guide for developing realistic restoration objectives. *Grasslands* Winter 2006:7-11.

- Bauder, Ellen. 2000. *Recovery and Management of Orcutt's Spineflower (Chorizanthe orcuttiana) Final Report*. Prepared for the California Department of Fish and Game.
- Bauder, Ellen T., Juda Sakrison and H. David Truesdale. 2010a. *Chorizanthe orcuttiana (Orcutt's Spineflower) Final Report*. Prepared for Coastal IPT NAVFACSW and Naval Facilities Engineering Command, Southwest. Contract #: N68711-02-LT-00041, Department of the Navy.
- Bittner, John D., C. Meador, Brittany Schlotfeldt, and Renée. Rivard. 2010. *Report on the Status of the Golden Eagle in the San Diego MSCP 2004-2010*. Confidential report prepared by the Wildlife Research Institute, Inc. for the San Diego Association of Governments (SANDAG).
- BLM. 2012. *Bureau of Land Management Otay Mountain Wilderness Area*. Accessed September 2012. http://www.blm.gov/ca/st/en/prog/wilderness/wa/areas/otay_mountain.html
- Bolger, Douglas T. 2007. Spatial and temporal variation in the Argentine ant edge effect: Implications for the mechanism of edge limitation. *Biological Conservation*. 136:295-305.
- Bontrager, David R., Rick A. Erickson, and Robert A. Hamilton. 1995. Impacts of the October 1993 Laguna Canyon Fire on California gnatcatchers and cactus wrens. In *Brushfires in California Wildlands: Ecology and Resource Management*, Ed. J.E. Keeley and T. Scott, International Association of Wildland Fire, Fairfield, WA.
- Brehme, C.S., D.R. Clark, C.J. Rochester, and R.N. Fisher. 2011. Wildfires alter rodent community structure across four vegetation types in southern California, USA. *Fire Ecology* 7(2): 81-98. doi: 10.4996/fireecology.0702081
- Brehme, Cheryl S., Carlton Rochester, Stacie A. Hathaway, Brian H. Smith, and Robert N. Fisher. 2012. *Rapid Assessment of the Distribution of American Badgers Within Western San Diego County*. Data summary prepared for the California Department of Fish and Game. 42 pp.
- Brown, Chris and Robert Fisher. 2008. *Data Summary for the 2007 and 2008 Pacific Pond Turtle (Actinemys marmorata) Surveys Conducted in the County of San Diego; Boulder Oaks, Lusardi Creek and Los Penasquitos Canyon*. Prepared for the County of San Diego. U.S. Geological Survey, Western Ecological Research Center.
- Brown, Chris, Hathaway, Stacie, and Robert, Fisher. 2012. *Data Summary for the TransNet Environmental Mitigation Program Grant Agreement 5001140 Regarding Southwestern Pond Turtle Restoration at Sycuan Peak Ecological Reserve, March 2012*. Prepared for SANDAG. U.S. Geological Survey, Western Ecological Research Center.
- Burcham, L.T. 1956. Historical backgrounds of range land use in California. *Journal of Range Management* 9:81-86.
- Cal Fire. 2012. *Fire and Resource Assessment Program (FRAP) GIS Database*. Accessed September 2012. <http://frap.fire.ca.gov/data/frapgisdata/select.asp>
- Callaway, John C. and Joy B. Zedler. 2004. Restoration of urban salt marshes: lessons from southern California. *Urban Ecosystems* 7:107-124.
- California Native Plant Society (CNPS). 2011. *Inventory of Rare and Endangered Plants* (online edition, v8-01a). California Native Plant Society, Sacramento, CA. Accessed on March 15, 2011.

CALTRANS. 2012a. *California Department of Transportation: California's South Bay Expressway Mitigation Program*. <http://www.environment.fhwa.dot.gov/ecosystems/eei/ca06.asp>

CALTRANS. 2012b. *Excel Spreadsheet and Maps with Artificial Burrow Locations*, provided by Michael Galloway of the California State Department of Transportation.

Cayan, D.R., E.P. Maurer, M.D. Dettinger, M. Tyree, and K. Hayhoe. 2008. Climate change scenarios for the California region. *Climatic Change* 87 (Suppl 1):S21-S42.

CBI. 2007a. *Baseline Conditions Report for Ramona Grasslands Preserve, San Diego County*. Report prepared by the Conservation Biology Institute for the County of San Diego Department of Parks and Recreation.

CBI. 2007b. *Baseline Conditions Report for Ramona Grasslands Preserve, San Diego County: Volume 2 – Technical Appendices*. Report prepared by the Conservation Biology Institute for the County of San Diego Department of Parks and Recreation.

CBI. 2012c. *2012 Biological Monitoring Status Report for Crestridge Ecological Reserve and South Crest Properties*. Prepared by the Conservation Biology Institute for the Endangered Habitats Conservancy.

CBI. 2012d. *Covered and Invasive Species Management: Crestridge Ecological Reserve and South Crest Properties Tasks 1-4: Covered Species Mapping, Invasive Species Mapping, Invasive Plant Control, and Early Detection Plan*. Prepared for San Diego Association of Governments.

CBI et al. 2012. *Management Priorities for Invasive Non-native Plants: A Strategy for Regional Implementation, San Diego County, California*. Prepared by the Conservation Biology Institute, California Invasive Plant Council and Dendra for the San Diego Association of Governments. Contract No. 5001322

CCB. 2002. *Biocomplexity Maps and Data*. University of California Riverside's Center for Conservation Biology. <http://ccb.ucr.edu/biocommaps.html> Accessed November 29, 2012.

CCH. 2013. *Consortium of California Herbaria*. <http://ucjeps.berkeley.edu/consortium/> Accessed 2013.

CDFG. 2008. California Department of Fish and Game Trapping License Examination Reference Guide. <http://www.dfg.ca.gov/wildlife/hunting/uplandgame/docs/CADFGTrappingGuideJan2009.pdf>

CDFG. 2011a. *State of California, the Natural Resources Agency, Department of Fish and Game, Biogeographic Data Branch, California Natural Diversity Database, Special Animals*. January 2011.

CDFG. 2011b. *California Native Plant Society Rare Plant Treasure Hunt Field Survey Form*. Completed for San Elijo Lagoon by Meredith Osborne, Davie Lawhead and David Varner of California Department of Fish and Wildlife.

CDFG. 2012a. *California Department of Fish and Game*. Accessed September 2012. <http://www.dfg.ca.gov/about>

CDFG. 2010. *Burrowing Owl burrow survey*, unpublished data

CDFG. 2012b. *Burrowing Owl Artificial and Natural Burrow Survey Database*. GIS shapefile prepared by the California Department of Fish and Wildlife.

CFGC. 2013. California Fish and Game Commission Mammal Hunting Regulations 2013-2014.
<http://www.fgc.ca.gov/regulations/current/mammalregs.aspx#460>

Chester, Tom, Wayne Armstrong, and Kay Madore. 2007. *Brodiaea santarosae* (Themidaceae), a new rare species from the Santa Rosa basalt area of the Santa Ana Mountains of southern California. *Madroño* 54:187-198.

Cinzano, Pierantano and Chris D. Elvidge. 2004. Night sky brightness at sites from DSMP-OLS satellite measurements. *Monthly Notices of the Royal Astronomical Society* 353:1107-1116.

Cinzano, Pierantonio, Fabio Falchi, and Chris D. Elvidge. 2012. *The World Atlas of the Artificial Night Sky Brightness*. Copyright Royal Astronomical Society. Reproduced from the Monthly Notices of the RAS by permission of Blackwell Science. Accessed October 2012. <http://www.lightpollution.it/dmsp/>

City of San Diego. 1995. *Multiple Species Conservation Program (MSCP) Volume II: Appendix A – Biological Resources*. Prepared by Ogden Environmental and Energy Services Co., the Rick Alexander Company, Onaka Planning and Economics, Douglas Ford and Associates, Sycamore Associates, SourcePoint and CESAR. Prepared for the City of San Diego.

City of San Diego. 1999. *City of San Diego Rare Plant Monitoring Data*.
<http://www.sandiego.gov/planning/programs/mscp/pdf/monitor/monitoringsummary1999to2009.pdf>

City of San Diego. 2000. *City of San Diego Rare Plant Monitoring Data*.
<http://www.sandiego.gov/planning/programs/mscp/pdf/monitor/monitoringsummary1999to2009.pdf>

City of San Diego. 2001. *City of San Diego Rare Plant Monitoring Data*.
<http://www.sandiego.gov/planning/programs/mscp/pdf/monitor/monitoringsummary1999to2009.pdf>

City of San Diego. 2003. *City of San Diego Rare Plant Monitoring Data*.
<http://www.sandiego.gov/planning/programs/mscp/pdf/monitor/monitoringsummary1999to2009.pdf>

City of San Diego. 2004. *City of San Diego Rare Plant Monitoring Data*.
<http://www.sandiego.gov/planning/programs/mscp/pdf/monitor/monitoringsummary1999to2009.pdf>

City of San Diego. 2005. *City of San Diego Rare Plant Monitoring Data*.
<http://www.sandiego.gov/planning/programs/mscp/pdf/monitor/monitoringsummary1999to2009.pdf>

City of San Diego. 2006. *City of San Diego Rare Plant Monitoring Data*.
<http://www.sandiego.gov/planning/programs/mscp/pdf/monitor/monitoringsummary1999to2009.pdf>

City of San Diego. 2008. *City of San Diego Rare Plant Monitoring Data*.
<http://www.sandiego.gov/planning/programs/mscp/pdf/monitor/monitoringsummary1999to2009.pdf>

City of San Diego. 2009. *City of San Diego Rare Plant Monitoring Data*.
<http://www.sandiego.gov/planning/programs/mscp/pdf/monitor/monitoringsummary1999to2009.pdf>

City of San Diego. 2010. *City of San Diego Rare Plant Monitoring Data*.

City of San Diego. 2011. *City of San Diego Rare Plant Monitoring Data*.

City of San Diego. 2012. *City of San Diego Rare Plant Monitoring Data*.

City of San Diego. 2013. *Mission Trails Regional Park Sensitive Habitat Field Notes*.

CNDDDB. 2012. *California Natural Diversity Database*. Species occurrences shapefile, accessed 2012 and 2013.

CNLM. 2005. *Habitat Management Plan for the Rancho La Costa Habitat Conservation Area: A Dedicated Natural Open Space System Set Aside as Part of the La Costa Villages and University Commons Developments which Includes the Nelson Property*. Prepared for the City of Carlsbad, City of San Marcos, U.S. Fish and Wildlife Service, California Department of Fish and Game.

CNLM. 2009. *Habitat Management Plan for the Rancho La Costa Habitat Conservation Area: A Dedicated Natural Open Space System Set Aside as Part of the La Costa Villages, University Commons, and Cassia Professional Offices Developments and also Includes the "Nelson" and "Meadowlark" Parcels*. Prepared for the U.S. Fish and Wildlife Service, California Department of Fish and Game, and City of Carlsbad.

CNLM. 2010a. *Calavera Hills and Robertson Ranch Habitat Conservation Area: Dedicated Natural Areas Set Aside as Part of the Calavera Hills Phase II and Robertson Ranch Developments, Annual Work Plan, October, 2010-September 2011*. Prepared for the U.S. Fish and Wildlife Service, California Department of Fish and Game, and City of Carlsbad.

CNLM. 2010b. *Carlsbad Oaks North Habitat Conservation Area, Annual Work Plan, October, 2010-September 2011*. Prepared for the U.S. Fish and Wildlife Service, California Department of Fish and Game, and City of Carlsbad.

CNLM. 2012a. *Results of Orcutt's hazardia Surveys Conducted by the Center for Natural Lands Management at Natural and Planted Populations in Carlsbad and Encinitas*. Microsoft Excel spreadsheet.

CNLM. 2012b. *The Effects of Fusilade II and Dethatching on Population Numbers and Flowering in Thread-leaved Brodiaea (Brodiaea filifolia) and Monitoring Population Size of Thread-leaved Brodiaea: Estimating from Sexual Production and Modeling Annual Variation*. Center for Natural Lands Management powerpoint presentation to the San Diego Management and Monitoring Program.

County of Riverside. 2003. *Western Riverside County Multiple Species Habitat Conservation Plan, Volume I: The Plan*.

County of San Diego. 2002. *Sensitive Plant Monitoring Final Report*. Prepared by the County of San Diego Multiple Species Conservation Program for the California Department of Fish and Game Local Assistance Grant #P9950025.

County of San Diego. 2007. *County of San Diego MSCP Monitoring Summary Report, January 1998-June 2007*. Prepared for the U.S. Fish and Wildlife Service and California Department of Fish and Game.

County of San Diego. 2010. *Draft North County Multiple Species Conservation Plan Conservation Analysis*.

County of San Diego. 2012a. *SanBIOS- Sensitive Species Sightings*. Accessed October 2012.
<http://catalog.opensandiego.org/opendata/resource/3118/sanbios-ecology/>

County of San Diego. 2012b. *San Diego County Parks and Recreation*. Accessed September 2012.
<http://www.sdcountry.ca.gov/parks/parklist.html#Preserves>

D'Antonio, C., S. Bainbridge, C. Kennedy, J. Bartolome, and S. Reynolds. 2000. *Ecology and Restoration of California Grasslands with Special Emphasis on the Influence of Fire and Grazing on Native Grassland Species*. Report prepared for the David and Lucille Packard Foundation and the University of California, Berkeley.

Deutschman, Doug, and Sarah McCullough. 2012. *Monitoring and Adaptive Management of Burrowing Owl on Conserved Lands in Southern San Diego County, Task B: Continued Habitat Enhancement*. Prepared for San Diego Association of Governments Contract Amendment 4 to #5001562.

Dodero, Mark. 2012. *Personal Communication*.

Dudek and Associates. 2000. *City of San Diego Mission Trails Regional Park San Diego Ambrosia Management Plan*. Prepared for the City of San Diego.

Dudek and Associates. 2009. *Annual Report (2008) 4S Ranch Specific Plan Habitat Management Plan Area*. Prepared for Newland California/4S Kelwood GP.

Dudek and Associates. 2010a. *Baseline Biodiversity Survey for the Otay Ranch Preserve*. Prepared for the County of San Diego.

Dudek and Associates. 2010b. *Baseline Biodiversity Survey for the Simon Preserve*. Prepared for the County of San Diego Department of Parks and Recreation.

Dudek and Associates. 2011a. *Baseline Biodiversity Survey for the Escondido Creek Preserve*. Prepared for the County of San Diego Department of Parks and Recreation.

Dudek and Associates. 2011b. *Baseline Biodiversity Survey for the Pascoe, Helix-Lambron and Cielo Azul Parcel Additions to the Del Dios Highlands Preserve*. Prepared for the County of San Diego.

Dudek and Associates. 2011c. *Final Baseline Biodiversity Survey for the San Luis Rey River Park*. Prepared for the County of San Diego Department of Parks and Recreation.

Elvin Mark A. and Andrew C. Sanders. 2003. A new species of *Monardella* (lamiaceae) from Baja California, Mexico, and southern California, United States. *Novon* 13:425-432.

Elvin Mark A. and Andrew C. Sanders. 2009. Nomenclatural changes for *Monardella* (lamiaceae) in California. *Novon* 19:315-343.

Environmental Science Associates. 2011. *City of Carlsbad Habitat Management Plan: Annual Report and Monitoring Summary, Year 7, Nov. 2010-October 2011*. Prepared on behalf of Technology Associates (TAIC) for the City of Carlsbad.

Fellows, Meghan G.N. and Joy B. Zedler. 2005. Effects of the non-native grass *Parapholis incurva* (Poaceae), on the rare and endangered hemiparasite, *Cordylanthus maritimus* subsp. *Maritimus* (Scrophulariaceae). *Madroño* 52:91-98.

Fisher, Robert N., Dustin A. Wood, Chris W. Brown, Phillip Q. Spinks and Amy G. Vandergast. 2012. *Assessment of Western Pond Turtle Population Genetic Structure and Diversity in Southern California*. Powerpoint presentation for SDMMMP Management and Monitoring Coordination Meeting.

Franklin, I.R. 1980. Evolutionary change in small populations. Pages 135-140 in: M.E. Soule and B.A. Wilcox (eds.), *Conservation Biology: An Evolutionary-Ecological Perspective*. Sinauer Associates, Sunderland, Mass.

Freudenberger, D.O., B.E. Fish, and J.E. Keeley. 1987. Distribution and stability of grasslands in the Los Angeles Basin. *Bulletin of the Southern California Academy of Science* 86:13-26.

Gogol-Prokurat, M. and M. Osborne. 2002. *Report to the Fish and Game Commission on the Status of Orcutt's hazardia (Hazardia orcuttii)*. Status report 2002-01. California Department of Fish and Game, Habitat Conservation Planning Branch, Sacramento, CA.

Gordon-Reedy, Patricia. 2012. *Personal Communication*.

Hamilton, Robert A. 2008. *2008 Surveys Cactus Wrens and California Gnatcatchers San Dieguito River Valley, San Diego County*. Report prepared for Conservation Biology Institute.

Hamilton, R.A., G.A. Proudfoot, D.A. Sherry, and S. Johnson. 2011. *Cactus Wren (Campylorhynchus brunneicapillus)*, The Birds of North America Online (A. Poole, Ed.). Ithica: Cornell Lab of Ornithology, Retrieved from the Birds of North America Online: <http://bna/birds.cornell.edu/bna/species/558>. doi: 10.2173/bna.558.

Harris, J. 2000. *California Wildlife Habitat Relationships System Species Account for Townsend's Big-Eared Bat*. Prepared for California Department of Fish and Game California Interagency Wildlife Task Group.

Hasselquist, Niles, Eliza Maher Hasselquist, and Deborah Rogers. 2009. *Final Report: Comparison of Vegetation Management Techniques to Support Recovery of the Federally Endangered Ambrosia pumila*. Prepared by the Center for Natural Lands Management.

Hathaway, Stacie., John O'Leary, Robert Fisher, Carlton Rochester, Cheryl Brehme, Chris Haas, Scott McMillan, Mark Mendelsohn, Drew Stokes, Krista Pease, Chris Brown, Brian Yang, Ed Ervin, Manna Warburton, and Melanie Madden-Smith. 2002. *Baseline Biodiversity Survey for the Rancho Jamul Ecological Reserve*. U.S. Geological Survey Final Report. Prepared for the California Department of Fish and Game.

Hayhoe, K., D. Cayan, C.B. Field, P.C. Frumhoff, E.P. Maurer, N.L. Miller, S.C. Moser, S.H. Schneider, K. Nicholas Cahill, E.E. Cleland, L. Dale, R. Drapek, R.M. Hanemann, L.S. Kalkstein, J. Lenihan, C.K. Lunch, R.P. Neilson, S.C. Sheridan, and J.H. Verville. 2004. Emissions pathways, climate change and impacts on California. *Proceedings of the National Academy of Sciences* 101:12422-12427.

Helenurm, Kaius and Lorraine S. Parsons. 1997. Genetic variation and the reintroduction of *Cordylanthus maritimus* ssp *maritimus* to Sweetwater Marsh, California. *Restoration Ecology* 5:236-244.

Hess, William J. and James C. Dice. 1995. *Nolina cismontana* (Nolinaceae), a new species name for an old taxon. *Novon* 5:162-164.

Hierl, Lauren A., Janet Franklin, Douglas H. Deutschman, and Helen M. Regan. 2007. *Developing Conceptual Models to Improve the Biological Monitoring Plan for San Diego's Multiple Species Conservation Plan*. Prepared for the California Department of Fish and Game.

Holway, David A. and Andrew V. Suarez. 2006. Homogenization of ant communities in Mediterranean California: The effects of urbanization and invasion. *Biological Conservation* 127:319-326.

ICF Jones and Stokes. 2008a. *Appendix A: Baseline Biological Resources Evaluation for Sycamore Canyon and Goodan Ranch Preserves*. Prepared for the County of San Diego Department of Parks and Recreation.

- ICF Jones and Stokes. 2008b. *Baseline Biological Resources Evaluation for the El Capitan Preserve*. Prepared for the County of San Diego Department of Parks and Recreation.
- ICF Jones and Stokes. 2009. *Appendix A: Baseline Biological Resources Evaluation Lusardi Creek Preserve*. Prepared for the County of San Diego Department of Parks and Recreation.
- Jameson, E.W. and H.J. Peeters. 1988. *California Mammals*. University of California Press, Berkeley, California.
- Jones and Stokes. 2007. *Appendix A: Baseline Biological Resources Evaluation Boulder Oaks Open Space*. Prepared for the County of San Diego Department of Parks and Recreation.
- Kamada, Dana and Kristine Preston. 2013. *Nature Reserve of Orange County: Coastal Cactus Wren Dispersal and Survival Surveys, Genetics and Parasite Sampling, and Arthropod Foraging Ecology in 2012*. Annual Memorandum of Understanding report prepared for California Department of Fish and Wildlife.
- Keeley, J.E., M. Baer-Keeley, and C.J. Fotheringham. 2005. Alien plant dynamics following fire in Mediterranean-climate shrublands of California. *Ecological Applications* 15:2109-2125.
- Keeley, J. E., T.J. Brennan. 2012. Fire-driven alien invasion in a fire-adapted ecosystem *Oecologia* 169:1043-1052
- Kelly, Mike and Cindy Burrascano. 2007. Lopez Canyon willow monardella project 2001 to July 2006. *Canyon News* 21:1-6.
- Kelly, Mike, Cindy Burrascano, and Melanie Johnson Rocks. 2008. *Spraying over the top of Ambrosia pumila, a federally listed species to control weeds*. Powerpoint presentation.
- Kew. 2001. *Field Manual for Seed Collectors: Seed Collecting for the Millennium Seed Bank Project*, Royal Botanic Gardens, Kew.
- Klute, David S., William H. Howe, Steven R. Sheffield, Loren W. Ayers, Stephanie L. Jones, Tara S. Zimmerman, Michael T. Green and Jill A. Shaffer. 2003. *Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States*. US Department of the Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R6001-2003, Washington, D.C.
- Kochert, M.N., K. Steenhof, C.L. McIntyre, and E.H. Craig. 2003. *Golden Eagle (Aquila chrysaetos)*, The Birds of North America Online (A. Poole, Ed.), Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/684>. doi: 10.2173/bna.684.
- Kurz, Joseph C. and R. Larry Marchinton. 1972. Radiotelemetry studies of feral hogs in South Carolina. *Journal of Wildlife Management* 36: 1240-1248
- Kus, Barbara. 2012. U.S. Geological Survey, Survey of cactus wren genetics, unpublished data
- Kus, Barbara E. and Mary J. Whitfield. 2005. Parasitism, productivity, and population growth: response of Least Bell's Vireos (*Vireo bellii pusillus*) and Southwestern Willow Flycatchers (*Empidonax traillii extimus*) to cowbird (*Molothrus* spp.) control. *Ornithological Monographs* 57:16-27.
- Landis, Frank. 2011a. *State Beaches Rare Plant Surveys by California Native Plant Society Rare Plant Survey Committee, Spring 2011*.

Landis, Frank. 2011b. *Batiquitos Rare Plant Surveys by California Native Plant Society Rare Plant Survey Committee, Spring 2011.*

Landis, Frank. 2011c. *Silver Strand Elementary Rare Plant Surveys by California Native Plant Society Rare Plant Survey Committee, Spring 2011.*

Landis, Frank. 2011d. *Fiesta Island Rare Plant Surveys by California Native Plant Society Rare Plant Survey Committee, Spring 2011.*

Leatherman BioConsulting, Inc. 2009. *Central Reserve Cactus Wren Habitat Assessment and Study 2008.* Prepared for the Nature Reserve of Orange County.

Longcore, Travis, Douglas D. Murphy, Dennis Deutschman, Richard Redak, and Robert Fisher. 2003. *A Management and Monitoring Plan for Quino Checkerspot Butterfly (Euphydryas editha quinto) and its Habitats in San Diego County.* Advisory Report to the County of San Diego.

Macias-Duarte, Alberto. 2011. *Change in Migratory Behavior as a Possible Explanation for Burrowing Owl Population Declines in Northern Latitudes.* Dissertation submitted to the University of Arizona.

Madden-Smith, Melanie, Ervin, Edward, Meyer, Kathy, Hathaway, Stacie, and Robert N. Fisher. 2005. *Distribution and Status of the Arroyo Toad (Bufo californicus) and Western Pond Turtle (Emys marmorata) in the San Diego MSCP and Surrounding Areas.* Prepared for California Department of Fish and Game and the County of San Diego. U.S. Geological Survey, Western Ecological Research Center.

Madden-Smith, Melanie C., Edward L. Ervin, Kathy P. Meyer, Stacie A. Hathaway, and Robert N. Fisher. 2005. *Distribution and Status of the Arroyo Toad (Bufo californicus) and Western Pond Turtle (Emys marmorata) in the San Diego MSCP and Surrounding Areas.* Final report prepared for the County of San Diego and California Department of Fish and Game.

Madden-Smith, Melanie, Cheryl S. Brehme, Mark B. Mendelsohn, Denise R. Clark, Carlton J. Rochester, Tritia Matsuda, Stacie A. Hathaway, and Robert N. Fisher. 2004. *Baseline Biodiversity Survey for the Hollenbeck Canyon Wildlife Area and Continued Bird Monitoring at the Rancho Jamul Ecological Reserve, 2003-2004.* U.S. Geological Survey technical report prepared for the California Department of Fish and Game.

Marschalek, Daniel A. and Michael W. Klein. 2010. Distribution, ecology, and conservation of Hermes copper (*Lycaenidae: Lycaena [Hermelycaena] hermes*). *Journal of Insect Conservation* 14:721-730.

Martin, J. 2013. *San Diego Ambrosia (Ambrosia pumila) on San Diego National Wildlife Refuge.*

Mattoni, Rudi, Gordon F. Pratt, Travis R. Longcore, John F. Emmel, and Jeremiah N. George. 1997. The endangered quino checkerspot butterfly, *Euphydryas editha quino* (Lepidoptera: Nymphalidae). *Journal of Research on Lepidoptera* 34:99-118.

Matsuda, T., G. Turschak, C.S. Brehme, C.J. Rochester, M.J. Mitrovich, and R.N. Fisher. 2011. Effects of large-scale wildfire on ground foraging ants (Hymenoptera: Formicidae) in southern California. *Environmental Entomology* 40(2):204-216. doi: 10.1603/EN10061

McEachern, Kathryn, Bruce Pavlik, Jon Rebman, and Robert Sutter. 2006. *San Diego Multiple Species Conservation Program (MSCP) Rare Plant Monitoring Review and Revision.* Draft technical report prepared for the City of San Diego.

McEachern, Kathryn. 2007. *Compiled Rare Plant Monitoring Database for San Diego Multiple Species Conservation Program*.

McEachern, Kathryn and Robert D. Sutter. 2007a. *San Diego Multiple Species Conservation Program (MSCP) Rare Plant Monitoring Review and Revision: U.S. Geological Survey Scientific Investigations Report 2007-5016*.

McEachern, Kathryn, Bruce Pavlik, Jon Rebman, and Rob Sutter. 2010a. *Assessment of Eleven Years of Rare Plant Monitoring Data from the San Diego Multiple Species Conservation Plan*. USGS-WERC-Channel Islands Field Station Administrative Report 2010-01, Ventura, CA, 146 p.

McEachern, Kathryn. 2010b. *Appendix A San Diego MSCP Rare Plant Monitoring Site Assessments*.

McGlaughlin, Mitchell E. and Elizabeth A. Friar. 2006. Clonality in the endangered *Ambrosia pumila* (Asteraceae) inferred from RAPD markers; implications for conservation and management. *Conservation Genetics* 8:319-330.

McMillan and CBI. 2002. *2001 MSCP Rare Plant Survey and Monitoring Report*. Prepared by McMillan Biological Consulting and the Conservation Biology Institute for the City of San Diego Planning and Development Department, San Diego, California.

Mendelsohn, M.B., C.S. Brehme, C.J. Rochester, D.C. Stokes, S.A. Hathaway, and R.N. Fisher. 2008. Responses in bird communities to wildland fires in southern California. *Fire Ecology* 4: 63-82.

Michael Brandman Associates. 2010a. *Baseline Biodiversity Report for the Mount Olympus Preserve in Unincorporated San Diego County, California*. Prepared for the County of San Diego Department of Parks and Recreation.

Michael Brandman Assoc. 2010b. *Baseline Biodiversity Report for the Wilderness Gardens Preserve in Unincorporated San Diego County, California*. Prepared for the County of San Diego Department of Parks and Recreation.

Miller, David A.W, Cheryl S. Brehme, James E. Hines, James D. Nichols, and Robert N. Fisher. 2012. Joint estimation of habitat dynamics and species interactions: disturbance reduces co-occurrence of non-native predators with an endangered toad. *Journal of Animal Ecology*. doi: 10.1111/j.1365-2656.2012.020.

Miner, Karen L. and Drew C. Stokes. 2005. *Bats in the South Coast Ecoregion: Status, Conservation Issues, and Research Needs*. USDA Forest Service Gen. Tech. Rep. PSW-GTR-195.

Minnich, R.A. 2008. *California's Fading Wildflowers: Lost Legacy and Biological Invasions*. University of California Press, Berkeley.

Minnich, R.A. and R.J. Dezzani. 1998. Historical decline of coastal sage scrub in the Riverside-Perris plain, California. *Western Birds* 29:366-391.

Mitrovich, Milan J. and Robert A. Hamilton. 2007. *Status of the Cactus Wren (Campylorhynchus brunneicapillus) within the Coastal Subregion of Orange County, California*. Prepared for the Nature Reserve of Orange County.

Mitrovich, Milan J., Tertia Matsuda, Krista A. Pease, and Robert N. Fisher. 2010. Ants as a measure of effectiveness of habitat conservation planning in southern California. *Conservation Biology* 24:1239-1248.

Noe, Gregory B. and Joy B. Zedler. 2001. Variable rainfall limits the germination of upper intertidal marsh plants in southern California. *Estuaries* 24:30-40.

Oberbauer, Thomas. 1981. Noteworthy collections: *Hazardia orcuttii* (Gray) Greene (Compositae). *Madroño* 28:38.

Ochoa-Hueso, Raúl, Edith B. Allen, Cristina Branquinho, Cristina Cruz, Teresa Dias, Mark E. Fenn, Estaban Manrique, M. Esther Pérez-Corona, Lucy J. Sheppard, and William D. Stock. 2011. Nitrogen deposition effects on Mediterranean-type ecosystems: An ecological assessment. *Environmental Pollution*: 2265-2279.

Parmesan, C. 1996. Climate and species range. *Nature* 382:765-766.

Parsons, Lorraine S. and Joy B. Zedler. 1997. Factors affecting reestablishment of an endangered annual plant at a California salt marsh. *Ecological Applications* 7:253-267.

Perry, Gad and Robert N. Fisher. 2006. Night lights and reptiles: Observed and potential effects. In *Ecological Consequences of Artificial Night Lighting*, ed. C. Rich and T. Longcore, 169-220. Washington, D.C.: Island Press.

Preston, Kristine L. and Dana Kamada. 2012a. *Nature Reserve of Orange County: Monitoring Coastal Cactus Wren Reproduction, Dispersal and Survival, 2009-2011*. Report prepared for California Department of Fish and Game, Local Assistance Grant #PO982013.

Preston, Kristine L., Richard A. Redak, Michael F. Allen, and John T. Rotenberry. 2012. Changing distribution patterns of an endangered butterfly: linking local extinction patterns and variable habitat relationships. *Biological Conservation* 152:280-290.

Price, Linda M. 2009. *The Relationship of Monardella viminea to Closely Related Taxa based on Analyses of ISSRs*. Report prepared for the USFWS Carlsbad Office.

Quinn, J. 2008. *The Ecology of the American badger (Taxidea taxus) in California: Assessing Conservation Status on Multiple Scales*. Ph.D. Dissertation. The University of California Davis, Davis, CA. 200pp.

Rao, Leela E., Edith B. Allen, and Thomas Meixner. 2010. Risk-based determination of critical nitrogen deposition loads for fire spread in southern California deserts. *Ecological Applications* 20:1320-1335.

RECON. 2004. *Baseline Biological Resources Report for the Chula Vista Central City Preserve Baseline Biological Survey, City of Chula Vista*. Prepared for the City of Chula Vista Planning and Building Department, Chula Vista, California.

RECON. 2005. *Final Long-term Management Plan for Fox-Miller Property Open Space, Carlsbad, California*. Prepared for H.G. Fenton Company.

RECON. 2009. *Carmel Mountain and Del Mar Mesa Preserves Resource Management Plan*. Prepared for the City of San Diego.

RECON. 2011. *2010-11 Baseline Survey Report for the Dulzura Parcels of the Otay Ranch Preserve*. Prepared for the City of Chula Vista.

RECON. 2012. *2010-11 Baseline Survey Report for the Northern San Ysidro, McMillan, and Little Cedar Canyon Parcels of the Otay Ranch Preserve*. Prepared for the City of Chula Vista.

Regan, Helen M., Lauren A. Hierl, Janet. Franklin, and Douglas.H. Deutschman. 2006. *Draft MSCP Covered Species Prioritization*. Task B of Local Assistance Grant #P0450009. Prepared for the California Department of Fish and Game.

Reiser, C. 1994. *Rare Plants of San Diego County*. <http://sandiego.sierraclub.org/rareplants/> Accessed 2012 and 2013.

Riley, Seth P.D., Gary T. Busteed, Lee B. Kats, Thomas L. Vandergon, Lena F.S. Lee, Rosi G. Dagit, Jacob L. Kerby, Robert N. Fisher and Raymond M. Sauvajot. 2005. Effects of urbanization on the distribution and abundance of amphibians and invasive species in southern California streams. *Conservation Biology* 19:1894-1907.

Rochester, C.J., C.S. Brehme, D.R. Clark, D.C. Stokes, S.A. Hathaway, and R.N. Fisher. 2012. Reptile and Amphibian Response to Large Scale Wildfires In Southern California. *Journal of Herpetology* 44(3) p. 333-351.

Rourke, James W., Scarlett L. Howell, and Barbara E. Kus. 2008. *Distribution, Abundance and Breeding Activities of the Southwestern Willow Flycatcher at Marine Corps Base Camp Pendleton, California. 2007 Annual Data Summary*. Prepared for Assistant Chief of Staff, Environmental Security, Marine Corps Base Camp Pendleton.

Sakarias, M. 1975. Cleveland National Forest: San Diego's Watershed. *The Journal of San Diego History*. Vol 21 No. 4. <http://www.sandiegohistory.org/journal/75fall/cleveland.htm>

SANBIOS. 2012. *Sensitive Species Sightings Geodatabase*. <http://catalog.opensandiego.org/opendata/resource/3118/sanbios-ecology/>

SANDAG. 2003. *Volume II: Final MHCP Plan Biological Analysis and Permitting Conditions*. Prepared by AMEC Earth and Environmental, Inc., Conservation Biology Institute, and AMEC. Prepared for the Multiple Habitat Conservation Program administered by the San Diego Association of Governments (SANDAG).

SANDAG. 2013. Conserved Lands Database, SANGIS/SANDAG IGS Warehouse. <http://www.sandag.org/>

SANDAG. 2012. *Maps and GIS, GIS Downloads*. Regional GIS Data Warehouse. Accessed September 2012. <http://www.sandag.org/index.asp?subclassid=100&fuseaction=home.subclasshome>

SanGIS. 2012. *Regional Data Warehouse*. Accessed September 2012. <http://www.sangis.org/download/index.html>

SANGIS. 2012. *Eco Vernal Pools GIS Shapefile*.

Santos, Elizabeth. 2010. *Pinus torreyana: An Ecological Assessment*. Master's defense, San Diego State University.

Scheid, Gerald A. and Jennifer J. McAller. 2005. *Year 5 Final Mitigation Monitoring Report for the Small-leaved Rose Translocation Project on the Ocean View Hills Property (Formerly California Terraces and Otay Corporate Center)*. Prepared for Pardee Homes.

SDMMP. 2011. *Connectivity Monitoring Strategic Plan for the San Diego Preserve System*. Prepared for the San Diego Environmental Mitigation Program Working Group. http://www.sdmmp.com/monitoring/connectivity_monitoring.aspx

SDNHM. 2013a. *San Diego County Plant Atlas*. <http://www.sdnhm.org/science/botany/projects>
Accessed 2013.

Seabloom, E.W., W.S. Harpole, O.J. Reichman, and D. Tilman. 2003. Invasion, competitive dominance, and resource use by exotic and native California grassland species. *Proceedings of the National Academy of Sciences* 100:13384-13389.

Seager, R., M. Ting, I. Held, Y. Kushnir, J. Lu, G. Vecchi, H.P. Huang, N. Harnik, A. Leetmaa, N. Lau, C. Li, J. Velez, and N. Naik. 2007. Model predictions of an imminent transition to a more arid climate in southwestern North America. *Science* 316:1181-1184.

Sharp, Bryan L. and Barbara E. Kus. 2006. Factors influencing the incidence of cowbird parasitism of Least Bell's Vireos. *Journal of Wildlife Management* 70:682-690.

Sjobergevashenk Consulting Inc. 2012. *TransNet Independent Taxpayer Oversight Committee: Fiscal Year 2012 Triennial Performance Audit*. Prepared for the San Diego Association of Government's Independent Taxpayer Oversight Committee.

Skinner, M. and B. Pavlik. 1994. *Inventory of Rare and Endangered Vascular Plants of California*. California Native Plant Society.

Stahlheber, K.A. and C.M. D'Antonio. 2013. Using livestock to manage plant composition: A meta-analysis of grazing in California Mediterranean grasslands. *Biological Conservation* 157:300-308.

Stokes, Drew C., Cheryl S. Brehme, and Robert N. Fisher. 2003. *Bat inventory of the San Diego County Multiple Species Conservation Program Area*. U.S. Geological Survey, Western Ecological Research Center Interim report prepared for the County of San Diego and California Department of Fish and Game.

Stokes, Drew C., Cheryl S. Brehme, Stacie A. Hathaway, and Robert N. Fisher. 2005. *Bat inventory of the Multiple Species Conservation Program Area in San Diego County, California, 2002-2004*. U.S. Geological Survey, Western Ecological Research Center final report prepared for the County of San Diego and California Department of Fish and Game.

Stylinski, C.D. and E.B. Allen. 1999. Lack of species recovery following severe exotic disturbance in southern California shrublands. *The Journal of Applied Ecology* 36:544-554.

Suarez, Andrew V., Douglas T. Bolger, and Theodore J. Case. 1998. Effects of fragmentation and invasion on native ant communities in coastal southern California. *Ecology* 79:2041-2056.

TAIC. 2002. California gnatcatcher habitat evaluation model for USFWS. Digital data. U.S. Fish and Wildlife Service Office, Carlsbad, California, USA.

TAIC. 2010. *Biological Monitoring Report for the Tijuana River Valley Regional Park (Monitoring Year 2009)*. Prepared by Technology Associates International Corporation (TAIC) for the County of San Diego Department of Parks and Recreation.

Talluto, M.V. and K.N. Suding. 2008. Historical change in coastal sage scrub in southern California, USA in relation to fire frequency and air pollution. *Landscape Ecology* 23:803-815.

Technology Assoc. and Environmental Science Assoc. 2011a. *Biological Diversity Baseline Report for the Furby-North Property*. Prepared for the San Diego County Department of Parks and Recreation.

Technology Associates. 2011b. *Biological Diversity Baseline Report for the Lawrence and Barbara*

- Daley Preserve, County of San Diego*. Prepared for County of San Diego.
- Tierra Data Inc. 2005. *City of Carlsbad Preserve Management Plan for Carlsbad Oaks North Habitat Conservation Area*. Prepared for the Center for Natural Lands Management.
- Tierra Data Inc. 2011. *City of Carlsbad Preserves: 2012-2016 Preserve Management Plan*. Prepared for Center for Natural Lands Management.
- Truill, Lochran W., Barry W. Brook, Richard R. Frankham, and Corey J.A. Bradshaw. 2010. Pragmatic population viability targets in a rapidly changing world. *Biological Conservation* 143:28-34.
- Unitt, Phil. 1984. *The Birds of San Diego County*. Memoir 13. San Diego Natural History Museum, San Diego.
- Unitt, Phil. 2004. *San Diego County Bird Atlas*. San Diego, California: No. 39 Proceedings of the San Diego Natural History Museum.
- USFS and BLM. 2012. *Environmental Assessment: Feral Pig Damage Control Project on Cleveland National Forest and Bureau of Land Management Lands*.
http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/72857_FSPLT2_148901.pdf
- USFWS. 1998. Endangered and threatened wildlife and plants: Withdrawal of proposed rule to list *Nolina interrata* (Dehesa beargrass) as threatened. *Federal Register* 63(197):54972-54974.
- USFWS. 2003. *Recovery Plan for the Quino Checkerspot Butterfly (Euphydryas editha quino)*. Portland, Oregon.
- USFWS. 2003b. *Draft 2003 Report of MSCP Covered Species at San Diego National Wildlife Refuge*. Unpublished report. Prepared for the San Diego National Wildlife Refuge Complex and the Carlsbad Fish and Wildlife Office.
- USFWS. 2004. *Writing Refuge Management Goals and Objectives: A Handbook*.
- USFWS. 2006. *San Diego Bay National Wildlife Refuge (NWR) Sweetwater Marsh and South San Diego Bay Units: Final Comprehensive Conservation Plan and Environmental Impact Statement, San Diego County, California, Volume I*.
- USFWS. 2007. *Chorizanthe orcuttiana* (Orcutt's spineflower) Five Year Review: Summary and Evaluation. Prepared by the U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office.
- USFWS. 2009a. *Chloropyron maritimum subsp. Maritimum (Cordylanthus maritimus subsp. Maritimus) (Salt Marsh Bird's-beak) 5-Year Review: Summary and Evaluation*. Prepared by the U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office, Carlsbad, California.
- USFWS. 2009b. *Fremontodendron mexicanum (Mexican Flannelbush) 5-Year Review: Summary and Evaluation*. Prepared by US Fish and Wildlife Service, Carlsbad Fish and Wildlife Office.
- USFWS. 2009c. *Quino Checkerspot Butterfly (Euphydryas editha quino) 5-Year Review: Summary and Evaluation*. Prepared by US Fish and Wildlife Service Carlsbad Fish and Wildlife Office.
- USFWS. 2009d. *Arroyo Toad (Bufo californicus (=microscaphus)) 5-Year Review: Summary and Evaluation*. Prepared by U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office.

USFWS. 2009e. *Deinandra conjugens* (Otay tarplant) 5-Year Review: Summary and Evaluation. Prepared by the U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, Carlsbad, California.

USFWS. 2009f. *Estimation of San Diego County California Gnatcatcher Population Size and Recovery Following the 2003 Wildfires*. Summary report.

USFWS. 2009g. *Brodiaea filifolia* (thread-leaved brodiaea) 5-Year Review: Summary and Evaluation. Prepared by the U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office, Carlsbad, California.

USFWS. 2010. *Ambrosia pumila* (San Diego Ambrosia) 5-Year Review: Summary and Evaluation. Prepared by the U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office, Carlsbad, California.

USFWS. 2011a. *RegSS and SSPoly GIS datasets*. Accessed 2011.

USFWS. 2011b. Endangered and threatened wildlife and plants: Revised endangered status, revised critical habitat designation, and taxonomic revision for *Monardella linoides* ssp. *viminea*; Proposed Rule. *Federal Register* 76:33880-33921.

USFWS. 2011c. Endangered and threatened wildlife and plants; 12-month finding on a petition to list Hermes copper butterfly as endangered or threatened. *Federal Register* Vol. 76(72):20918-20939.

USFWS. 2011d. *Intra-service Formal Section 7 Consultation for Issuance of a Section 10(a)(1)(B) (TE-03216A-0) Incidental Take Permit under the Endangered Species Act for the San Diego County Water Authority Subregional Natural Community Conservation Plan/Habitat Conservation Plan, San Diego and Riverside Counties, California*. Prepared by the Carlsbad Fish and Wildlife Office for the USFWS Regional Director, Pacific Southwest Region.

USFWS. 2011e. *End of Fiscal Year Report on the Status of the Shinohara Vernal Pool Restoration Project*. Letter report prepared by John Martin for Jill Terp, San Diego National Wildlife Refuge.

USFWS. 2012a. *U.S. Fish and Wildlife Service Species Assessment and Listing Priority Assignment Form for Hazardia orcuttii*. 4/16/12.

USFWS. 2012b. Endangered and threatened wildlife and plants: Revised endangered status, revised critical habitat designation, and taxonomic revision for *Monardella linoides* ssp. *viminea*; Final Rule. *Federal Register* 77:13394-13447.

USFWS. 2012c. *Monardella viminea* (Willow Monardella): Five Year Review Short Form Summary. Prepared by U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office.

USFWS. 2012d. *Quino Recovery Units and Occurrence Complexes*, unpublished data

USFWS, CDFG, and SDMMMP. 2012. San Diego Multiple Species Conservation Program Status Report: 1997-2011.

USGS. 2011. *American Badger Scat Locations Detected by Canine Surveys GIS Shapefile*. Provided by Cheryl Brehme, U.S. Geological Survey.

Vanderplank, Sula E. 2012. *Conservation Plan for Shaw's Agave (Agave shawii subsp. Shawii) Agavaceae (Draft)*. Rancho Santa Ana Botanic Garden Occasional Publications. Claremont, California.

Varner, David 2012. *Orcutt's hazardia (Hazardia orcuttii) Population Update and Status of 2004 Planting Project*. Letter report to the USFWS, CDFW, and CNLM, dated October 30, 2012.

- Vourlitis, George L., J. Kirker, and Kari Coler. 2006. *Research for Management and Conservation of Orcutt's Hazardia (Hazardia orcuttii) Final Report*. Unpublished report prepared for California Department of Fish and Game, Meredith Osborne, contract manager. (Contract PO285014).
- Vourlitis, George L., Julie Miller, and Kari Coler. 2009. Soil and community characteristics associated with *Hazardia orcuttii* (Asteraceae). *Madroño* 56:229-237.
- Wall, Michael. 2009. *Seed Collection Guidelines for California Native Plant Species*. Prepared for Rancho Santa Ana Botanic Garden.
- Westman, W.E. and J.F. O'Leary. 1986. Measures of resilience: the response of coastal sage scrub to fire. *Vegetatio* 65:1790189.
- Winchell, C.S. and P.F. Doherty, Jr. 2006. Using California gnatcatcher to test underlying models in Habitat Conservation Plans. *Journal of Wildlife Management* 72:1322-1327.
- Winchell, Clark. 2011. *Cactus Mapping and Cactus Wren Survey Results, 2009-2011*. Microsoft Access database.
- WRI. 2005. *Final Report – NCCP/MSCP Raptor Monitoring Project (January 1, 2001 – December 31, 2003)*. Prepared by the Wildlife Research Institute, Inc. for the California Department of Fish and Game.
- WRI. 2010. *Golden Eagle Territories in San Diego County*, unpublished data.
- Wynn, Susan. 2012. *Personnel communication*.
- Zedler, J.B. and J.M. West. 2007. Declining diversity in natural and restored salt marshes: A 30-year study of Tijuana Estuary. *Restoration Ecology* 16:249-262.
- Zoological Society of San Diego & City of San Diego Water Department. 2009. *Transnet Proposal for Habitat Enhancement of 45 Acres of Cactus Scrub in the San Pasqual Valley*. Prepared for the San Diego Association of Governments TransNet Environmental Mitigation Program (EMP) Funding for Land Management.