Natural Resource Management Plan for Mission Trails Regional Park, San Diego, California

Prepared for

City of San Diego
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Acronyms

ASMD	Area-specific Management Directives
Cal-IPC	California Invasive Plant Council
Caltrans	California Department of Transportation
CDFG	California Department of Fish and Game
City	City of San Diego
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society's
CWMA	Cactus Wren Management Area
EO	Elemental Occurrence
GIS	Geographic Information System
GPS	Global Positioning System
MCAS	Marine Corps Air Station
MHPA	Multi-habitat Planning Area
MSCP	Multiple Species Conservation Program
MSP	Management Strategic Plan
MTRP	Mission Trails Regional Park
NAS	National Academy of Sciences
NRMP	Natural Resource Management Plan
SANDAG	San Diego Association of Governments
SDCWA	San Diego County Water Authority
SDG&E	San Diego Gas & Electric
SDMMP	San Diego Management and Monitoring Program
SDSU	San Diego State University
SR-52	State Route 52
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WMA	Weed Management Area
WTI	Western Tracking Institute

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1.0 Introduction

This Natural Resource Management Plan (NRMP) fulfills the City of San Diego's (City) Multiple Species Conservation Program (MSCP) requirement to develop Area-specific Management Directives (ASMDs) for the protection of natural resources at Mission Trails Regional Park (MTRP) (see MSCP Implementing Agreement Section 10.6.B, City Subarea Plan Section 1.5.6, and Final MSCP Plan Section 6.3). MTRP is a core biological area and regional wildlife corridor within the MSCP's Multi-habitat Planning Area (MHPA) and is managed to achieve the goals of the MSCP. The specific objectives of the NRMP are to:

- Update sensitive species and habitat mapping.
- Develop management guilds (management units based on habitat groupings with similar life-history requirements and/or threats) for groups of species and/or habitats.
- Identify and prioritize threats to sensitive species and habitats.
- Document current understanding of natural systems and species life history requirements using conceptual models.
- Develop conservation and enhancement goals for individual populations/habitats and/or management guilds based on MSCP conditions of coverage (MSCP Plan Table 3-5).
- Develop specific management actions (e.g., ASMDs) within an adaptive management framework to address the identified threats and ensure long-term, viable populations of these species within MTRP.
- Develop protocols (e.g., data collection methods, success criteria) to evaluate adaptive management techniques and projects proposed in this plan.

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2.0 Existing Conditions

2.1 Environmental Setting

The MTRP planning envelope occupies a total of 9,696 acres and is located eight miles northeast of the City's downtown (Figure 2-1). MTRP supports a wide range of native vegetation, habitats, and wildlife species within a diverse physical setting, and is a core biological resource area within the MHPA. MTRP has multiple notable features, including Cowles and Fortuna mountains, the San Diego River, Sycamore Landfill, Lake Murray, Mission Gorge, and the Old Mission Dam. For planning and discussion purposes, MTRP has been divided into six areas based on significant features of each. The designated areas are shown on Figure 2-2 and are:

- Lake Murray
- Cowles Mountain
- Mission Gorge
- Fortuna Mountain
- East Elliott
- West Sycamore

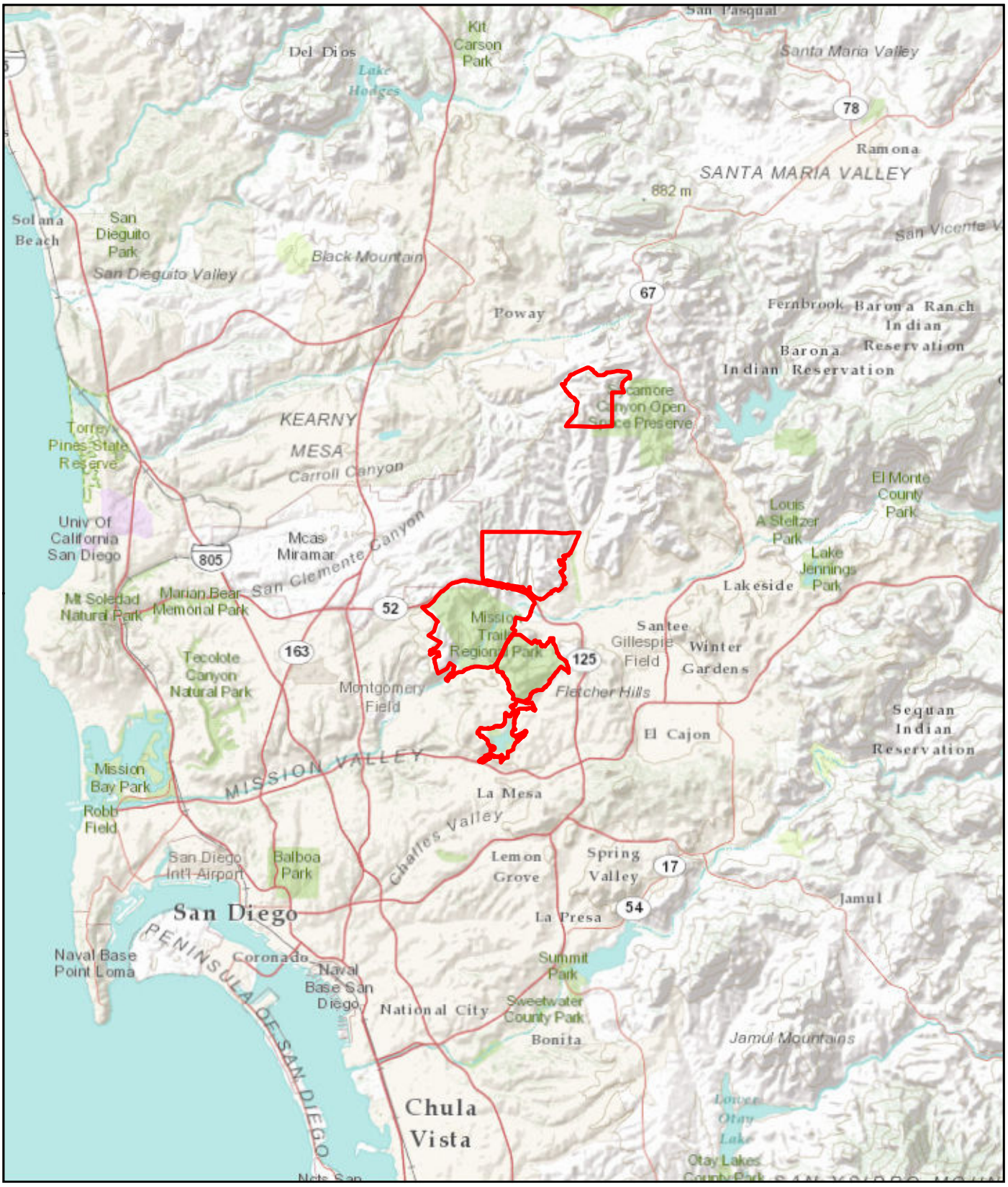
MTRP is a regionally important recreation area for many outdoor sports, including: hiking, mountain biking, horseback riding, and rock climbing. The trails providing access for recreational and maintenance activities currently cover approximately 40 linear miles. Trails are generally 2–4 feet in width, except where co-located with access roads. The existing trail system at MTRP is currently being reevaluated and revised in the Master Plan update associated with this NRMP.

2.1.1 Topography

MTRP contains a variety of topographic features, including canyons, valleys, mountains, hills, and low-lying areas. The topography is generally very rugged, with elevations ranging dramatically throughout the different areas. Cowles Mountain is the highest point in MTRP at 1,591 feet (Figure 2-3).

2.1.2 Geology and Paleontology

Geologically, the region of San Diego County in which MTRP is located consists of a layer cake sequence of Cenozoic sedimentary rock units which preserve portions of the last 47 million years of Earth history. These Cenozoic sedimentary rocks overlie a deeply eroded terrain formed in significantly older crystalline basement rocks (e.g., metasediments, metavolcanics, gabbros, granites, and tonalities) of the massive Peninsular Ranges Batholith.



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Project Boundary

FIGURE 2-1

Regional Location of Mission Trails Regional Park

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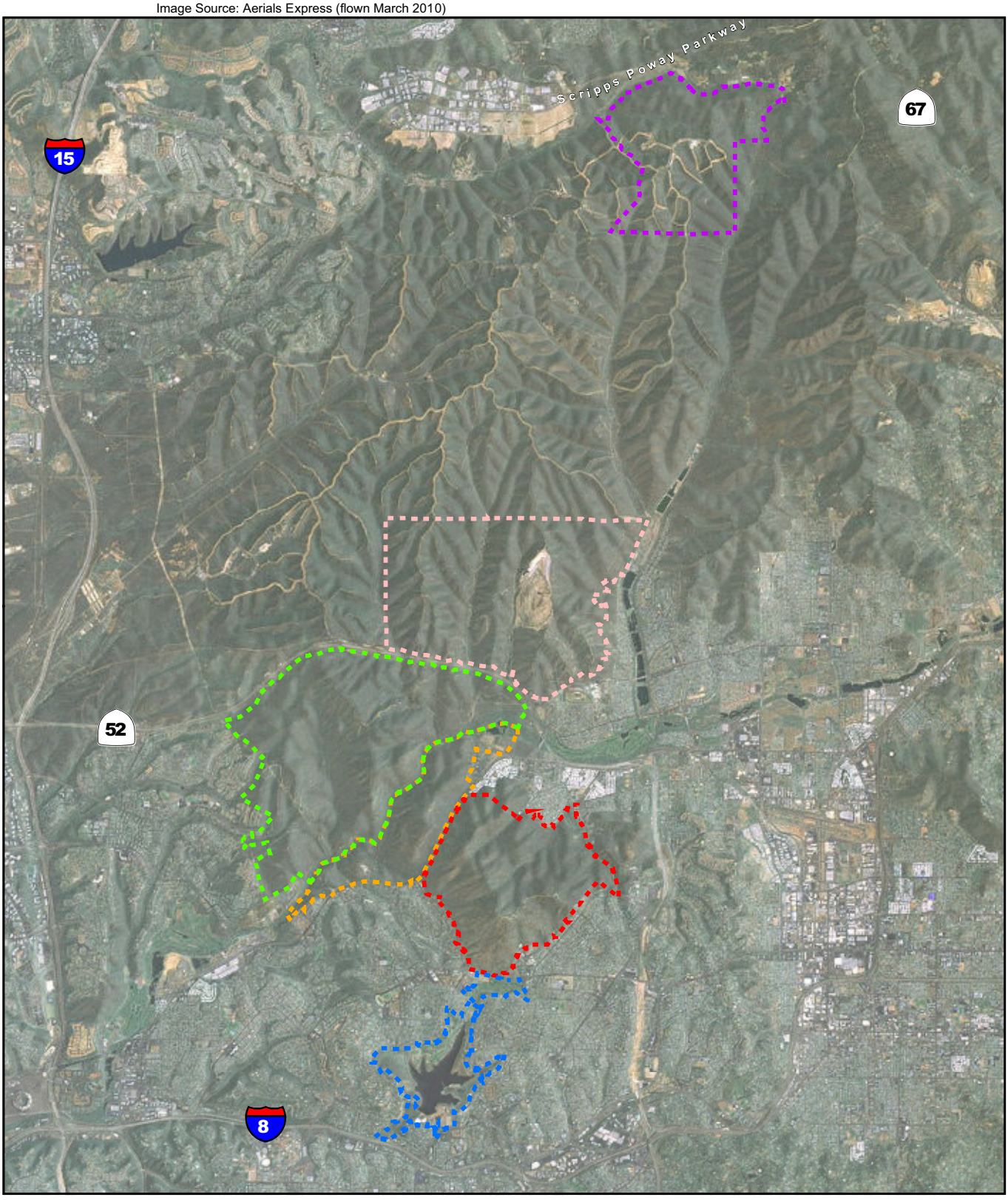
Image Source: Aerials Express (flown March 2010)



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Cowles Mountain Area
East Elliott Area
Fortuna Mountain Area
Lake Murray Area
Mission Gorge Area
West Sycamore Area

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FIGURE 2-2
Mission Trails Regional Park Areas

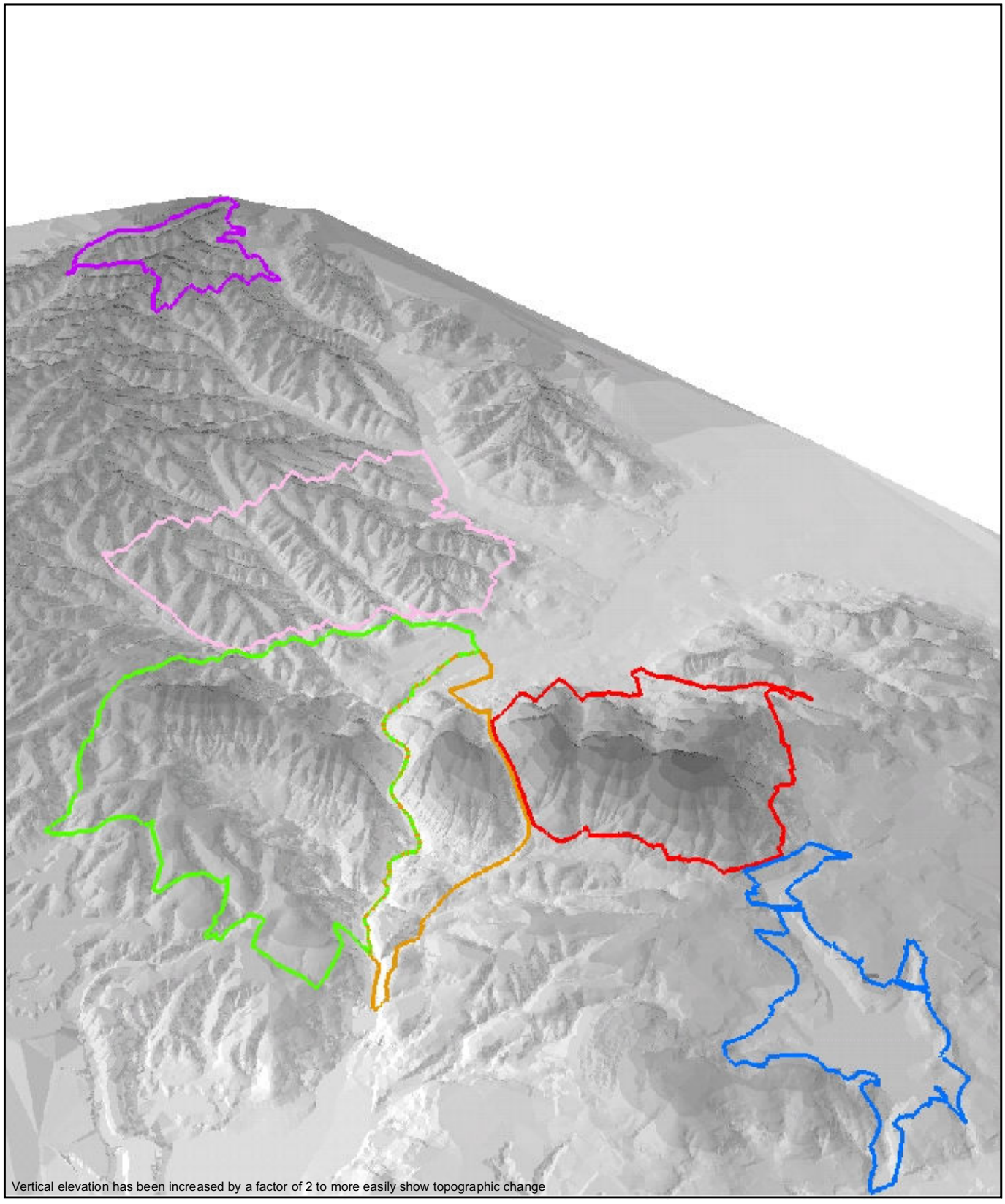

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FIGURE 2-3

Topography within Mission Trails Regional Park

In 2011, the San Diego Natural History Museum conducted a paleontological resource assessment of MTRP (see Appendix A-E). The report identified five formations present at MTRP with a high sensitivity for the presence of paleontological resources (see Table 2-1) such as vertebrate fossil remains.

TABLE 2-1
GEOLOGIC FORMATIONS
WITH HIGH PALEONTOLOGICAL SENSITIVITY
WITHIN MTRP

Geologic Formation
Pomerado Conglomerate
Stadium Conglomerate
Friars Formation
Mission Valley Formation
Torrey Sandstone

Fossils are most likely to be found in the Friars Formation, Stadium Conglomerate, Mission Valley Formation, and Pomerado Conglomerate. A full discussion of paleontological resources at MTRP can be found in Appendix A-E.

2.1.3 Soils

The U.S. Department of Agriculture (USDA; 1973) has mapped a total of 43 soil types within MTRP (Figure 2-4). Several of these soil types are known to be a primary component of sensitive species habitat, have been associated with sensitive species occurrences, and can be used as a tool to guide survey and restoration efforts.

2.1.3.1 Mafic soils

Mafic soils are derived from igneous rocks and have high levels of minerals such as magnesium and iron (USDA 1973). The unique mineral-rich composition of mafic soils (and other ultra-mafic soils such as the California State rock serpentine) can act as a mild plant toxin and promote the development of unique endemic vegetation assemblages. Mafic and ultramafic soils are a necessary habitat component of a variety of rare plants in southern California.

San Miguel – Exchequer rocky silt loams (SnG). This mafic soil has been mapped in the northwest corner of the Fortuna Mountain subarea (Figure 2-5)

2.1.3.2 Clay soils

Clay soils, in general, have low water permeability rates, tend to favor herbaceous vegetation, and are associated with sensitive plant species.

Diablo clay (DaC, DaD, DaE). Diablo clay soil is an upland clay soil formed from soft sandstone and shale. Diablo clay soils are the primary soil type of an endangered tar plant (*Deinandra conjugens*) in southern San Diego County. At MTRP, San Diego thornmint (*Acanthomintha ilicifolia*), an endangered herb, is known to occupy diablo clay soils. Diablo clay soils are very dark grey and have been mapped within the western portion of the Fortuna Mountain area.

Linne clay loam (LsE). Linne clay loams are moderately deep clay soils derived from soft calcareous sandstones and shale. At MTRP, a cluster of linne clay loam has been mapped within the western portion of the Fortuna Mountain area.

2.1.3.3 Hardpan soils

Hardpan soils are associated with sensitive vernal pools due to a sub-soil perching on an impervious, concrete-like, hardpan layer. At MTRP, these include hardpan clay soils such as Redding cobbly loam and Olivenhain cobbly loams.

Redding cobbly loams (RdC, ReE, RtF). This soil type is generally observed to have a rusty red color and round cobbles scattered throughout the soil surface and sub-surface. Redding cobbly loam has been mapped within the western portion of the Fortuna Mountain area and is the principal soil in the East Elliott and West Sycamore areas (see Figure 2-5).

Olivenhain cobbly loams (OhE, OhV). This soil type has been mapped throughout the western portion of the Fortuna Mountain area (see Figure 2-5).

2.1.4 Hydrology

MTRP is located within two watersheds: the San Diego River and Los Peñasquitos Creek. The majority of MTRP is within the San Diego River Watershed (Figure 2-6), which has its headwaters in the Cuyamaca Mountains near Julian, CA and its terminus in San Diego near Mission Bay. The watershed, as a whole, contains 11 significant tributaries, five water storage reservoirs, and several important groundwater aquifers. There are four dams, including El Capitan, San Vicente, Lake Jennings, and Cuyamaca, which affect flows into MTRP.

Image source: Aerials Express (flown March 2010)

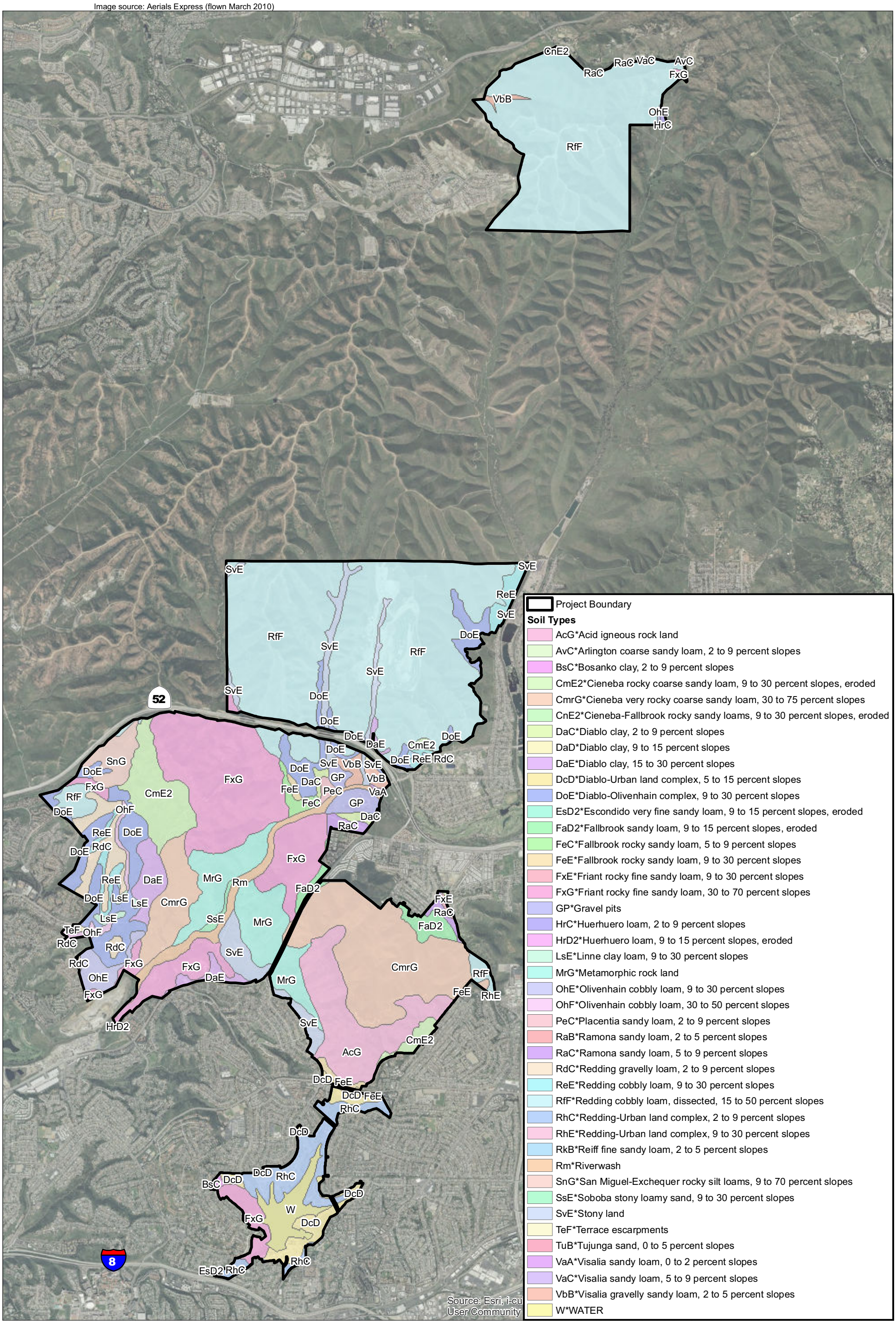

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FIGURE 2-4
Soil Types Present within Mission Trails Regional Park

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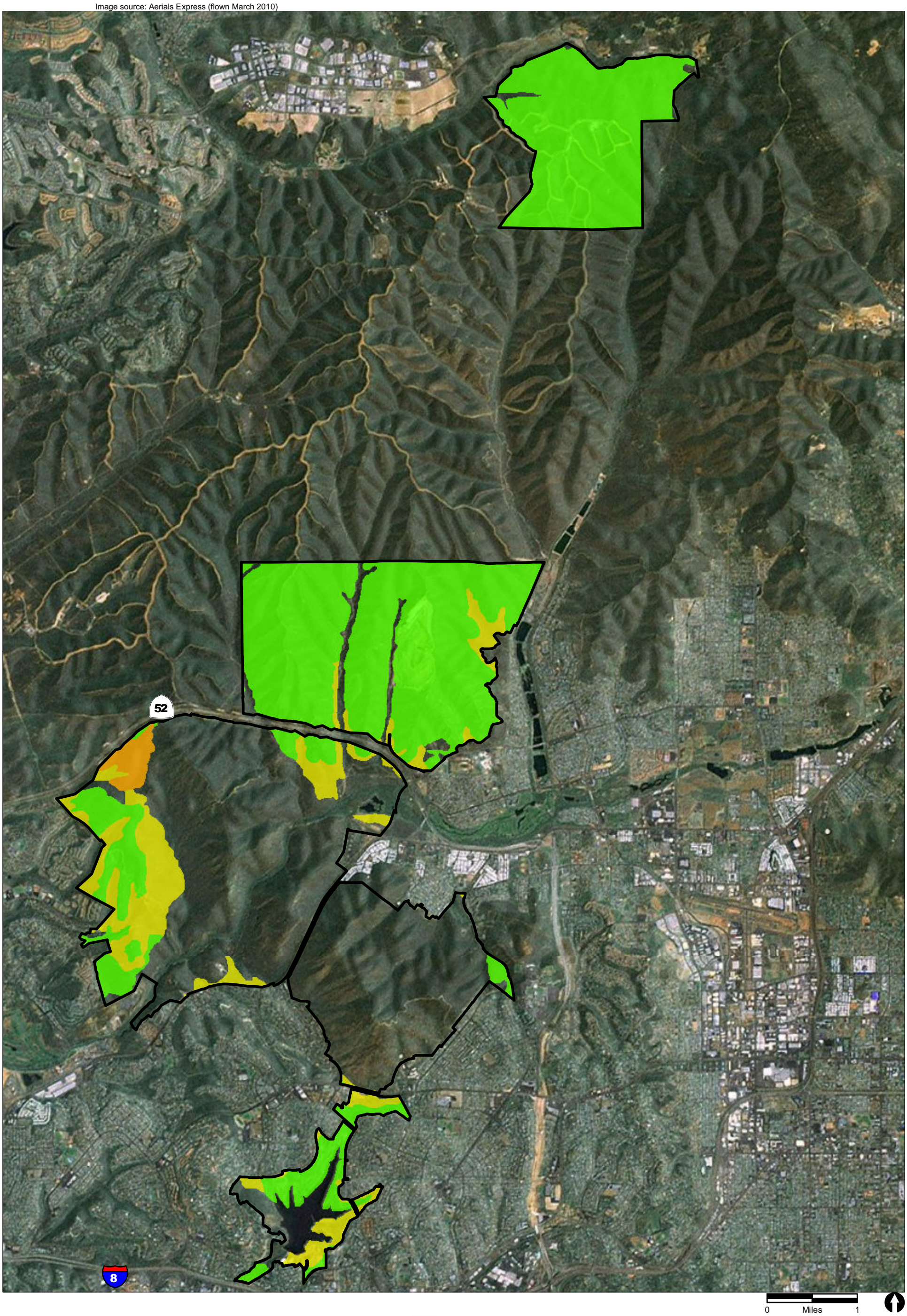

Project Boundary

Soil Types

- Clay Soils
- Hardpan Soils
- Mafic Soils

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FIGURE 2-5

Soil Types Associated with Sensitive Species Occurrences Present within Mission Trails Regional Park

Image Source: Aerials Express (flown March 2010)

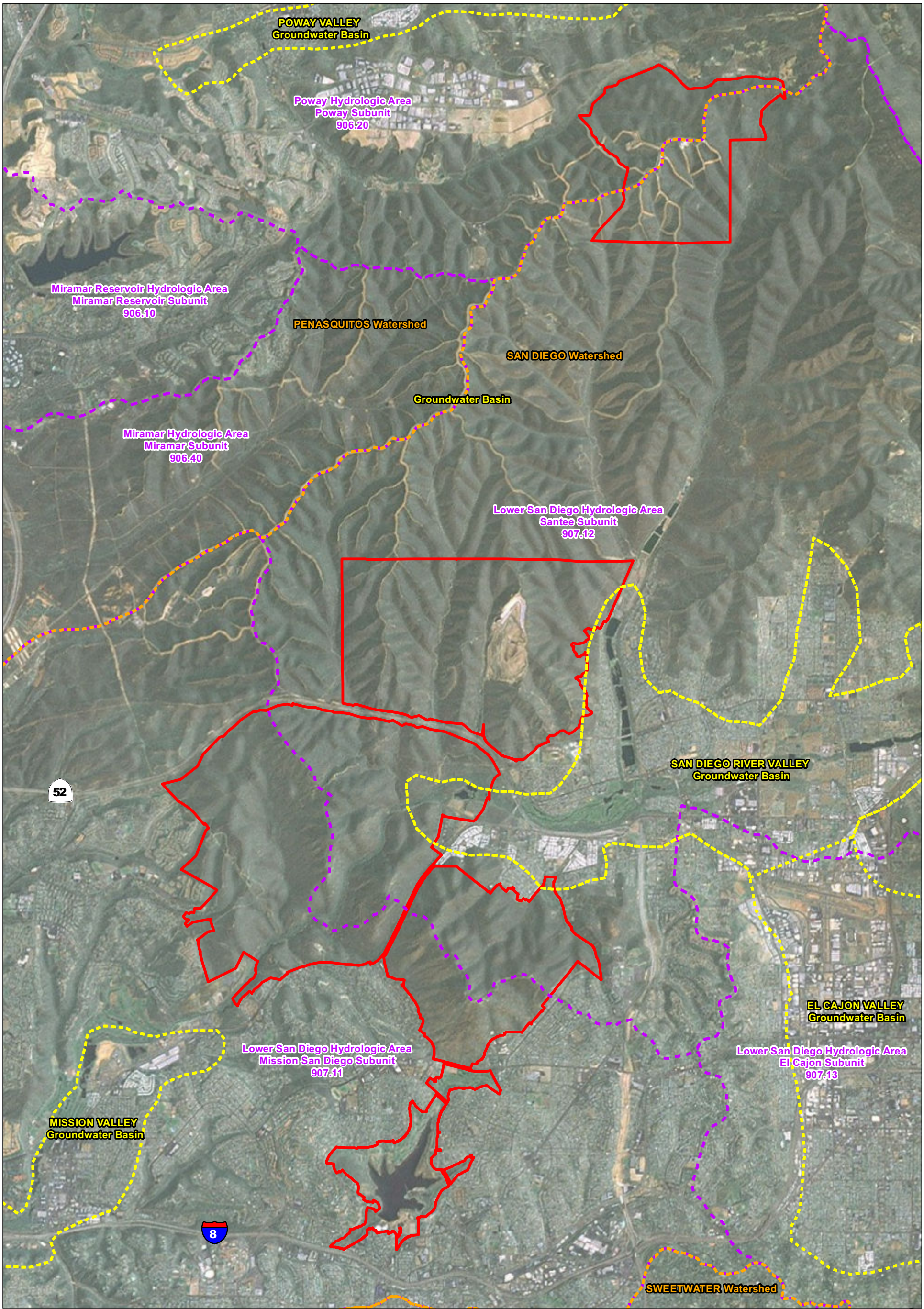

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FIGURE 2-6

Hydrologic Units Present within Mission Trails Regional Park

Historically, the San Diego River flowed intermittently west of El Capitan and was characterized by periods of drought and extreme flooding events (Smythe 1908). Currently, with the addition of several dams and additional water inputs from urban run-off and treated wastewater, the San Diego River flows year-round and is less prone to flooding. The San Diego River Watershed has a precipitation range of 10.5 to 35 inches (Weston Solutions Inc. 2007).

A portion of the Los Peñasquitos Creek Watershed is contained within the northwest corner of the West Sycamore area of MTRP (see Figure 2-6). The Peñasquitos creek watershed is relatively small and drains a mainly urbanized area of coastal San Diego. The watershed begins at its headwaters in Poway, CA just north of MTRP, and flows through a series of military, open space, and urbanized canyons to empty into the Pacific Ocean at the Los Peñasquitos Lagoon. As with the San Diego River, Peñasquitos Creek originally flowed intermittently and is now considered to have perennial flows due to increased waterflows from urbanization (Kelly 1998).

2.2 Existing Biological Resources

The biological resources in MTRP have been studied through biological inventories, vegetation mapping, MSCP monitoring, archive research, and general scientific research. The results of the biological studies and surveys have been compiled and are presented below (Table 2-2).

2.2.1 Vegetation Communities

Vegetation community composition directly and indirectly influences habitat quality for the majority of species within MTRP.

Vegetation communities at MTRP were mapped using two compatible classification systems: Holland (1986) as modified by Oberbauer (2005), and the *Vegetation Classification Manual for Western San Diego County* (San Diego Association of Governments [SANDAG] 2011). Though both systems provide methods to classify vegetation, Holland communities are described at a landscape scale and are currently used by the MSCP to plan conservation and mitigation throughout the area, while the SANDAG system provides a high-resolution view into the specific vegetative components of communities and changes within communities over time. Due to the precision of data available from the SANDAG mapping system, it was selected to inform management actions for this document.

TABLE 2-2
BASELINE DATA COLLECTION AT MTRP

Surveyor(s)	Survey Type	Date	CM	EE	FM	MG	LM	WS
City of San Diego	MSCP monitoring	Annually	X	X	X	X	X	X
CNPS	Willowy monardella surveys	Annually		X				
RECON Environmental	Vegetation Map (SANDAG)/Invasive sp.	2011		X				X
Clark Biological	Avian Surveys of Cliffs	2010	X		X	X		
RECON Environmental	Riparian vegetation and wildlife	2010				X		
RECON Environmental	Chaparral vegetation wildlife	2010	X		X			
RECON Environmental (sub. SDNHM)	Roosting and foraging bats	2010	X		X	X		
WTI	Mammal monitoring and Habitat Assessment	2010	X	X	X	X		
Clark Biological Services	Avian surveys of Cliffs	2010	X		X	X		
RECON Environmental	Vegetation Map (SANDAG/Invasive sp.	2009	X		X	X	X	
SDNHM	Birds and Mammal Survey (BioBlitz)	2009						
SDNHM	Herpetological survey (BioBlitz)	2009	X		X	X		
Helix Environmental	Vegetation communities (Holland)/rare plants	2001						X
Scott McMillan	Rare plant surveys	2001	X	X	X	X		

Subareas: **CM**=Cowles Mountain, **EE**=East Elliott, **FM**=Fortuna Mountain, **MG**=Mission Gorge, **LM**= Lake Murray, **WS**=West Sycamore

2.2.1.1 Holland Vegetation Communities

Holland vegetation descriptions are designed to be a “coarse filter” dividing the landscape into manageable vegetation units (Holland 1986). Under the Holland system, MTRP contains a total of 18 vegetation communities and land cover types (Table 2-3, Figures 2-7a-e).

TABLE 2-3
HOLLAND VEGETATION COMMUNTIES AND LAND COVER TYPES WITHIN MTRP

Vegetation Community	Holland Code	Acres
Eucalyptus Woodland	11100	20.3
Disturbed Habitat	11300	127.3
Urban/Developed	12000	696
Open Water	13100	149.3
Diegan Coastal Sage Scrub	32500	3,545.10
Southern Mixed Chaparral	37120	1,280.50
Chamise Chaparral	37200	2,140.00
Scrub Oak Chaparral	37900	69.7
Native Grassland	42100	1.5
Valley Needlegrass Grassland	42110	17.2
Non-native Grassland	42200	1,161.00
Wildflower Field	42300	1.2
San Diego Mesa Vernal Pool	44320	0.8
Coastal and Freshwater Marsh	52410	4.3
Southern Riparian Scrub	63300	176.4
Mule Fat Scrub	63310	1.4
Southern Willow Scrub	63320	236.2
Coast Live Oak Woodland	71160	58.7

2.2.1.2 SANDAG Vegetation Communities

Vegetation community classifications below follow SANDAG (2011). Under this system, vegetation communities are first classified into Groups by similarities in diagnostic growth forms reflecting local environmental conditions (for example: Riparian Forests, Table 2-4).

TABLE 2-4
SANDAG VEGETATION GROUPS WITHIN MTRP

Vegetation Group	Acres
Hydrophytic Herbaceous Vegetation	12.2
Riparian Forests and Woodlands	242.2
Riparian Shrublands	177.8
Sclerophyllous, Evergreen Shrublands	3,603.10
Soft-leaved, Drought-deciduous Shrublands	3,512.20
Upland Forests and Woodlands	79.4
Upland Herbaceous Vegetation	1,306.70

Within these Groups, vegetation communities are further divided into Alliances, which are classified by the dominant or co-occurring species. Subsequently, a subset of diagnostic plants within each Alliance is referred to as Associations. A total of seven groups, 38 Alliances, and 40 vegetation Associations were mapped within MTRP (Table 2-5 and Figures 2-8a-e).

2.2.2 Plant Species

MTRP contains a high diversity of plant species resulting from the multiple niches created by complex topography, soils, and its geographic location in coastal San Diego County. MTRP currently supports a total of 244 plant species, representing 61 plant families. Of this total, 196 (80 percent) are species native to southern California, and 52 (20 percent) are introduced species. Of these introduced species, the California Invasive Plant Council (Cal-IPC) has listed 2 as "High" (severe ecological damage potential), 19 as "Moderate" (significant, but not severe, ecological damage potential), and 9 as having "Limited" (minor ecological damage potential) (Cal-IPC 2012). Plant species that have been observed/detected in MTRP are listed in Appendix A-A.

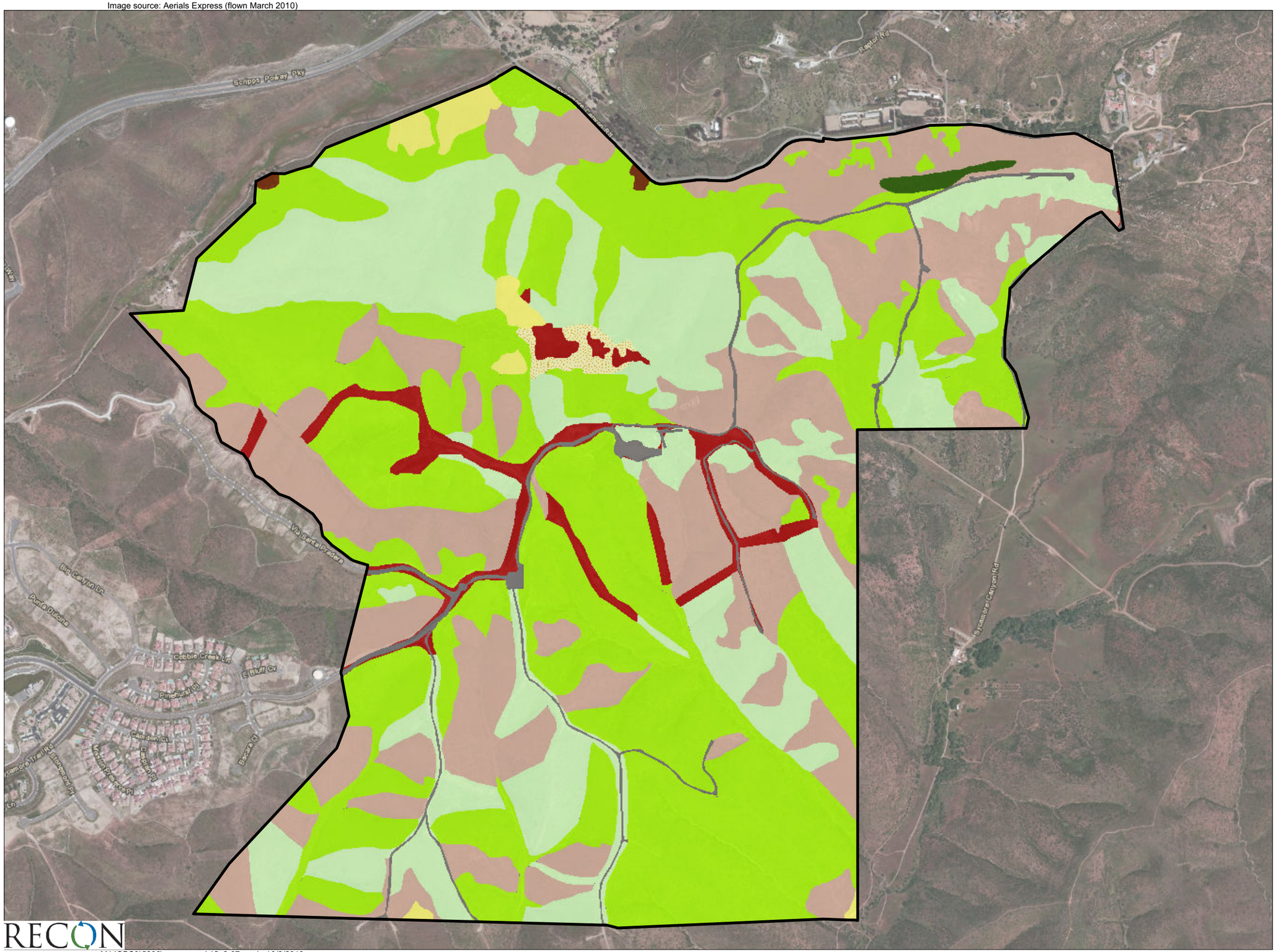
2.2.3 Wildlife Species

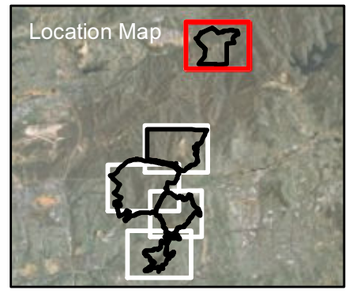
MTRP currently supports a diverse wildlife population, including at least 26 mammals, 101 birds, 17 reptiles and amphibians, and over 600 invertebrate species (San Diego Natural History Museum 2009). The diversity of animal species observed or expected to occur within MTRP is typical of large, ecologically connected open space areas with a mix of coastal sage scrub, chaparral, grassland, and riparian woodland habitats in coastal San Diego County. MTRP's variety of habitats, topography, and hydrologic features further enhance this diversity:

- **Open grasslands** provide burrowing opportunities for many reptiles and small mammals, as well as foraging opportunities for many raptors.
- **Scrub communities** provide habitat for a wide variety of reptile, mammal, and avian species, and often include steeper topography and rocky outcrops.
- **Riparian corridors** provide a perennial water source for amphibians, mesic reptiles, riparian birds, and foraging mammals.
- **Steep cliff faces** host at least four bat species and provide shelter for nesting avian species.

Wildlife species that have been observed/detected in MTRP are listed in Appendix A-B.

Image source: Aerials Express (flown March 2010)





Project Boundary

Vegetation Communities

(Holland Code)

- Chamise Chaparral
- Coast Live Oak Woodland
- Diegan Coastal Sage Scrub
- Disturbed Habitat
- Eucalyptus Woodland
- Non-native Grassland
- Southern Mixed Chaparral
- Urban/Developed
- Valley Needlegrass Grassland

0 Feet 1,000

FIGURE 2-7A

Vegetation Communities at MTRP (Holland Code)

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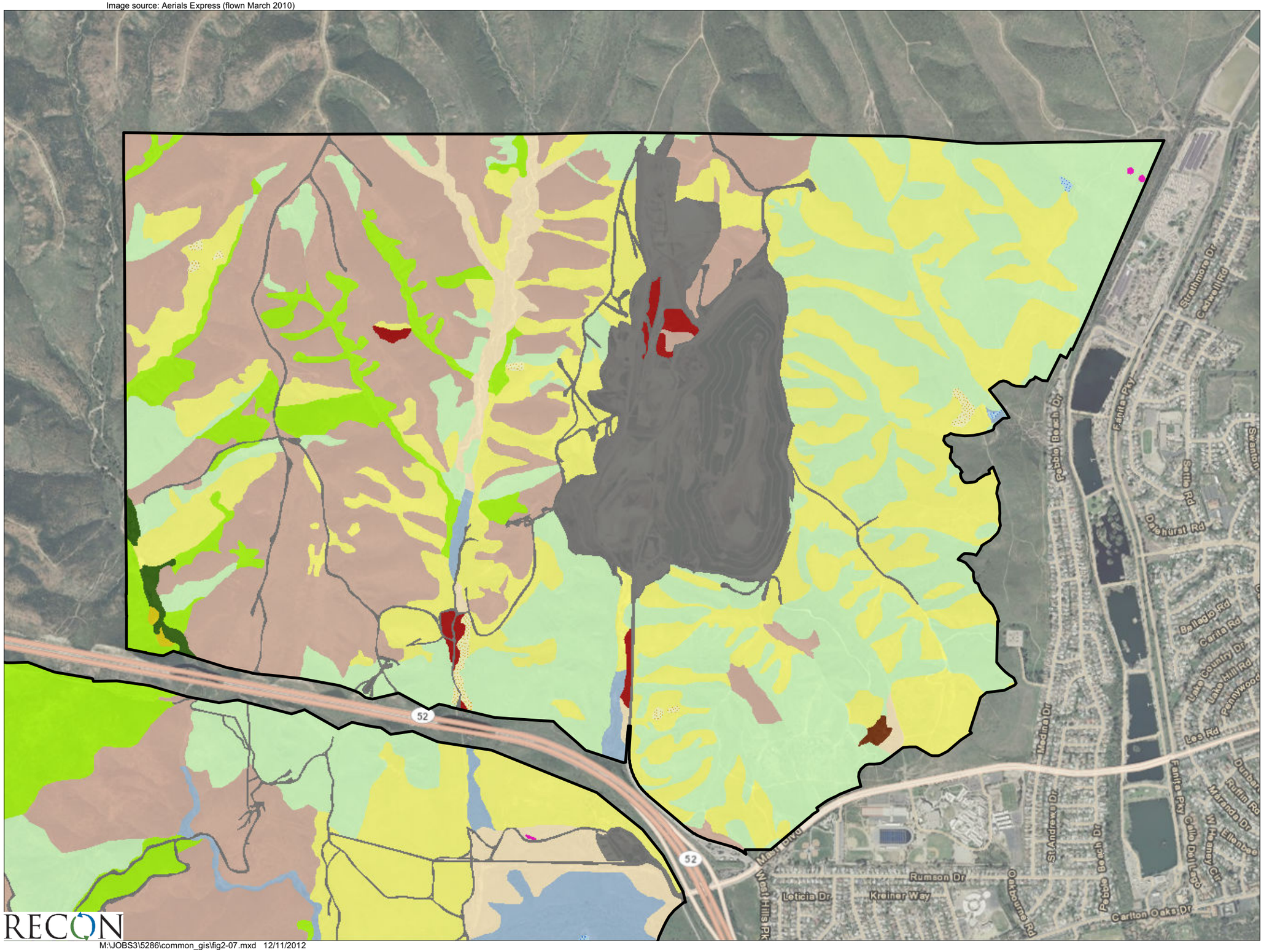
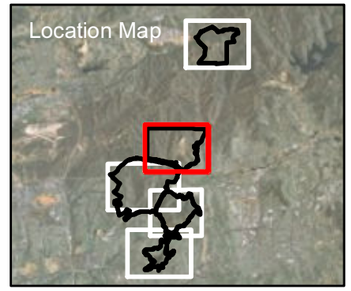
Image source: Aerials Express (flown March 2010)





Project Boundary

Vegetation Communities
(Holland Code)

- Chamise Chaparral
- Coast Live Oak Woodland
- Diegan Coastal Sage Scrub
- Disturbed Habitat
- Eucalyptus Woodland
- Native Grassland
- Non-native Grassland
- Open Water
- Southern Mixed Chaparral
- Southern Riparian Scrub
- Southern Willow Scrub
- Urban/Developed
- Valley Needlegrass Grassland
- Vernal Pool

0 Feet 1,000

FIGURE 2-7B
Vegetation Communities at East Elliott (Holland Code)

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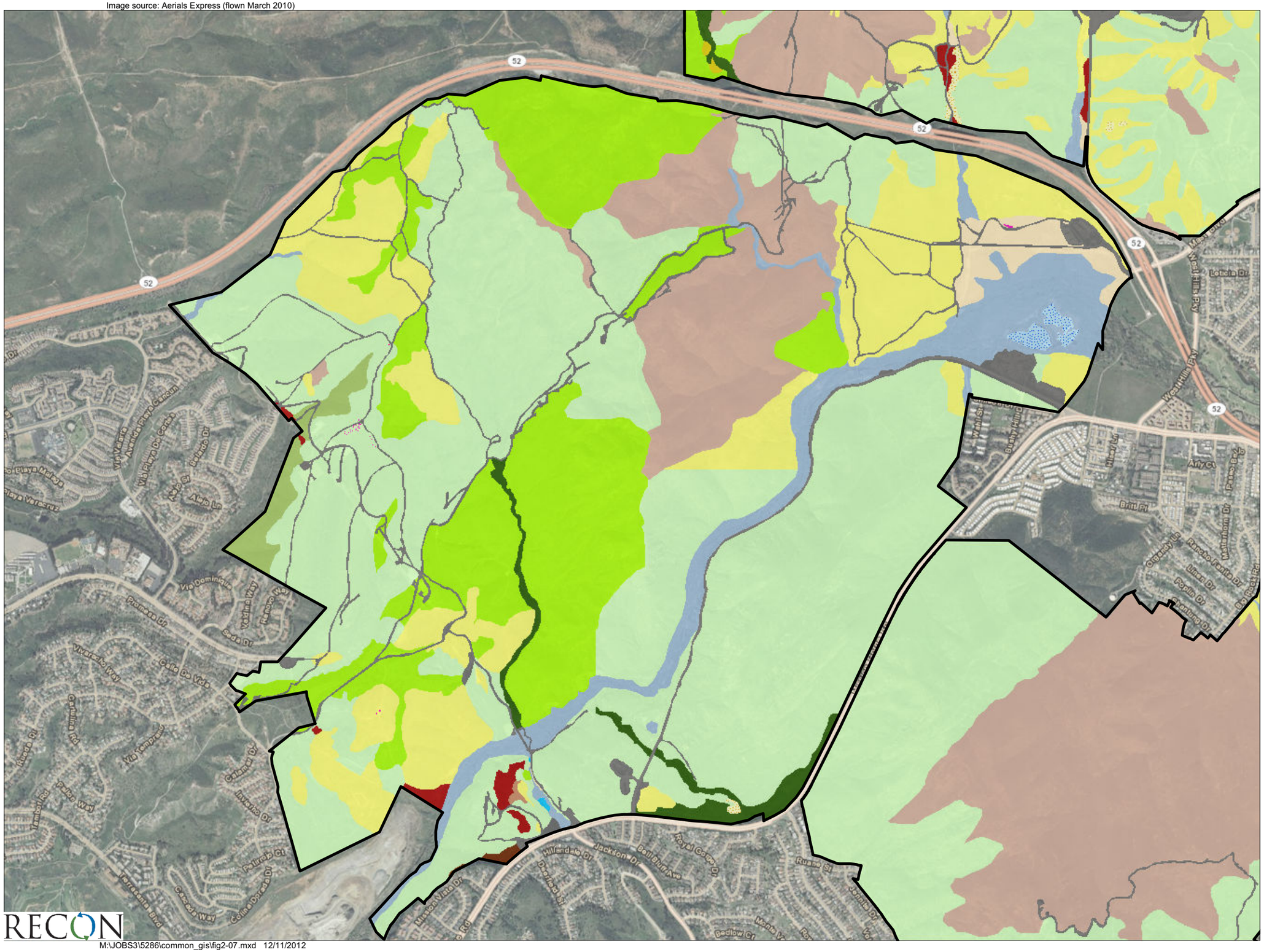
Image source: Aerials Express (flown March 2010)



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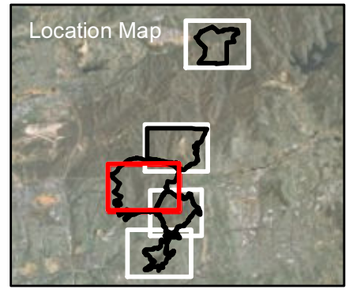


Project Boundary

Vegetation Communities

(Holland Code)

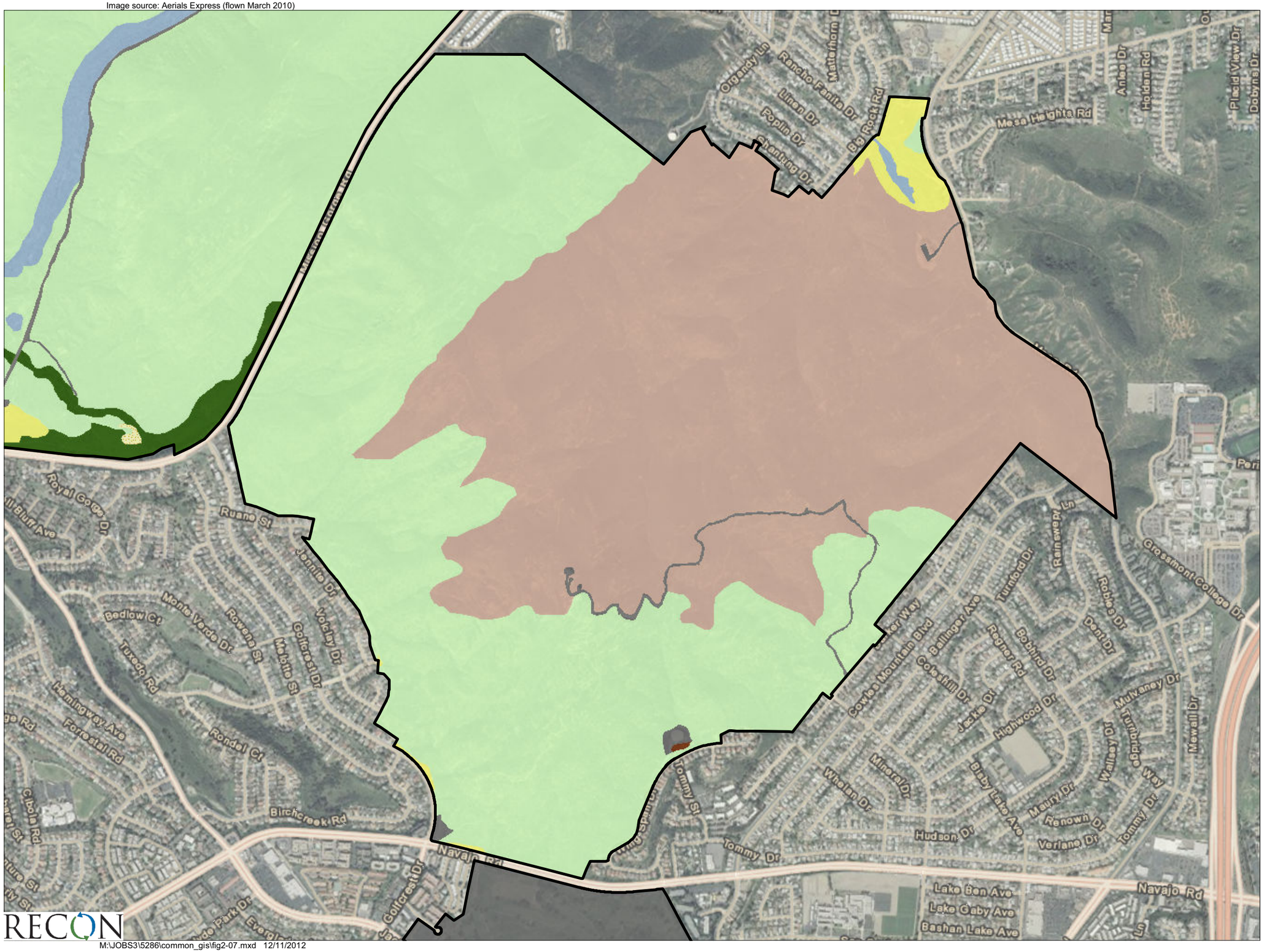
- Chamise Chaparral
- Coast Live Oak Woodland
- Coastal and Valley Freshwater Marsh
- Diegan Coastal Sage Scrub
- Disturbed Habitat
- Eucalyptus Woodland
- Mule Fat Scrub
- Native Grassland
- Non-native Grassland
- Open Water
- Scrub Oak Chaparral
- Southern Mixed Chaparral
- Southern Riparian Scrub
- Southern Willow Scrub
- Urban/Developed
- Valley Needlegrass Grassland
- Vernal Pool

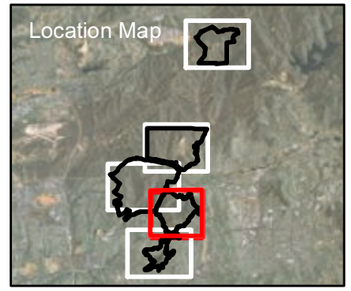
0 Feet 1,000

FIGURE 2-7C

Vegetation Communities at MTRP (Holland Code)

Image source: Aerials Express (flown March 2010)





Project Boundary

Vegetation Communities

(Holland Code)

- Chamise Chaparral
- Coast Live Oak Woodland
- Diegan Coastal Sage Scrub
- Eucalyptus Woodland
- Non-native Grassland
- Southern Mixed Chaparral
- Southern Willow Scrub
- Urban/Developed
- Valley Needlegrass Grassland

0 Feet 1,000

FIGURE 2-7D

Vegetation Communities at MTRP (Holland Code)

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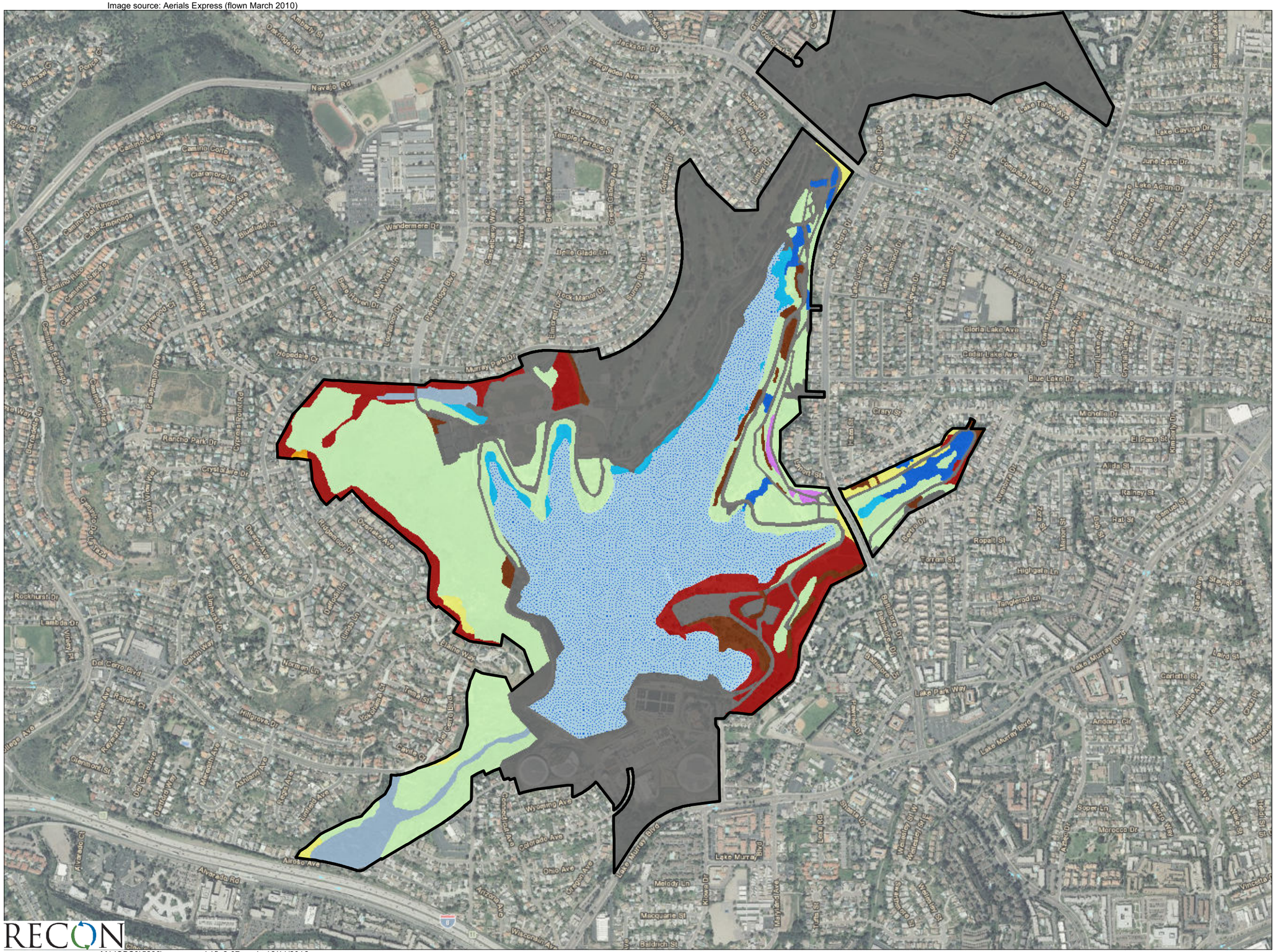
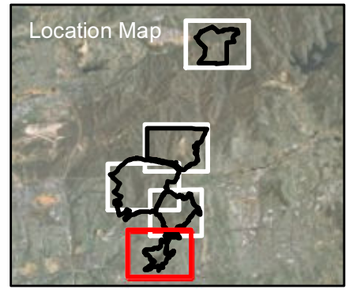
Image source: Aerials Express (flown March 2010)





Project Boundary

Vegetation Communities

(Holland Code)

- Coastal and Valley Freshwater Marsh
- Diegan Coastal Sage Scrub
- Disturbed Habitat
- Disturbed Wetland
- Eucalyptus Woodland
- Non-native Grassland
- Non-native Vegetation
- Open Water
- Southern Willow Scrub
- Urban/Developed
- Wildflower Field

0 Feet 1,000

FIGURE 2-7E

Vegetation Communities at MTRP (Holland Code)

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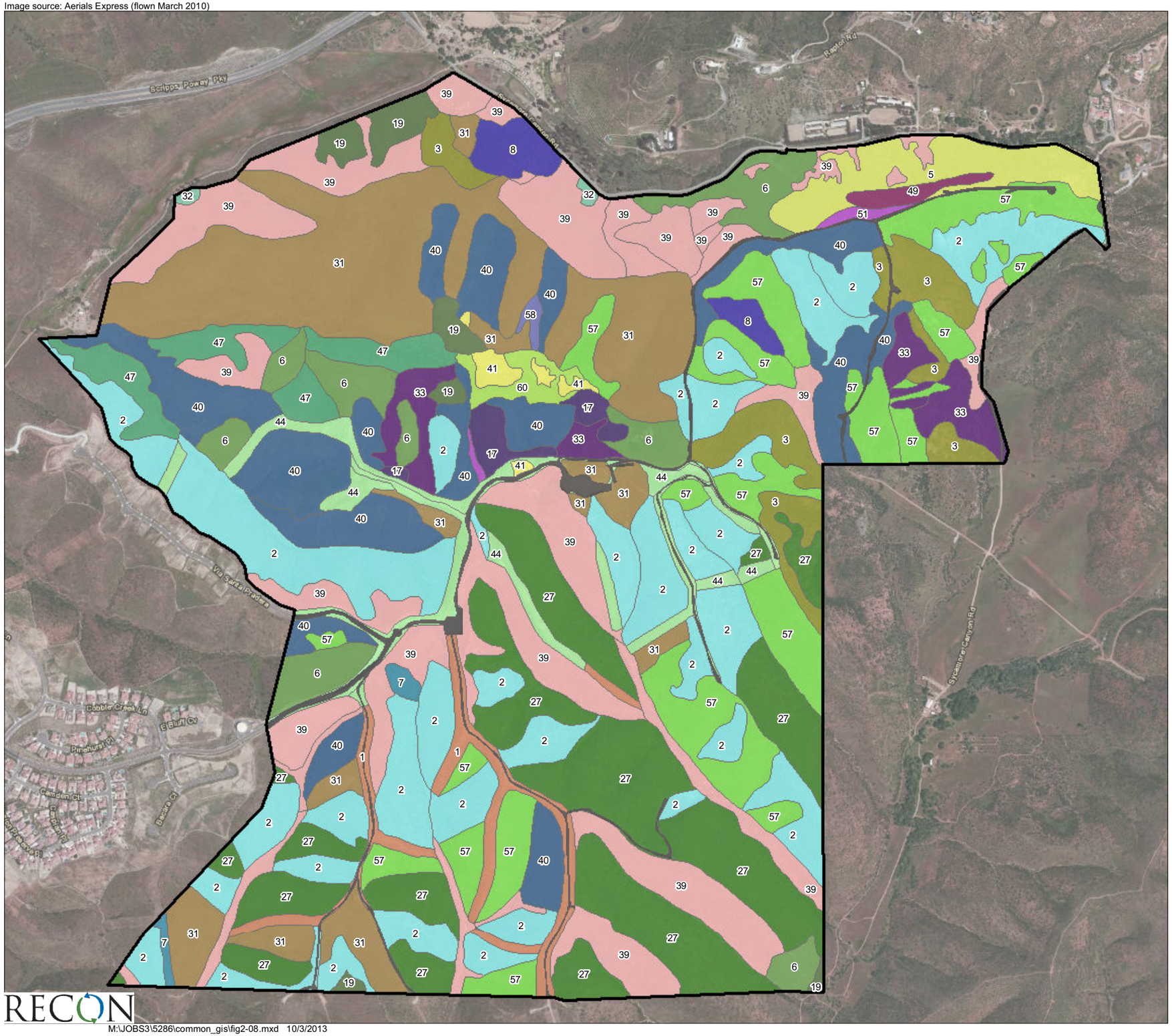
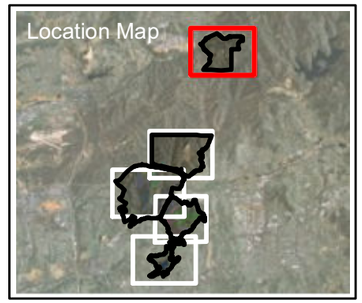
Image source: Aerials Express (flown March 2010)





Project Boundary

Vegetation Communities (SANDAG)

ID--Alliance\Association

- 1--Acmispon glaber\Acmispon glaber
- 2--Adenostoma fasciculatum
- 3--Adenostoma fasciculatum-Xylococcus bicolor
- 5--Adenostoma fasciculatum-Xylococcus bicolor\Adenostoma fasciculatum-Xylococcus bicolor-Quercus berberifolia
- 6--Adenostoma fasciculatum\Adenostoma fasciculatum
- 7--Adenostoma fasciculatum\Adenostoma fasciculatum-Acmispon glaber
- 8--Adenostoma fasciculatum\Adenostoma fasciculatum-Ceanothus tomentosus
- 17--Artemisia californica\Artemisia californica
- 19--Avena (barbata, fatua) Semi-Natural Stands
- 27--Ceanothus tomentosus\Ceanothus tomentosus
- 29--Urban\Developed
- 31--Eriogonum fasciculatum\Eriogonum fasciculatum
- 32--Eucalyptus semi-natural stands
- 33--Heteromeles arbutifolia
- 39--Malosma laurina\Malosma laurina
- 40--Malosma laurina\Malosma laurina-Acmispon glaber
- 41--Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands
- 44--Pennisetum setaceum Semi-Natural Stands
- 47--Quercus (berberidifolia, x acutides)\Quercus (berberidifolia, x acutides)
- 49--Quercus agrifolia\Quercus agrifolia-Toxicodendron diversilobum-Grass
- 51--Rhamnus crocea\Rhamnus crocea Provisional Association
- 57--Salvia mellifera\Salvia mellifera
- 58--Salvia mellifera\Salvia mellifera-Malosma laurina
- 60--Stipa pulchra\Stipa pulchra

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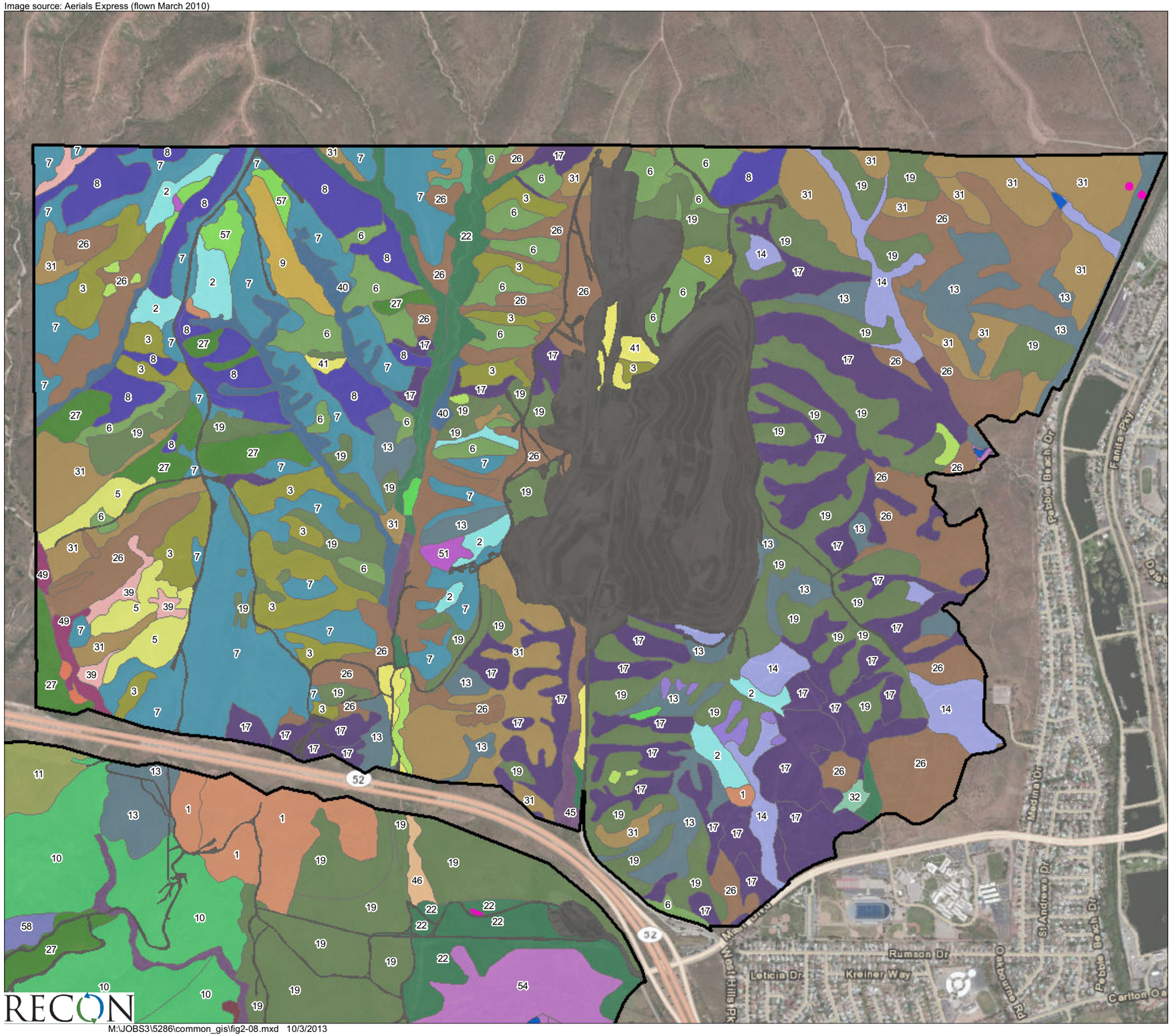
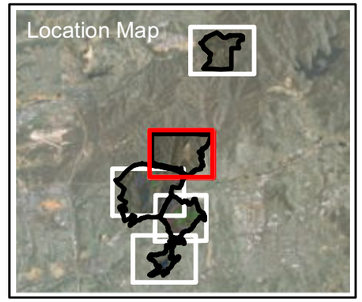
FIGURE 2-8A

Vegetation Communities at MTRP (SANDAG)

Image source: Aerials Express (flown March 2010)





Project Boundary

Vegetation Communities (SANDAG)

ID--Alliance\Association

- 1--Acmispon glaber\Acmispon glaber
- 2--Adenostoma fasciculatum
- 3--Adenostoma fasciculatum-Xylococcus bicolor
- 5--Adenostoma fasciculatum-Xylococcus bicolor\Adenostoma fasciculatum-Xylococcus bicolor-Quercus berberifolia
- 6--Adenostoma fasciculatum\Adenostoma fasciculatum
- 7--Adenostoma fasciculatum\Adenostoma fasciculatum-Acmispon glaber
- 8--Adenostoma fasciculatum\Adenostoma fasciculatum-Ceanothus tomentosus
- 9--Adenostoma fasciculatum\Adenostoma fasciculatum-Xylococcus biocolor-Ceanothus tomentossus
- 10--Adenostoma fasciculatum\Adenostoma fasciculatum (Eriogonum fasciulatum, Artemesia californica, Salvia me
- 11--Arctostaphylos glandulosa\Arctostaphylos glandulosa-Adenostoma fasciculatum
- 13--Artemisia californica-Eriogonum fasciculatum\Artemisia californica-Eriogonum fasciculatum
- 14--Artemisia californica-Eriogonum fasciculatum\Artemisia californica-Eriogonum fasciculatum-Malosma laurina
- 17--Artemisia californica\Artemisia californica
- 19--Avena (barbata, fatua) Semi-Natural Stands
- 22--Baccharis sarothroides\Baccharis sarothroides
- 24--Bahiopsis lacinata\Bahiopsis lacinata-Artemisia californica-Eriogonum fasciculatum
- 26--Bromus (diandrus, hordeaceus)-Brachypodium distachyon Semi-Natural Stands
- 27--Ceanothus tomentosus\Ceanothus tomentosus
- 29--Urban\Developed
- 31--Eriogonum fasciculatum\Eriogonum fasciculatum
- 32--Eucalyptus semi-natural stands
- 35--Leymus triticoides\Leymus triticoides
- 36--Malacothamnus fasciculatum\Malacothamnus fasciculatum
- 38--Malosma laurina
- 39--Malosma laurina\Malosma laurina
- 40--Malosma laurina\Malosma laurina-Acmispon glaber
- 41--Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands
- 43--Open Water
- 45--Platanus racemosa\Platanus racemosa
- 46--Platanus racemosa\Platanus racemosa-Populus spp./Salix lasiolepis
- 47--Quercus (berberidifolia, x acutides)\Quercus (berberidifolia, x acutides)
- 49--Quercus agrifolia\Quercus agrifolia-Toxicodendron diversilobum-Grass
- 51--Rhamnus crocea\Rhamnus crocea Provisional Association
- 54--Salix gooddingii\Salix gooddingii
- 57--Salvia mellifera\Salvia mellifera
- 58--Salvia mellifera\Salvia mellifera-Malosma laurina
- 60--Stipa pulchra\Stipa pulchra
- 62--Vernal Pool

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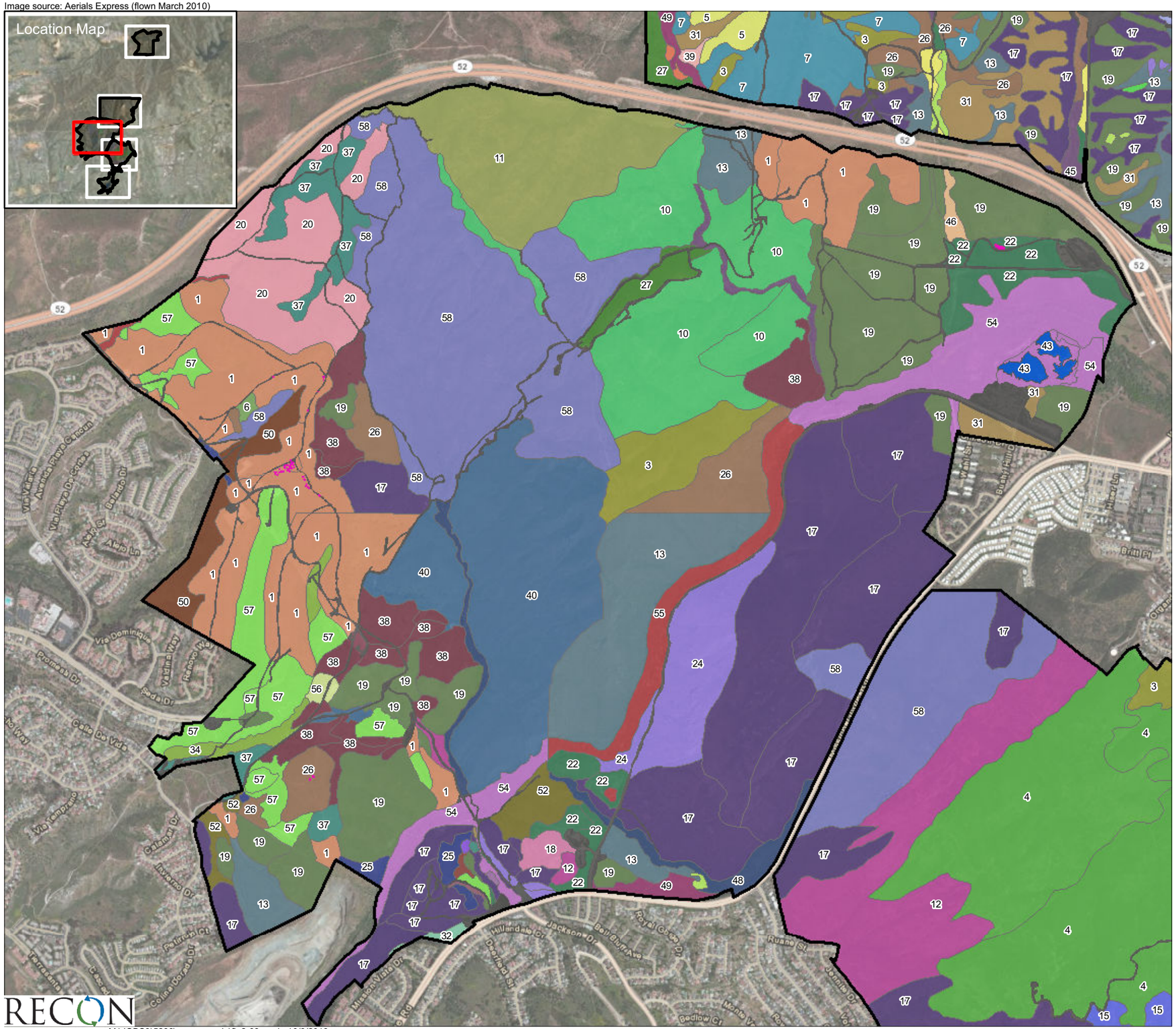
FIGURE 2-8B

Vegetation Communities at MTRP (SANDAG)

Image source: Aerials Express (flown March 2010)



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Project Boundary

Vegetation Communities (SANDAG)

ID--Alliance\Association

1--Acmispon glaber\Acmispon glaber
2--Adenostoma fasciculatum
3--Adenostoma fasciculatum-Xylococcus bicolor
4--Adenostoma fasciculatum-Xylococcus bicolor\Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus tomentosus
5--Adenostoma fasciculatum-Xylococcus bicolor\Adenostoma fasciculatum-Xylococcus bicolor-Quercus berberifolia
6--Adenostoma fasciculatum\Adenostoma fasciculatum
7--Adenostoma fasciculatum\Adenostoma fasciculatum-Acmispon glaber
10--Adenostoma fasciculatum\Adenostoma fasciculatum (Eriogonum fasciulatum, Artemesia californica, Salvia me
11--Arctostaphylos glandulosa\Arctostaphylos glandulosa-Adenostoma fasciculatum
12--Artemisia californica-Eriogonum fasciculatum
13--Artemisia californica-Eriogonum fasciculatum\Artemisia californica-Eriogonum fasciculatum
14--Artemisia californica-Eriogonum fasciculatum\Artemisia californica-Eriogonum fasciculatum-Malosma laurina
15--Artemisia californica-Salvia mellifera
16--Artemisia californica-Salvia mellifera\Artemisia californica-Salvia mellifera
17--Artemisia californica\Artemisia californica
18--Artemisia californica\Artemisia californica-Mimulus aurantiacus
19--Avena (barbata, fatua) Semi-Natural Stands
20--Avena (barbata, fatua) Semi-Natural Stands\Avena (barbata, fatua) Semi-Natural Stands
21--Baccharis salicifolia\Baccharis salicifolia
22--Baccharis sarothroides\Baccharis sarothroides
23--Bahiopsis lacinata\Bahiopsis lacinata
24--Bahiopsis lacinata\Bahiopsis lacinata-Artemisia californica-Eriogonum fasciculatum
25--Brassica (nigra) and Other Mustards Semi-Natural stands
26--Bromus (diandrus, hordeaceus)-Brachypodium distachyon Semi-Natural Stands
27--Ceanothus tomentosus\Ceanothus tomentosus
29--Urban\Developed
31--Eriogonum fasciculatum\Eriogonum fasciculatum
32--Eucalyptus semi-natural stands
34--Heteromeles arbutifolia\Heteromeles arbutifolia
35--Leymus triticoides\Leymus triticoides
36--Malacothamnus fasciculatum\Malacothamnus fasciculatum
37--Malacothamnus fasciculatus
38--Malosma laurina
39--Malosma laurina\Malosma laurina
40--Malosma laurina\Malosma laurina-Acmispon glaber
41--Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands
43--Open Water
45--Platanus racemosa\Platanus racemosa
46--Platanus racemosa\Platanus racemosa-Populus spp./Salix lasiolepis
48--Quercus agrifolia\Quercus agrifolia
49--Quercus agrifolia\Quercus agrifolia-Toxicodendron diversilobum-Grass
50--Quercus berberidifolia\Quercus berberidifolia
52--Rhus integrifolia\Rhus integrifolia
54--Salix gooddingii\Salix gooddingii
55--Salix lasiolepis\Salix lasiolepis
56--Salvia apiana\Salvia apiana-Artemesia californica
57--Salvia mellifera\Salvia mellifera
58--Salvia mellifera\Salvia mellifera-Malosma laurina
60--Stipa pulchra\Stipa pulchra
61--Typha (angustifolia, domingensis, latifolia)
62--Vernal Pool

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FIGURE 2-8C

Vegetation Communities at MTRP (SANDAG)

Image source: Aerials Express (flown March 2010)

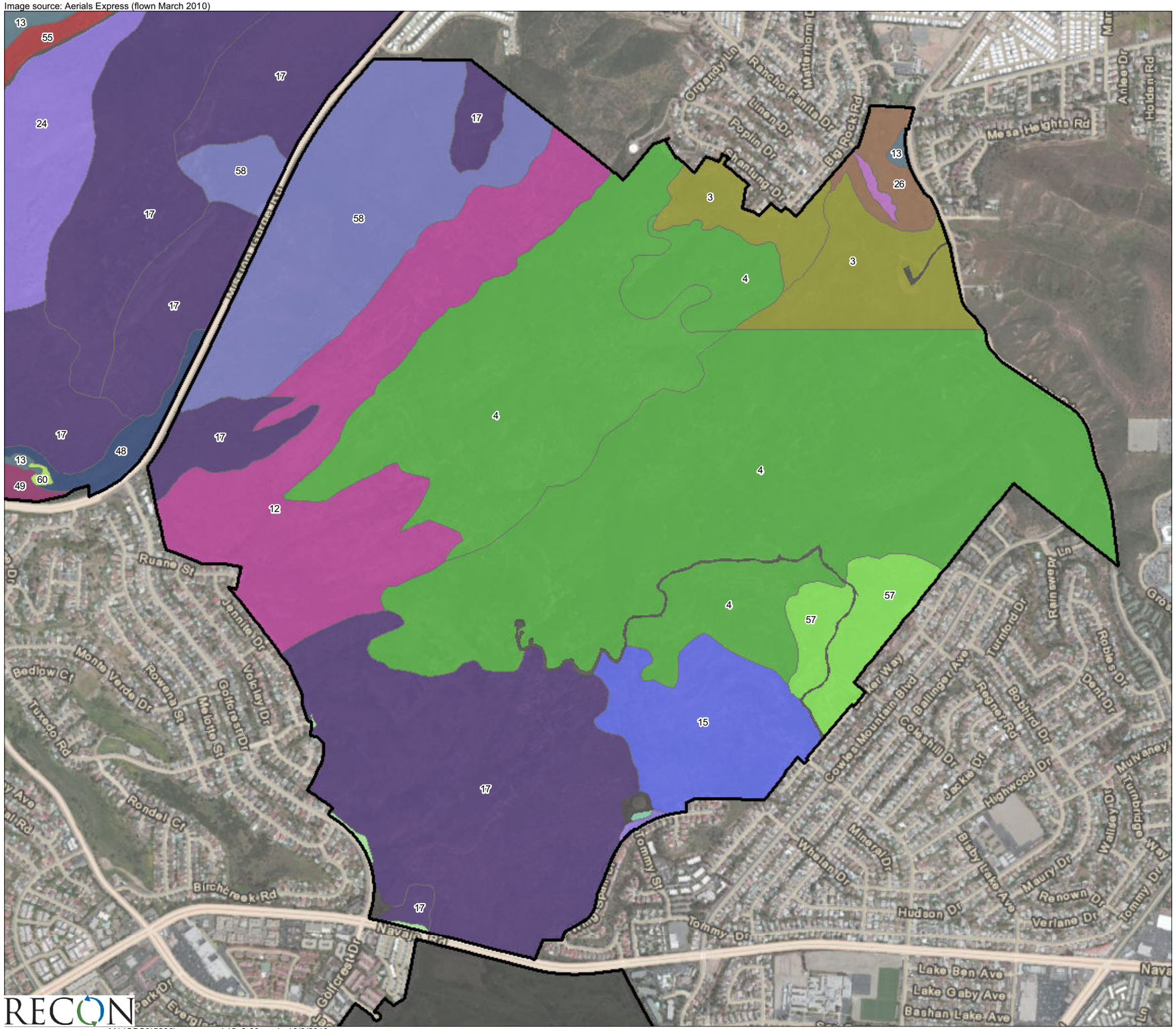

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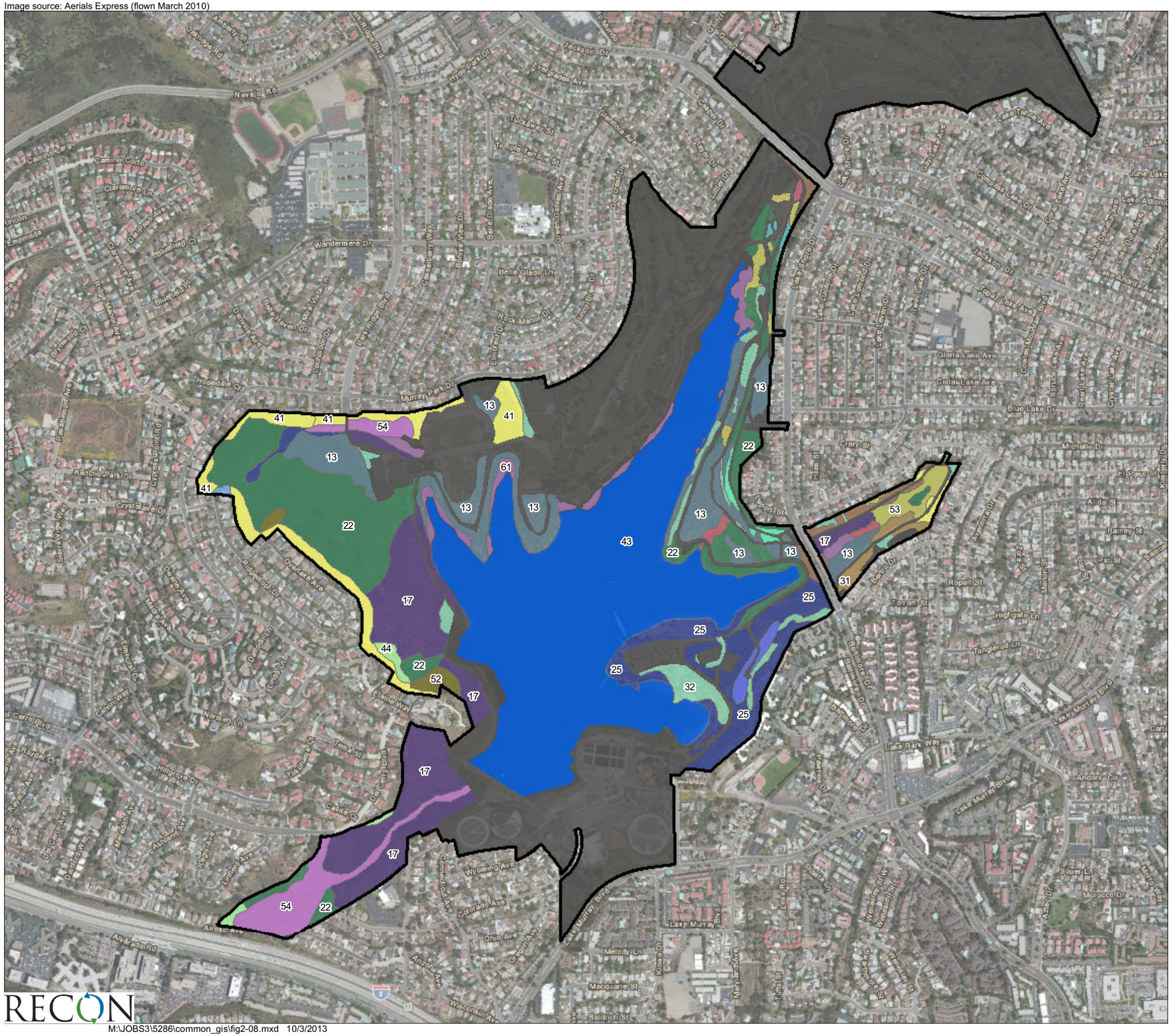
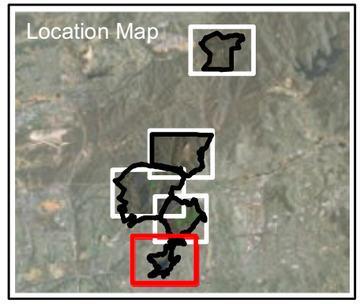
FIGURE 2-8D

Vegetation Communities at MTRP (SANDAG)

Image source: Aerials Express (flown March 2010)





Project Boundary

Vegetation Communities (SANDAG)

ID--Alliance\Association

- 13--Artemisia californica-Eriogonum fasciculatum\Artemisia californica-Eriogonum fasciculatum
- 15--Artemisia californica-Salvia mellifera
- 17--Artemisia californica\Artemisia californica
- 22--Baccharis sarothroides\Baccharis sarothroides
- 25--Brassica (nigra) and Other Mustards Semi-Natural stands
- 26--Bromus (diandrus, hordeaceus)-Brachypodium distachyon Semi-Natural Stands
- 28--Deinandra fasciculata
- 29--Urban\Developed
- 30--Encelia california
- 31--Eriogonum fasciculatum\Eriogonum fasciculatum
- 32--Eucalyptus semi-natural stands
- 41--Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands
- 42--Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands
- 43--Open Water
- 44--Pennisetum setaceum Semi-Natural Stands
- 52--Rhus integrifolia\Rhus integrifolia
- 53--Salix gooddingii
- 54--Salix gooddingii\Salix gooddingii
- 59--Schinus semi-natural Stands\
- 61--Typha (angustifolia, domingensis, latifolia)

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FIGURE 2-8E

Vegetation Communities at MTRP (SANDAG)

TABLE 2-5
SANDAG VEGETATION COMMUNITY ALLIANCE AND ASOCIATIONS OBSERVED AT MTRP

Group	Alliance	Association	Acres
Riparian Forests and Woodlands			**242.2**
	Western Sycamore Woodland		**26**
	Platanus racemosa	*Platanus racemosa*	20.7
		Platanus racemosa-Populus spp./*Salix lasiolepis*	5.3
	Black Willow Woodland		**164.4**
	Salix gooddingii	*Salix gooddingii*	164.4
	Arroyo Willow Woodland		**51.8**
	Salix lasiolepis	*Salix lasiolepis*	51.8
Upland Forests and Woodlands			**79.4**
	Coast Live oak woodland		**58.8**
	Quercus agrifolia	*Quercus agrifolia*	35.5
		Quercus agrifolia/Toxicodendron diversilobum/Grass	23.3
	Peppertree woodland	-	**0.32**
	Schinus semi-natural stands*		0.32
	Eucalyptus woodland	-	**20.3**
	Eucalyptus semi-natural stands*		20.3
Riparian Shrublands			**177.8**
	Mule Fat Scrub		**1.4**
	Baccharis salicifolia	*Baccharis salicifolia*	1.4
	Broom Baccharis		**176.4**
	Baccharis sarothroides	*Baccharis sarothroides*	176.4

TABLE 2-5
SANDAG VEGETATION COMMUNITY ALLIANCE AND ASOCIATIONS OBSERVED AT MTRP
(continued)

Group	Alliance	Association	Acres
Sclerophyllous, Evergreen Shrublands			**3,603.1**
	Chamise Chaparral		**1,103.70**
	Adenostoma fasciculatum	*Adenostoma fasciculatum*	154.9
		Adenostoma fasciculatum-Acmispon glaber	263.9
		Adenostoma fasciculatum-Ceanothus tomentosus	129.7
		Adenostoma fasciculatum (Eriogonum fasciculatum, Artemisia californica, Salvia mellifera)	539.5
		Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus tomentosus	15.7
	Chamise-Mission Manzanita Chaparral		**1,036.40**
	Adenostoma fasciculatum-Xylococcus bicolor	*Adenostoma fasciculatum-Xylococcus bicolor*	288
		Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus tomentosus	688.5
		Adenostoma fasciculatum-Xylococcus bicolor-Quercus berberidifolia	59.9
	Eastwood Manzanita Chaparral		**162.2**
	Arctostaphylos glandulosa	*Arctostaphylos glandulosa-Adenostoma fasciculatum*	162.2
	Ramona lilac Chaparral		**245.7**
	Ceanothus tomentosus	*Ceanothus tomentosus*	245.7
	Toyon Chaparral		**44.5**
	Heteromeles arbutifolia	*Heteromeles arbutifolia*	44.5
	Coastal Bushmallow Scrub		**51.6**
	Malacothamnus fasciculatus	*Malacothamnus fasciculatus*	51.6
	Laurel Sumac Chaparral		**852**
	Malosma laurina	*Malosma laurina*	415.1
		Malosma laurina-Acmispon glaber	436.9
	Scrub oak Chaparral		**69.7**
	Quercus (berberidifolia, x acutides)	*Quercus (berberidifolia, x acutides)*	69.7
	Red Berry Scrub		**7.2**
	Rhamnus crocea	*Rhamnus crocea*	7.2
	Lemonade Berry Scrub		**30.1**
	Rhus integrifolia	*Rhus integrifolia*	30.1

TABLE 2-5
SANDAG VEGETATION COMMUNITY ALLIANCE AND ASOCIATIONS OBSERVED AT MTRP
(continued)

Group	Alliance	Association	Acres
Soft-leaved, Drought-deciduous Shrublands			**3,512.2**
	Deer weed scrub		**352.1**
	Acmispon glaber	*Acmispon glaber*	352.1
	Coastal sagebrush scrub		**1139.3**
	Artemisia californica	*Artemisia californica*	1130
		Artemisia californica-Mimulus aurantiacus	9.3
	Coastal sagebrush-California buckwheat scrub		**588.2**
	Artemisia californica-Eriogonum fasciculatum	*Artemisia californica-Eriogonum fasciculatum*	532.4
		Artemisia californica-Eriogonum fasciculatum- Malosma laurina	55.8
	Coastal sagebrush-Black sage scrub		**80.5**
	Artemisia californica-Salvia mellifera	*Artemisia californica-Salvia mellifera*	80.5
	San Diego sunflower scrub		**94.8**
	Bahiopsis lacinata	*Bahiopsis lacinata*	0.6
		Bahiopsis lacinata-Artemisia californica- Eriogonum fasciculatum	94.2
	Bush sunflower scrub		**0.7**
	Encelia californica	*Encelia californica*	0.7
	California buckwheat Scrub		**399.4**
	Eriogonum fasciculatum	*Eriogonum fasciculatum*	399.4
	White sage Scrub		**4.2**
	Salvia apiana	*Salvia apiana-Artemisia californica*	4.2
	Black sage Scrub		**853**
	Salvia mellifera	*Salvia mellifera*	300.4
		Salvia mellifera-Malosma laurina	552.6

TABLE 2-5
SANDAG VEGETATION COMMUNITY ALLIANCE AND ASOCIATIONS OBSERVED AT MTRP
(continued)

Group	Alliance	Association	Acres
Hydrophytic Herbaceous Vegetation			**12.2**
	Beard-less wild rye		**1.5**
	Elymus triticoides	*Elymus triticoides*	1.5
	Cat tail		
	Typha (angustifolia, domingensis, latifolia)	-	**8.4**
	Naturalized Warm-Temperate Riparian and Wetland	-	**1.5**
	Semi-Natural Stands*		
	Vernal pools **	-	**0.8**
Upland Herbaceous Vegetation			**1,306.7**
	Purple Needlegrass grassland		**17.2**
	Stipa pulchra	*Stipa pulchra*	17.2
	Tarweed field		**1.2**
	Deinandra fasciculata		1.2
	Wild oat grassland*		**787.7**
	Avena (barbata, fatua) Semi-Natural Stands*		787.7
	Mustard field*		**38.2**
	Brassica (nigra) and Other Mustards Semi-Natural stands*		38.2
	Brome grassland*		**369.5**
	Bromus (diandrus, hordeaceus)-Brachypodium distachyon		369.5
	Semi-Natural Stands*		
	Disturbed Habitat*		**37.5**
	Mediterranean California Naturalized Annual and Perennial		37.5
	Grassland Semi-Natural Stands*		
	Purple fountain grassland*		**55.4**
	Pennisetum setaceum Semi-Natural Stands*		55.4

2.2.4 Wildlife Corridors

Maintaining connectivity amongst core MSCP areas as well as to lands within the greater Southern California region is essential for maintaining the biodiversity of the MHPA and resilience of species and natural communities in San Diego (San Diego Management and Monitoring Program [SDMMP] 2010). Regionally, MTRP is a Core Biological Resource Area within the MHPA, as well as a critical regional open space link for the movement of animals between inland natural areas surrounding Marine Corps Air Station (MCAS) Miramar, west through Sycamore Canyon Preserve and various County parks in the Central Poway/San Vicente Reservoir/North Poway Core Resource Area, and eventually east to the Cleveland National Forest (Ogden Environmental and Energy Services [Ogden] 1998, Figure 2-9).

2.2.4.1 Corridor Constraints within MTRP

MTRP areas are separated by man-made and topographic boundaries, and as a result, require a discussion of preserve level connectivity. Each area within MTRP has varying levels of urban edge and connectivity (Table 2-6). The Lake Murray area, while containing some significant biological resources, is not within an established MSCP Core Resource Area and is entirely bounded by developed lands. It abuts the Cowles Mountain area to the north. Natural vegetation between the Lake Murray and Cowles Mountain subareas are separated by a golf course and two paved roads (Jackson Drive and Navajo Road). The Cowles Mountain area is within a Core Resource Area, is approximately 85 percent bounded by developed lands, abuts the Mission Gorge subarea to the northwest. The Cowles Mountain and Mission Gorge areas are separated by Mission Gorge Road, a four-lane highway. The Mission Gorge area is approximately 24 percent bounded by developed lands, is within a Core resource Area, and directly abuts Open Space to the southeast and northwest. The Fortuna Mountain area has developed lands on 29 percent of its boundaries and is adjacent to the Mission Gorge area along its southeastern border and East Elliott to the north. The Fortuna Mountain and East Elliott areas are separated by State Route 52 (SR-52) (see below). The East Elliott area shares approximately 47 of its boundaries with developed lands, including the City of Santee to the east and the Sycamore Landfill internally. East Elliott is bordered to the north by MCAS Miramar, which is predominantly open space and separates East Elliott from West Sycamore. The West Sycamore area is bounded by MCAS Miramar to the south, the Goodan Ranch Preserve to the east, and development to the northwest.

TABLE 2-6
PRESERVE LEVEL ADJACENCY TO OPEN SPACE AT MTRP

MTRP Area	% of Area Bounded by Developed Lands	MSCP Biological Core Area?*
Lake Murray	100	No
Cowles Mountain	85	Yes
Mission Gorge	24	Yes
Fortuna Mountain	29	Yes
East Elliott	47	Yes
West Sycamore	08	Yes

*Taken from Table 2-2 of the MSCP Plan.

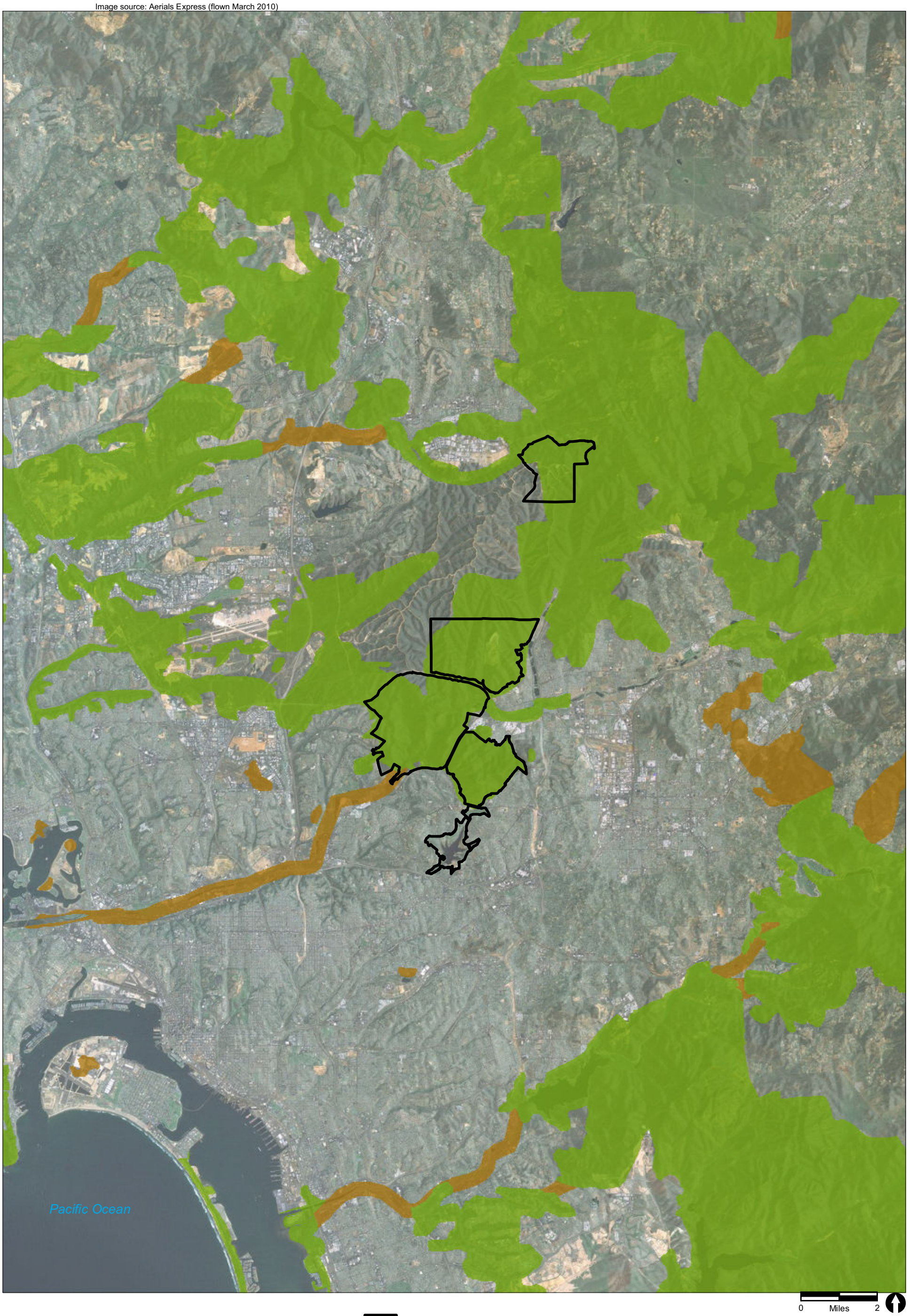
In 2010, the Western Tracking Institute (WTI) conducted a study on the presence and movement of mammals within MTRP. Although mammal populations were observed to be plentiful and relatively diverse, some concern was noted regarding internal constraints to wildlife movement, with particular emphasis on wildlife crossing beneath SR-52 (WTI 2010). Large, MSCP-covered mammals with extensive home ranges, such as mountain lion (*Puma concolor*) and mule deer (*Odocoileus hemionus*), require these crossings to extend foraging ranges and facilitate gene flow between disparate populations.

SR-52 is a six-lane highway which bisects MTRP between the East Elliott area and the Fortuna Mountain area and poses a significant constraint on connectivity between "main MTRP" (Cowles Mountain, Fortuna Mountain, and Mission Gorge) and open space to the north (East Elliott and West Sycamore). A total of seven wildlife undercrossing choke points beneath SR-52 have been identified and are crucial to limiting the effects of habitat fragmentation to a number of species (WTI 2010). These crossings west to east are (1) the SR-52 "wildlife tunnel," (2) the Oak Canyon Bridge undercrossing, (3) the Spring Canyon Bridge undercrossing, (4) the Mast Boulevard culverts, (5) the eastern San Diego River course, and (6 and 7) and two small culverts (Figures 2-10 and 2-11). Of these seven crossings, only two (Oak Canyon Bridge undercrossing and Spring Canyon Bridge undercrossing) are considered viable movement corridors for large mammals.

Recreational activities, especially when conducted at night (which would be illegal, as MTRP is closed at night), can reduce wildlife movement through choke points. Nocturnal activities can result in the wildlife avoidance of undercrossings and the associated increase of at-grade crossings. During the WTI study, animals were observed crossing at grade through broken exclusion fencing along SR-52, which was subsequently repaired. As the freeway fencing along the north and south boundaries of SR-52 are maintained by the Department of Transportation, work to inspect and repair fencing near corridor chokepoints should be coordinated with California Department of Transportation (Caltrans) District 11 staff.

An analysis of the north-south corridor constraints across SR-52 at MTRP is presented below and is summarized in Table 2-7.

Image source: Aerials Express (flown March 2010)



Project Boundary

Generalized Core and Linkage Areas (MSCP 1998)

Core Resources

Habitat Linkages

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FIGURE 2-9

Regional Wildlife Corridors at Mission Trails Regional Park

TABLE 2-7
WILDLIFE UNDERCROSSINGS AT SR-52

Name	Type	Diameter (m)	Height (m)	Width (m)	Length (m)	Openness Ratio	Substrate	Allowed Recreational Uses?	Wildlife use
Wildlife Tunnel	Wildlife underpass	4.57	-	-	90	0.73	Sand	No	Large mammals*, medium mammals, small mammals, reptiles
Oak Canyon Bridge	Divided Highway Bridge	-	20	50	50	94.00	Vegetation, soil, and water	Yes	Large mammals, medium mammals, small mammals, reptiles, amphibians
Culvert A	Culvert	1.5	-	-	82	0.09	Concrete	No	Small mammals
Culvert B	Culvert	0.6	-	-	150	0.01	Concrete	No	Small mammals
Spring Canyon Bridge	Divided highway Bridge	-	30	50	50	150.00	Vegetation, soil, and water	Yes	Large mammals, medium mammals, small mammals, reptiles, amphibians
Mast Culvert	Culvert	1.2	-	-	170	0.03	Concrete	No	Small mammals
San Diego River Course	Undivided highway Bridge	-	7	137	26	36.88	Vegetation, soil, and water	No	Large mammals, medium mammals, small mammals, reptiles, amphibians

*During WTI surveys in 2010, metal fencing was observed on MCAS Miramar side of wildlife tunnel, restricted potential access to large mammals.

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Image Source: Microsoft Corporation

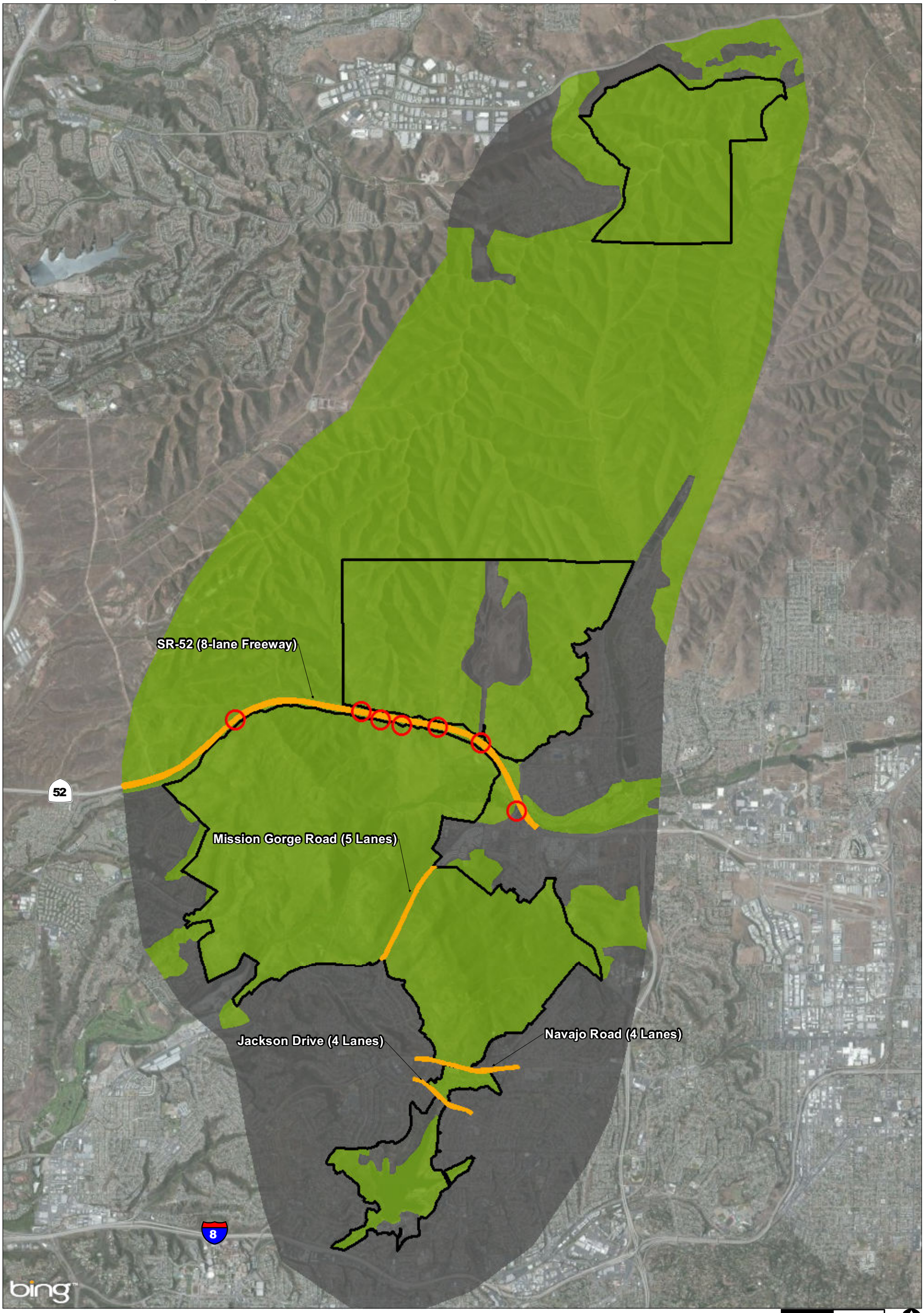

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FIGURE 2-10

Preserve Level Connectivity within Mission Trails Regional Park

Image Source: Aerials Express (flown March 2010)

East Elliott Area
Cowles Mountain Area
Fortuna Mountain Area
Mission Gorge Area

Wildlife Crossings

- 1, Wildlife Tunnel
- 2, Oak Canyon Bridge Undercrossing
- 3, Culvert A
- 4, Culvert B
- 5, Spring Canyon Bridge Undercrossing
- 6, Mast Boulevard Culverts
- 7, San Diego River Course

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FIGURE 2-11

Wildlife Crossings at Mission Trails Regional Park

2.2.4.1.1 The Wildlife Tunnel

This Wildlife Tunnel is a wildlife undercrossing approximately 1.8 miles north of the Tierrasanta trailhead. The Wildlife Tunnel under crosses SR-52 and connects the Fortuna Mountain area with lands managed by MCAS Miramar (see Figure 2-9). MCAS Miramar has installed a set of bars at the northern end of the tunnel to restrict recreational encroachment onto their property. Despite the barriers and exclusion signage, WTI observed that vandals have broken the barrier and frequently use the tunnel (day and nighttime) to illegally access trails on MCAS Miramar. Evidence collected during the study suggested that the mule deer will cross SR-52 at grade when fencing in this area is compromised (WTI 2010). Smaller mammals such as coyote (*Canis latrans*) and bobcats (*Lynx rufus*), however, continued to use the crossing. The combination of a partially functional gate and frequent recreational use appear to be limiting the wildlife tunnel's use by large mammals such as mule deer and mountain lion as a wildlife crossing.

It is recommended that City staff coordinate with MCAS Miramar to develop a plan to remove bars from the wildlife tunnel while addressing recreational encroachment onto federal lands.

2.2.4.1.2 Oak Canyon Bridge

The Oak Canyon Bridge is a high bridge (approximately 20 meters tall) about 1.15 miles west of the Mast Boulevard equestrian staging area. It spans Oak Canyon and provides a large undercrossing that is relatively isolated from MTRP entrances and heavily used trails (see Figure 2-9). Mule deer were observed to use this corridor; additionally, the corridor is likely used by mountain lion (WTI 2010). Due to the height and width of the undercrossing and the distance from major recreational uses, this wildlife crossing does not appear to be constrained, and no management actions are recommended.

2.2.4.1.3 Culverts A and B

Two small culverts undercrosss SR-52 between the Oak Canyon Bridge and Spring Canyon Bridge. These culverts were not evaluated under the WTI study in 2010. Their small diameter and great length make them unusable by wildlife to all but small mammals. No management actions are recommended for culverts A and B.

2.2.4.1.4 Spring Canyon Bridge

The Spring Canyon Bridge is another high bridge (approximately 30 meters tall) located approximately 0.5 mile from the Mast Boulevard equestrian staging area. The Spring Canyon Bridge has a higher rate of recreational usage than other crossings, but the bridge height, large undercrossing, and abundant vegetation appear to provide a functional crossing. Mule deer were observed to use this corridor; and is likely used by

mountain lion (WTI 2010). Therefore, this tunnel appears to be a functional wildlife corridor, and no management actions are recommended at this time.

2.2.4.1.5 Mast Culverts

Two adjacent pipe culverts under cross SR-52 approximately 0.1 mile north of the Mast Boulevard equestrian staging area in the Fortuna Mountain area (see Figure 2-9). These culverts serve primarily to drain Little Sycamore Canyon to the north through an unnamed drainage into the San Diego River to the south. These culverts are used regularly by a variety of smaller wildlife to transit between Little Sycamore Canyon in the East Elliott area to the San Diego River flood plain within the Fortuna Mountain and Mission Gorge areas. At the time of the 2010 WTI study, exclusion fencing to the north and south of the SR-52 freeway near the culvert appeared to be compromised. This culvert serves as a functional crossing for smaller species such as desert cottontail (*Sylvilagus audubonii*), bobcat, and raccoon (*Procyon lotor*).

2.2.4.1.6 San Diego River Course

The San Diego River enters MTRP from the east from the El Capitan Reservoir, flows through the city of Santee, and has marginal value as a large mammal wildlife corridor (WTI 2010). While the river channel habitat within MTRP is of relatively high quality, directly east (outside) of the MTRP boundary the river floodplain is heavily constrained by urban development, contains a golf course, and suffers from dense weed infestation (i.e., giant reed [*Arundo donax*]), trash accumulation, and various homeless encampments. Although mule deer were observed using habitat east (outside) of the MTRP, it is unclear whether they can move via the San Diego River to available habitat east of MTRP. As corridor constraints at the San Diego River course lie beyond the MTRP boundaries, no park management of the San Diego River course is recommended.

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3.0 Regulatory Framework

3.1 Multiple Species Conservation Program

The MSCP is a regional habitat conservation plan that addresses preservation of multiple species and natural vegetation communities within southwestern San Diego County. The MSCP provides a framework for preserving and protecting natural resources through mitigation of impacts to covered species and their habitats from direct, indirect, and cumulative impacts of future development on both public and private lands. The MSCP is implemented through the Final MSCP Plan (Ogden 1998), jurisdictional subarea plans such as the City MSCP Subarea Plan (City of San Diego 1997), and associated municipal codes which contain resource management requirements.

The MTRP NRMP includes Area Specific Management Directives (ASMD) required in MSCP Implementing Agreement Section 10.6.B, City Subarea Plan Section 1.5.6, and Final MSCP Plan Section 6.3.

3.2 Multi-Habitat Planning Area Guidelines for MTRP

The MSCP's MHPA includes regional wildlife corridors and core biological areas that are targeted for conservation. These lands have been determined to provide the necessary habitat quality, quantity, and connectivity to sustain the unique biodiversity of the San Diego region, and sensitive biological resources under the City's Environmentally Sensitive Lands Ordinance. Conditionally compatible uses within the MHPA include passive recreation, utility lines and roads, limited water facilities and essential public facilities, limited low-density residential use, brush management zone 2, and limited agriculture (MSCP Subarea Plan Section 1.4.1). The majority of lands at MTRP are located within the MHPA (Figure 3-1).

Section 1.5.2 of the City Subarea Plan provides general management directives which apply to all areas within the MHPA. These general directives provide guidance on access and recreation within open space areas, including MTRP. Priority directives include:

- Install sufficient signage and barriers identifying access to the MHPA
- Locate trails, overlooks, and staging areas in least-sensitive areas in MHPA
- Avoid paving trails
- Minimize recreational trail widths

- Limit equestrian trails near sensitive resources
- Prohibit recreational off-road and cross county access to MHPA
- Remove homeless camps from habitat areas
- Regularly maintain equestrian trails to remove manure

Sections 1.2.2, 1.2.4, 1.5.6, and 1.5.8 of the City Subarea Plan provide guidelines for MHPA compliance and specific management recommendations within MTRP. The following MHPA guidelines are relevant to park management within the lifespan of the NRMP. MHPA directive compliance responses are taken from both the MTRP NRMP and Master Plan Update (MPU).

Priority 1 (MSCP required directives):

1) Prepare an NRMP for the park to preserve and protect natural resources while encouraging public use and implementation of the Master Development Plan.

    - NRMP: MSCP directive satisfied by the production of this document.

2) Maintain and clearly demarcate trails around the visitor center and other areas of high public use to minimize habitat destruction.

    - High-use trails surrounding the Visitor Center are currently demarcated with signage and maintained by MTRP staff.

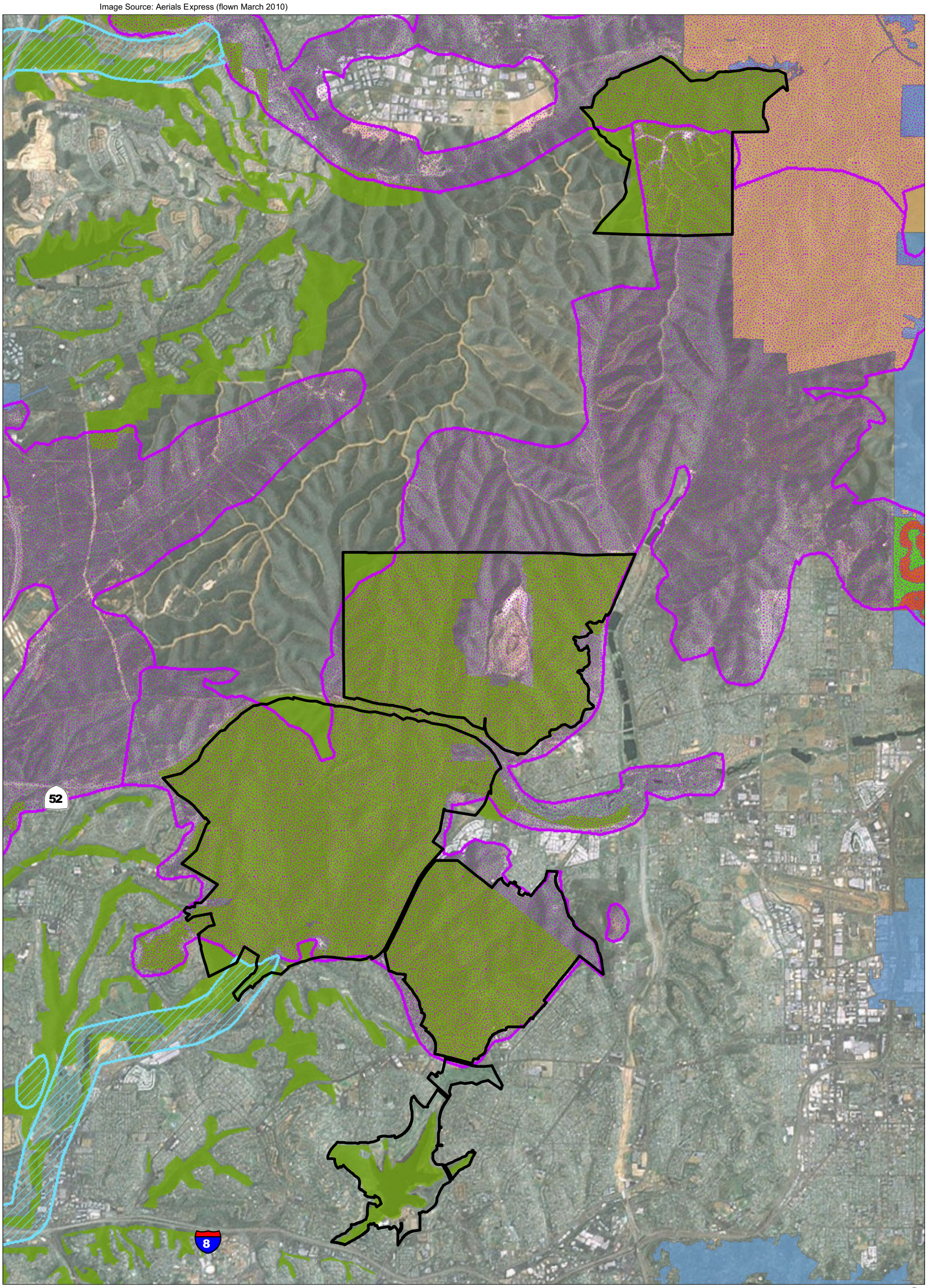
    - MPU: General Facility Recommendations #6 (p. 5–6) — Maintain and repair existing signage on an as-needed basis.

    - MPU: General Habitat/Species Recommendations #3 (p. 5–7) — Construct wildlife-compatible fencing where necessary to protect sensitive species, habitats, and cultural/historic resources.

    - MPU: General Habitat/Species Recommendations #5 — Close unauthorized, user-created trails where appropriate to reduce habitat fragmentation and encroachment.

    - MPU: General Recreation Recommendations #3 (p. 5–10) — Develop and implement a public information and education program focused on the requirements of the MSCP relative to the management and use of different areas of the park.

Image Source: Aerials Express (flown March 2010)



Project Boundary

City of San Diego MHPA

Generalized Core and Linkage Areas (MSCP 1998)

Core Resources Areas

Habitat Linkages

County of SD MSCP Sub Area Plan

Pre-Approved Mitigation Area

Hardline Preserve

Take Authorized

Unincorporated Land in Metro-Lakeside-Jamul Segment

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FIGURE 3-1

Project in Relation to MSCP Preserve Area

3) Limit future equestrian trails to specified trails which minimize trail edge disturbances and are no greater than 25 percent gradient.

   - MPU: Proposed equestrian trails have been designed to minimize edge disturbances, and are no greater than 25 percent gradient.

   - MPU: Trails analysis discussion (pp. 4-12–13) regarding both steep and fall-line trails.

   - MPU: Recommendations intro (p. 5-1) regarding MSCP requirements, safety, and sustainability as foundation for all recommendations.

   - MPU: General Recreation Recommendations #1 (p. 5-10) — Comply with the City's current Trail Policies and Standards per the current *City of San Diego Consultants Guide to Park Design and Construction* for all new and rerouted trails. Utilize other state and national sustainable trail guidelines as supplements to the City's Standards.

4) Seasonally restrict, if necessary, areas along the San Diego River, including riparian restoration areas (except along established trails), to prevent disturbance of breeding areas.

   - MPU: Recommendations introduction (p. 5-2): As additional environmental surveys are conducted and management actions implemented, conflicts between resource management objectives and recreational use may arise. When these conflicts are identified, temporary, seasonal, or permanent closures of the recreational use may be required. If permanent closure is required, then an alternate location or route for the recreational use should be identified and implemented.

5) As envisioned in the Master Development Plan, revegetate areas with eroded or denuded slopes for slope stability and habitat enhancement.

   - NRMP: Since the most recent fire in 2003, large vegetated areas in MTRP denuded by fire and fire breaks created to contain fire have naturally been recolonized by native and exotic species. As a result, there are few large areas in the park where erosion poses a threat to slope stability, water quality, and/or sensitive habitats. One significant departure from this trend is continuing erosion and channel degradation in the West Sycamore area. Erosional flows emanating from a previously graded construction pad and a utility road may be impacting a population of willowy monardella (*Monardella vimnea*), an MSCP covered species. Plans to control erosion within the West Sycamore area are found in Section 4.2.4.5.

- MPU: Habitat/Species Recommendations (pp. 5-13, 5-20, 5-27, 5-36, 5-51, and 5-63) — Conduct habitat restoration or revegetation activities within disturbed areas as needed.

6) Incorporate adequate setbacks into future plans to develop an equestrian center near the San Diego River in order to minimize impacts associated with brown-headed cowbird (*Molothrus ater*) parasitism. Establish a cowbird trapping program to minimize effects on the least Bell's vireo (*Vireo bellii pusillus*) and other song birds.

   - NRMP: The equestrian (multi-use) staging area was dedicated in 2004.A cowbird trapping program is on ongoing, and detailed in Section 4.3.4.4.

   - MPU: General Habitat/Species Recommendation #14 (p. 5-8) — Coordinate with regional efforts (USGS Western Ecological Research Center) to refine and develop cowbird trapping optimization studies.

   - MPU: General Habitat/Species Recommendation #15 — Plan and implement a cowbird trapping program along the San Diego River as deemed necessary by City biologists.

7) Minimize lighting for the campground, and collect garbage frequently to reduce nuisance wildlife (raccoons, opossums, skunks, and ravens).

   - MPU: Currently, lighting is minimized at the Kumeyaay campground. No permanent artificial lighting is used at the campground except at the entry station. Phase 2 of the campground has been cancelled, and is not a part of the MPU.

8) Establish signs to direct access and provide educational information at the periphery of sensitive resource areas and at points of access. Post signs to prohibit campfires, pets, firearms, and camping (except where allowed). Also post road signs to identify wildlife corridors to help reduce road kills.

   - NRMP: Access and exclusion signage has been proposed for new or rerouted trails adjacent to sensitive resources. For details see Sections 4.2.1, 4.2.2, 4.2.5, 4.3.1, 4.3.2, and 4.3.3.

   - MPU: General Facility Recommendations #6 (p. 5-6) — Maintain and repair existing signage on an as-needed basis.

   - MPU: General Facility Recommendations #10 — Develop and incorporate additional interpretive signage along the major trails near interpretable features, rest stops, or overlooks.

- MPU: General Facility Recommendations #13 — Continue to prohibit fires in the park to reduce fire danger, except within developed fire rings at the Kumeyaay Lake Campground, the Equestrian Multi-use Staging Area, and Lake Murray.

- MPU: General Habitat/Species Recommendations #3 (p. 5-7) — Construct wildlife-compatible fencing where necessary to protect sensitive species, habitats, and cultural/historic resources.

- MPU: General Habitat/Species Recommendations #5 — Close unauthorized, user-created trails where appropriate to reduce habitat fragmentation and encroachment.

- MPU: General Recreation Recommendations (p. 5-10) #3 — Develop and implement a public information and education program focused on the requirements of the MSCP relative to the management and use of different areas of the park.

9) Protect the remaining populations of San Diego ambrosia (*Ambrosia pumila*) in the private property area immediately to the east of the Kumeyaay Lake campground. Explore methods to protect and enhance the San Diego ambrosia population, such as transplanting to more remote areas or the use of split-rail fencing.

- NRMP: The population of San Diego ambrosia within MTRP has been the subject of previous and ongoing research designed to answer questions that will optimize future management. The latest science has been used to design goals and objectives for San Diego ambrosia in this document. In addition, a San Diego ambrosia transplantation site was identified within the park (Section 4.2.2).

- MPU: General Habitat/Species Recommendations #2 (p. 5-7) — Protect populations of identified sensitive plants including: … San Diego ambrosia. Reroute existing and proposed trails to avoid impacts.

- MPU: General Habitat/Species Recommendations #6 (p. 5-8) — Implement the adopted MTRP *San Diego Ambrosia Management Plan*.

- MPU: General Habitat/Species Recommendations #19 — Construct or repair and maintain wildlife compatible exclusionary fencing and signage around populations of …San Diego ambrosia…as necessary.

- MPU: Park Area Specific Recommendations: Cowles Mountain (p. 5-20) CM-H3 — Allow the transplant of San Diego ambrosia from areas outside

MTRP to the identified restoration site. Construct and maintain wildlife compatible exclusionary fencing and signage as required.

Mission Gorge (p. 5-27) MG-H1 — Use the closed trail (MG-R11) area to expand the population of San Diego ambrosia.

(p. 5-30) MG-R11 — Close and restore the western Kwaay Paay access trail from the Old Mission Dam staging area to avoid direct conflicts with the protection of San Diego ambrosia.

Fortuna Mountain (p. 5-44) FM-R49 — Close and restore an unauthorized, user-created trail within the Grasslands area that encroaches on San Diego ambrosia habitat.

10) (East Elliott) Implement programs to educate future adjacent landowners pursuant to the general adjacency management guidelines in Section 1.5.2.

- MPU: Park Area Planning Recommendation (p. 5-50) EE-P1 — Allow the development of private property holdings within East Elliott consistent with the community plan, MSCP requirements, and the Mission Trails Design District Ordinance.

11) Preserve 90 percent of the population of San Diego ambrosia at MTRP.

- NRMP: The population of San Diego ambrosia at MTRP is conserved. Future plans which may have impacted San Diego ambrosia (Phase II of the Kumeyaay campground development) have been removed from the Master Plan (Section 4.2.2.3).

12) Monitor areas with a history of invasive species, such as artichoke thistle (*Cynara cardunculus*), tamarisk (*Tamarix* sp.), and giant reed (*Arundo donax*) for re-invasion.

- NRMP: Giant reed and tamarisk are currently monitored within the San Diego River for reinvasion (Section 4.3.4.5). A growing population of artichoke thistle was observed within the West Sycamore area. Artichoke thistle control measures are detailed in Section 4.3.5.4.

- MPU: General Habitat/Species Recommendations #7 (p. 5-7) — Eradicate non-native invasive species from the park whenever feasible. Control species that cannot be eradicated on a regular basis to prevent significant spreading. Restore native species and habitats, including vernal pool species, throughout the park utilizing local seed/nursery stock when available.

- MPU: General Habitat/Species Recommendations #13 (p. 5-8) — Conduct surveys for giant reed biannually (or six months after major flood events) to identify, map, and remove small infestations.

- MPU: Park Area Recommendations: West Sycamore Habitat/Species (p. 5-63) WS-H1 — Plan and implement a removal and control program for artichoke thistle.

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4.0 Biological Resource Management

4.1 Sensitive Biological Resources

4.1.1 Sensitive Species within MTRP

MTRP contains 23 sensitive plant species and 41 sensitive wildlife species, including seven plant species and 16 wildlife species covered by the MSCP (Tables 4-1 and 4-2). Details of MSCP covered sensitive species, their conditions of coverage, and document reference to ASMDs are presented in Table 4-3.

For purposes of this plan, species are considered to be sensitive if they are (1) listed by state or federal agencies as threatened or endangered or are proposed for listing; (2) on Rank 1B (considered endangered throughout its range), Rank 2 (considered endangered in California but more common elsewhere), or Rank 4 (plants of limited distribution-a watch list) of the California Native Plant Society's (CNPS) *Inventory of Rare and Endangered Vascular Plants of California* (Skinner and Pavlik 1994); or (3) considered rare, endangered, or threatened by the California Natural Diversity Database (CNDDB; State of California 2000a, 2000b) or the City of San Diego's biology guidelines (City of San Diego 2002).

Determination of the potential occurrence for listed, sensitive, or noteworthy plant species was based upon known ranges and habitat preferences for the species (Zeiner et al. 1988, 1990; State of California 2011a; CNPS 2001), species occurrence records from the CNDDB (State of California 2011b), the San Diego MSCP rare plant data, and species occurrence records from other sites in the vicinity of the survey area.

4.1.2 Threats to Biological Resources at MTRP

Although direct habitat loss due to development is not a threat within conserved lands, habitat degradation due to both natural and anthropogenic threats continues to affect native species and habitats at MTRP. Threats are organized and analyzed below based on their scale and, consequently, the ability of preserve-level management actions effectiveness. For example, although climate change may pose a regional threat to some sensitive species, individual management actions taken at MTRP to combat climate change are not expected to be at the scale necessary to address the threat. In order to standardize terms for our discussion, direct threats and stressor nomenclature will follow the classification structure developed by SDMMP in support of a Management Strategic Plan (MSP).

TABLE 4-1
SENSITIVE PLANT SPECIES OBSERVED WITHIN MTRP

Common Name	Scientific Name	CNPS Rank	Federal/ State	MSCP Covered?
San Diego thornmint	*Acanthomintha ilicifolia*	1B.1	FT/CE	Yes
San Diego ambrosia	*Ambrosia pumila*	1B.1	FE	Yes
San Diego sagewort	*Artemisia palmeri*	4.2	-	No
San Diego sunflower	*Bahiopsis (=Viguiera) lacinata*	4.2	-	No
San Diego goldenstar	*Bloomeria clevelandii*	1B.1	-	Yes
Orcutt's brodiaea	*Brodiaea orcuttii*	1B.1	-	Yes
Peninsular spineflower	*Chorizanthe leptotheca*	4.2	-	No
Delicate clarkia	*Clarkia delicata*	1B.2	-	No
Summer holly	*Comarostaphylis diversifolia* ssp. *diversifolia*	1B.2	-	No
Western dichondra	*Dichondra occidentalis*	4.2	-	No
Variegated dudleya	*Dudleya variegata*	1B.2	-	Yes
Graceful tarplant	*Holocarpha virgata* ssp. *elongata*	4.2	-	No
Decumbent goldenbush	*Isocoma menziesii* var. *decumbens*	1B.2	-	No
San Diego marsh elder	*Iva hayesiana*	2.2	-	No
San Diego barrel cactus	*Ferocactus viridescens*	2.1	-	Yes
Robinson's pepper grass	*Lepidium virginicum* var. *robinsonii*	1B.2	-	No
Willowy monardella	*Monardella viminea*	1B.1	FE/CE	Yes
California adder's-tongue fern	*Ophioglossum californicum*	4.2	-	No
Nuttall's scrub oak	*Quercus dumosa*	1B.1		No
Chaparral ragwort	*Senecio aphanactis*	2.2	-	No
Purple stemodia	*Stemodia durantifolia*	2.1	-	No
San Diego County needlegrass	*Stipa* [=*Achnatherum*] *diegoensis*	4.2	-	No
Rush-like bristleweed	*Xanthisma juncea*	4.3	-	No

TABLE 4-2
SENSITIVE WILDLIFE SPECIES OBSERVED WITHIN MTRP

Common Name	Scientific Name	Federal/ State*	MSCP Covered?
Invertebrates			
San Diego fairy shrimp	*Branchinecta sandiegonensis*	FE	No
Hermes copper butterfly	*Lycaena hermes*	CSA	No
Quino checkerspot	*Euphydryas editha quino*	FE	No
Amphibians			
Western spadefoot toad	*Spea hammondii*	CSC	No
Reptiles			
Belding's orange-throated whiptail	*Aspidoscelis hyperthra beldingi*	CSC	Yes
Coastal western whiptail	*Aspidoscelis tigris stejnegeri*	CSA	No
Southern Pacific pond turtle	*Actinemys marmorata pallida*	CSC	Yes
Coronado skink	*Eumeces skiltonianus interparietalis*	CSC	No
San Diego horned lizard	*Phrynosoma coronatum blainvillii*	CSC	Yes
Coast patch-nosed snake	*Salvadora hexalepis virgultea*	CSC	No
Two-striped garter snake	*Thamnophis hammondi*	CSC	No
Northern red diamond rattlesnake	*Crotalus ruber*	CSC	No
Birds			
Cooper's hawk	*Accipiter cooperi*	CSA	Yes
Southern California rufous-crowned sparrow	*Aimophila ruficeps canescens*	CSC	Yes
Golden eagle	*Aquila chrysaetos canadensis*	CSC, CFP	Yes
Grasshopper sparrow	*Ammodramus savannarum*	CSC	No
Great blue heron	*Ardea herodias*	CSA	No
Coastal cactus wren	*Campylorhynchus brunneicapillus couesi*	CSC	Yes
Great egret	*Casmerodius albus*	CSA	No
Northern harrier	*Circus cyaneus*	CSC	Yes
Yellow warbler	*Dendroica petechia*	CSC	No
White-tailed kite	*Elanus leucurus*	CFP	No
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE/SE	Yes
California horned lark	*Eremophila alpestris actia*	CSC	No
Peregrine falcon	*Falco peregrinus anatum*	SE, CFP	Yes
Yellow-breasted chat	*Icteria virens*	CSC	No
Black-crowned night heron	*Nycticorax nycticorax*	CSA	No
Double-crested cormorant	*Phalacrocorax auritus albociliatus*	CSC	No
California gnatcatcher	*Polioptila californica californica*	FT, CSC	Yes
Western bluebird	*Sialia mexicana occidentalis*	-	Yes
Light-footed clapper rail	*Rallus longirostris levipes*	FE/SE, CFP	Yes
Least Bell's vireo	*Vireo bellii pusillus*	FE/SE	Yes
Mammals			
Dulzura California pocket mouse	*Chaetodipus californicus femoralis*	CSC	No
Northwestern San Diego pocket mouse	*Chaetodipus fallax fallax*	CSC	No
Western mastiff bat	*Eumops perotis californicus*	CSC	No
Western red bat	*Lasiurus blossevillii*	CSC	No
San Diego black-tailed jackrabbit	*Lepus californicus bennettii*	CSC	No
Southern mule deer	*Odocoileus hemionus fuliginata*	-	Yes
Mountain lion	*Puma concolor*	CFP	Yes
Pocketed free-tailed bat	*Nyctinomops femorosacca*	CSC	No
Big free-tailed bat	*Nyctinomops macrotis*	CSC	No

*Federal/State
FE = Federally listed endangered
FT = Federally listed threatened
SE = State listed endangered
CSC = California Department of Fish and Game species of special concern
CSA = California Department of Fish and Game Special Animal
CFP = California fully protected species

TABLE 4-3
MSCP COVERED SPECIES, REQUIRED AREA SPECIFIC MANAGEMENT DIRECTIVES (ASMDs), AND ASSOCIATED SECTIONS WITHIN THE MTRP NRMP

Common name	Scientific name	Required ASMD*	Corresponding NRMP Section
San Diego thornmint	*Acanthomintha ilicifolia*	- Specific measures to protect against detrimental edge effects	4.2.1 4.3.3
San Diego ambrosia	*Ambrosia pumila*	- Monitoring of transplanted populations - Specific measures to protect against detrimental edge effects	4.2.2
San Diego goldenstar	*Bloomeria clevelandii*	- Specific measures to protect against detrimental edge effects	4.3.2 4.3.3
Orcutt's brodiaea	*Brodiaea orcuttii*	- Specific measures to protect against detrimental edge effects	4.3.4
Variegated dudleya	*Dudleya variegata*	- Specific measures to protect against detrimental edge effects	4.2.3 4.3.3
San Diego barrel cactus	*Ferocactus viridescens*	- Specific measures to protect against detrimental edge effects - Specific measures to protect against unauthorized collection - Fire management	4.3.2 4.3.5
Willowy monardella	*Monardella viminea*	- Specific measures to protect against detrimental edge effects	4.2.4 4.3.4
Belding's orange-throated whiptail	*Aspidoscelis hyperthra beldingi*	- Specific measures to protect against detrimental edge effects	4.3.3 4.3.4 4.3.5
San Diego horned lizard	*Phrynosoma coronatum blainvillii*	- Specific measures to protect against detrimental edge effects - Measures to maintain native ant populations	4.3.2
Cooper's hawk	*Accipiter cooperi*	- 300 foot impact avoidance of active nests - Minimization of disturbance of oak woodlands and oak riparian forests	4.3.4
Southern California rufous-crowned sparrow	*Aimophila ruficeps canescens*	- Maintenance of dynamic processes, such as fire, to perpetuate some open phases of coastal sage with herbaceous components	4.3.2 4.3.3 4.3.5
Golden eagle	*Aquila chrysaetos canadensis*	- 4000 foot impact avoidance of active nests within preserve lands - Monitoring of nest sites to determine use/success	4.3.1

TABLE 4-3
MSCP COVERED SPECIES, REQUIRED AREA SPECIFIC MANAGEMENT DIRECTIVES (ASMDs), AND ASSOCIATED SECTIONS WITHIN THE MTRP NRMP
(continued)

Common name	Scientific name	Required ASMD*	Corresponding NRMP Section
Coastal cactus wren	*Campylorhynchus brunneicapillus couesi*	- Restoration of maritime succulent scrub , cactus patches	4.2.5
		- Active/adaptive management of cactus wren habitat	4.3.5
		- Monitoring of populations within preserves	
		- Measures to protect against detrimental edge effects	
Northern harrier	*Circus cyaneus*	- Manage agricultural and disturbed lands within 4 miles of nesting habitat	No history of species nesting at MTRP
		- Roosting impact avoidance area (900 feet or maximum possible within preserve)	
Southwestern willow flycatcher	*Empidonax traillii extimus*	- Measures to provide appropriate successional habitat and upland habitat	4.3.4
		- Measures to provide appropriate cowbird control	
		- Measures to protect against detrimental edge effects	
Peregrine falcon	*Falco peregrinus anatum*	- None	-
California gnatcatcher	*Polioptila californica californica*	- Specific measures to protect against detrimental edge effects	4.3.3
		- Minimize disturbance during nesting period	4.3.5
		- Fire protection measure to reduce the potential for habitat degredation	
		- Measures to maintain or improve habitat quality	
Western bluebird	*Sialia mexicana occidentalis*	- None	-
Light-footed clapper rail	*Rallus longirostris levipes*	- Active management of wetlands to ensure healthy saltmarsh habitat	4.3.4
		- Specific measures to protect against detrimental edge effects	
Least Bell's vireo	*Vireo bellii pusillus*	- Measures to provide appropriate successional habitat and upland habitat	4.3.4
		- Measures to provide appropriate cowbird control	
		- Measures to protect against detrimental edge effects	
Southern mule deer	*Odocoileus hemionus fuliginata*	- None	-
Mountain lion	*Puma concolor*	- None	-

* Taken from Table 3-5 in Final MSCP Plan (1998)

4.1.2.1 Preserve-level Threats

Preserve-level threats are those which MTRP managers have the ability, jurisdiction, and budget to effectively address; therefore, the resource management actions recommended here focus on preserve-level threat management. The following are brief descriptions of preserve-wide threats to sensitive species and habitats at MTRP.

4.1.2.1.1 Human Use of Reserves

Recreational uses can impact natural resources within MTRP through erosion, habitat fragmentation, trampling, and the invasion of non-native plant species associated with trail building and their use. Recreational use stressors can differ in intensity and extent depending on whether use is authorized or unauthorized.

Current recreational uses at MTRP include:

- Mountain biking
- Rock climbing
- Horseback riding
- Hiking
- Running (group events and individual runners)
- Birding
- Geocaching

Trail-associated recreation creates long linear impacts with relatively small widths. Trail widening and migration may occur as a result of group events where participants crowd trails. Impacts include:

- Soil disturbance especially during off-trail use and/or when the substrate is saturated
- Trampling damage to plant material
- Compacted soils which may inhibit root growth from adjacent vegetation and/or seedling recruitment
- Introduction vector for invasive plant species (such as weed seeds transported via dirt clods in bike treads or weed seeds found in horse feces)
- Significant negative effects on wildlife corridors, especially when recreation occurs at night when many large mammals are active
- Local fragmentation of the distribution of species sensitive to edge effects, the presence of humans, and/or associated domestic animals and recreational equipment.

Educating visitors about proper trail etiquette, designing trails to avoid sensitive resources, limiting authorized trail access to daylight hours, having clearly posted regulations, and having a clear patrol and violation enforcement strategy can help reduce some of the risks posed by recreation. MTRP currently has a signage and user education system in place within the Lake Murray, Cowles Mountain, Mission Gorge, and Fortuna Mountain areas. However, the East Elliott area is not fully owned by the City and, consequently, does not have an active signage or user education program installed. Signage and user education within this area is being addressed in the Master Plan Update.

4.1.2.1.2 Invasive/Exotic Species

Exotic species threaten natural resources within MTRP through direct competition with native species, habitat degradation, and the introduction of disease.

4.1.2.1.2.1 Plants

Invasive plant species have the potential to displace and dominate native species, hybridize with native plant species, provide food and habitat for invasive animal species, and disturb normal ecosystem functions such as nutrient cycling, wetland hydrology, sedimentation, fire frequency, and erosion (Brossard et al. 2000). Disturbances, such as fire, mammal burrowing, recreational activities, and development adjacent to natural open space, create opportunities for non-native species to invade and establish themselves. MTRP contains a matrix of recreational trails, maintenance roads, and utility right-of-ways and, consequently, opportunities for the introduction and establishment of invasive species. Presence and density invasive species at MTRP differs between species and disturbance history. For example, during weed surveys, exotic annual grasses were observed at a landscape scale in areas of MTRP recovering from recent burns, while within intact vegetation communities it was observed only along trail and utility right-of-way margins. Invasive plants observed within MTRP are listed in Appendix A-A.

4.1.2.1.2.2 Animals

Populations of native plants and animals can be significantly disrupted by the introduction of exotic wildlife and domestic animals into intact and disturbed habitats at MTRP. Exotic wildlife and domestic animals can threaten multiple species of native flora and fauna through direct predation, competition for resources, the introduction of disease, and eutrophication of water sources. Examples of exotic wildlife species observed at MTRP include brown-headed cowbirds, bullfrogs (*Rana catesbeiana*), and Argentine ants (*Linepithema humile*). Domestic animals, such as dogs, cats, and horses, have been shown to be linked with increased weed cover and density (via nutrients and seeds found in feces) (Bureau of Land Management 2012).

4.1.2.1.3 Altered Fire Regime

Southern California plant and wildlife species have evolved strategies to cope with fire, and some even require fire to complete part of their life cycle (Keeley 2008). However, with the increase of human activities, fire frequency has increased in some areas within MTRP. This has altered the plant community structure at MTRP through species loss and type conversion (especially the eastern portion of the East Elliott area). The secondary effects of frequent fire are increased erosion, increased sediment load, alteration of hydrology, and invasion of exotic plant species. For an in depth discussion of fire and fire management at MTRP, see Appendix A-D.

4.1.2.1.4 Altered Hydrology

Hydrology plays a major role in the formation and/or sustainability of many habitats. When a watershed is significantly altered, peak flow rates and flow duration can change the overall character of the stream bed and the associated vegetation community (Poff et al. 1997). Increased hydrological flows due to very high rainfall (2005) after the Cedar fire (2003) have been implicated in the destruction of habitat for a population of willowy monardella within the West Sycamore area of MTRP (B. Miller. pers. comm.). Natural and altered sedimentation due to hydrologic flows may eventually impact historic and anthropogenic structures at MTRP, including the Old Mission Dam.

4.1.2.1.5 Habitat Fragmentation

Habitat fragmentation limits habitat areas, isolates populations, reduces dispersal and gene flow, and degrades habitat quality through edge effects. When species are isolated by physical barriers such as roads, trails, urban areas, and utility right-of-ways, the ability of meta-populations to interbreed or cross-pollinate is reduced, leading to lower genetic variability which puts them at risk of localized extinction.

Regional habitat fragmentation at MTRP is managed by the maintenance of linkages to adjacent biological core areas. Preserve-level fragmentation (caused by MTRP roads, facilities, trails, and utility right-of-ways) at MTRP is managed by minimization of local fragmentation stressors (i.e., the reduction of trail redundancies and rerouting of existing trails away from habitats which are sensitive to local fragmentation and associated edge effects).

4.1.2.2 Region-wide Threats

Region-wide threats are those which occur at large spatial scales and, though they may be identified as significant contributors to overall population decline, are outside of the geographic and jurisdictional scope of MTRP managers. Management of region-wide threats requires region-wide actions, and will not be a significant portion of the recommendations of this document. A Management Strategic Plan (MSP) is being

developed by the SDMMP to identify and prioritize countywide threats to open space areas in San Diego. Regionwide threats to sensitive species and vegetation communities at MTRP are presented below.

4.1.2.2.1 Habitat Loss

Habitat loss occurs when an area utilized by a species becomes unsuitable for the species' use. Habitat loss can come in the form of new permanent impacts (residential development, utilities, roads, trails) or via the degradation of available habitat by increased external stressors (invasive species, noise, erosion, etc.). Lands within MTRP are considered to be preserved and, thus, habitat loss to development is considered to be negligible. Habitat degradation contributes to habitat loss at MTRP, but will be managed under specific stressors (see Section 4.1.2.1).

4.1.2.2.2 Urban Runoff

Water pollution has potential to negatively affect wildlife and riparian plant species (Hogan 2007). Eutrophication is the gradual, abnormal increase in nutrients such as nitrogen and phosphorus in water from sources such as fecal matter and other constituents of urban runoff (National Academy of Sciences [NAS] 1969). The excess nutrient causes algal blooms, which can deprive the water of oxygen, causing fish die-offs and altering the water's pH balance (NAS 1969). Urban runoff is not known to be a significant threat to habitats at MTRP. Urban runoff is managed under Jurisdictional Urban Runoff Management Plans and the Clean Water Act sections 404 and 401 administered by the U.S. Army Corps of Engineers and the State Regional Water Quality Control Board.

4.1.2.2.3 Drought

Drought may exacerbate hydrological problems, such as flow restriction and water pollution (McDowell et al. 2008), decrease vegetation cover, stress wetland habitats, and increase fire risk. The upland communities found within MTRP are adapted to moderate drought stress due to our arid climate, but severe and continued drought conditions may lead to a reduction in wetland and upland habitats.

4.1.2.2.4 Utility and Service Lines

There are several linear infrastructure right-of-ways which cross through MTRP, including San Diego Gas & Electric (SDG&E) transmission lines, San Diego County Water Authority (SDCWA) pipelines, sewer lines, water lines, and the SR-52 expressway. In addition to existing structures (electric towers and pipe access), utility right-of-way impacts often include maintained access roads and maintenance staging areas. Both utilities with easements within MTRP (SDG&E and SDCWA) have developed independent Natural Community Conservation Plans to provide long-term

conservation of habitats and species, including land set aside for the protection of plants and animals (SDG&E 1995; SDCWA and U.S. Fish and Wildlife Service [USFWS] 2010). The conservation efforts of SDG&E and SDCWA are independent of MTRP and the City MSCP Subarea Plan, but generally overlap in their conservation goals.

4.1.3 Adaptive Management

An adaptive management approach will be implemented as part of this Plan. Adaptive management is a systematic process for managing in the face of uncertainty (i.e., when best management practices are lacking) and continually improving management policies and practices by learning from the outcomes of operational procedures. If operational procedures are not meeting management goals, methods are adjusted until they are achieved. Adaptive management of MTRP will consist of the following key elements: establishment of management goals, identification of threats, assessment and selecting of techniques, implementation of management actions, monitoring/assessment of management action effects, and periodic review of management goals and restoration methods.

4.1.4 Management Prioritization

A prioritization system for management actions was developed for species and habitats at MTRP using survey data, information gleaned from a thorough literature review, and the combined knowledge of City biologists and rangers, members of the Institute of Ecological Monitoring and Management at San Diego State University (SDSU), and RECON biologists (Tables 4-4 and 4-5). The sensitive species and ecological guilds observed within MTRP were prioritized using the following criteria:

- Regional threat level (spatial and temporal)
- Preserve threat level
- Ability to effectively manage threats at MTRP

TABLE 4-4
PRIORITY SENSITIVE SPECIES AT MTRP

Common Name	Species
San Diego thornmint	*Acanthomintha ilicifolia*
San Diego ambrosia	*Ambrosia pumila*
variegated dudleya	*Dudleya variegata*
willowy monardella	*Monardella viminea*
coastal cactus wren	*Campylorhynchus brunneicapillus*

TABLE 4-5
PRIORITY MANAGEMENT GUILDS AT MTRP

Management Guild
River Terrace Grasslands
Tierra Santa Clay Ridge
East Elliott Clay Ridgelines
Riparian Woodlands
Cliffs and Rock Outcrops
Artemisia-dominated Coastal Sage Scrub

A list of sensitive species observed at MTRP, but not prioritized for single-species management, is provided in Appendix A-C. Rationales for not selecting individual species for prioritization included low threat levels within MTRP, regional threats not actionable at preserve-level, and/or species threats were covered by actions under a selected management guild. For description of management guilds and their constituent sensitive species, see Section 4.3.

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4.2 Priority Species Management at MTRP

The following is an analysis of threats, conceptual modeling, and ASMDs for prioritized sensitive species management at MTRP. As the ASMDs are specific to threats at MTRP, management recommendations will focus on preserve-level threats. Management of regional threats are addressed in the Management Strategic Plan for Conserved Lands in Western San Diego County (SDMMP 2013).

4.2.1 San Diego Thornmint (*Acanthomintha ilicifolia*)

4.2.1.1 Background

San Diego thornmint was listed by the state of California as an endangered species in 1982 (State of California 2011c) and federally listed as a threatened species in 1998 (USFWS 1998). It is a narrow endemic species covered under the MSCP and a CNPS (2001) Rank 1B.1 species. This aromatic annual in the mint family (Lamiaceae) grows about six inches tall and bears white and rose-colored flowers in April and May (Hickman 1993; Photograph 4-1). It usually occurs in openings in chaparral, coastal sage scrub, native grassland communities, and near vernal pools (CNPS 2001). It is restricted to heavy clay soils, either of gabbroic parent material or derived from calcareous marine sediments (USFWS 1998), particularly Las Posas or San Miguel–Exchequer soils (Reiser 2001). It is often found at sites with native spring annuals, bulbiferous perennials, and herbaceous species (Reiser 2001). At MTRP, San Diego thornmint occurs on friable clay lenses within coastal sage scrub and chaparral vegetation (Photograph 4-2).

As San Diego thornmint is an herbaceous annual, population sizes can fluctuate significantly year-to-year depending on environmental conditions (USFWS 2009). A pollination study completed in 2009 observed that individual plants were visited relatively infrequently by potential pollinators. Those San Diego thornmint flowers that received insect visits appeared to be pollinated by small (> 6 millimeters) generalist flying insects, bees being the most effective (Klien 2009). Experiments have shown that the reproductive output of San Diego thornmint can increase significantly when weed species have been removed (USFWS 2009). Management actions at MTRP which encourage pollinator floral access (dethatching, weed removal) are recommended (see Section 4.2.1.4).

Photograph 4-1: San Diego thornmint within a clay lens at MTRP.

Photograph 4-2: Degraded San Diego thornmint habitat on friable clay lens within the Fortuna Mountain sub-area within MTRP. Note invasion of purple false brome (light green grass between shrubs).

San Diego thornmint has been recorded from the city of Oceanside in the north, east to Ramona, southeast to Jamul, and southward to San Quentin in Baja California (USFWS 2009). The San Diego thornmint population at MTRP (CNDDB Elemental Occurrence [EO] 33 and 34) is one of 88 known populations, 55 of which are conserved, and which are estimated to include a total of 150,000 – 170, 000 individuals (USFWS 2009). Due to its size, MTRP site is not designated as a 'major' population (greater than 1,000 individuals) by the MSCP (USFWS and California Department of Fish and Game [CDFG] 1996). Although small, the site remains important as a geographically distinct population with potentially unique genetic diversity.

4.2.1.2 MSCP Conditions of Coverage

Area-specific management directives must include specific measures to protect against detrimental edge effects from surrounding development (MSCP 1998:Table 3-5).

4.2.1.3 Presence in MTRP

A total of nine populations of San Diego thornmint have been observed in MTRP (Figure 4-1). Of these, eight populations (B, C, D, E, F, G, H, and I) burned in wildfires in 2003. One population (I) burned in both 1983 and 2003. Population A is located within an area with no recorded burn history. Although San Diego thornmint populations experience significant interannual variation at many sites (USFWS 2009), the CNDDB's Elemental Occurrence No. 33 (population D) at MTRP has remained relatively stable over nearly 30 years (Table 4-6).

TABLE 4-6
SIZE OF POPULATION D OVER TIME

Year	Census/Estimate	Surveyor
1986	300	Garrett
1994	300	McMillan and Stone
2001	354	City of San Diego
2002	0	Kelly and volunteers
2003	296	Kelly and volunteers
2004	21	Kelly and volunteers
2005	120	Kelly and volunteers
2006	107	City of San Diego
2008	250	City of San Diego
2009	150	City of San Diego
2010	618	City of San Diego/Kelly and volunteers
2011	302	City of San Diego
2012	598	City of San Diego

Image Source: Aerials Express (flown February 2010)

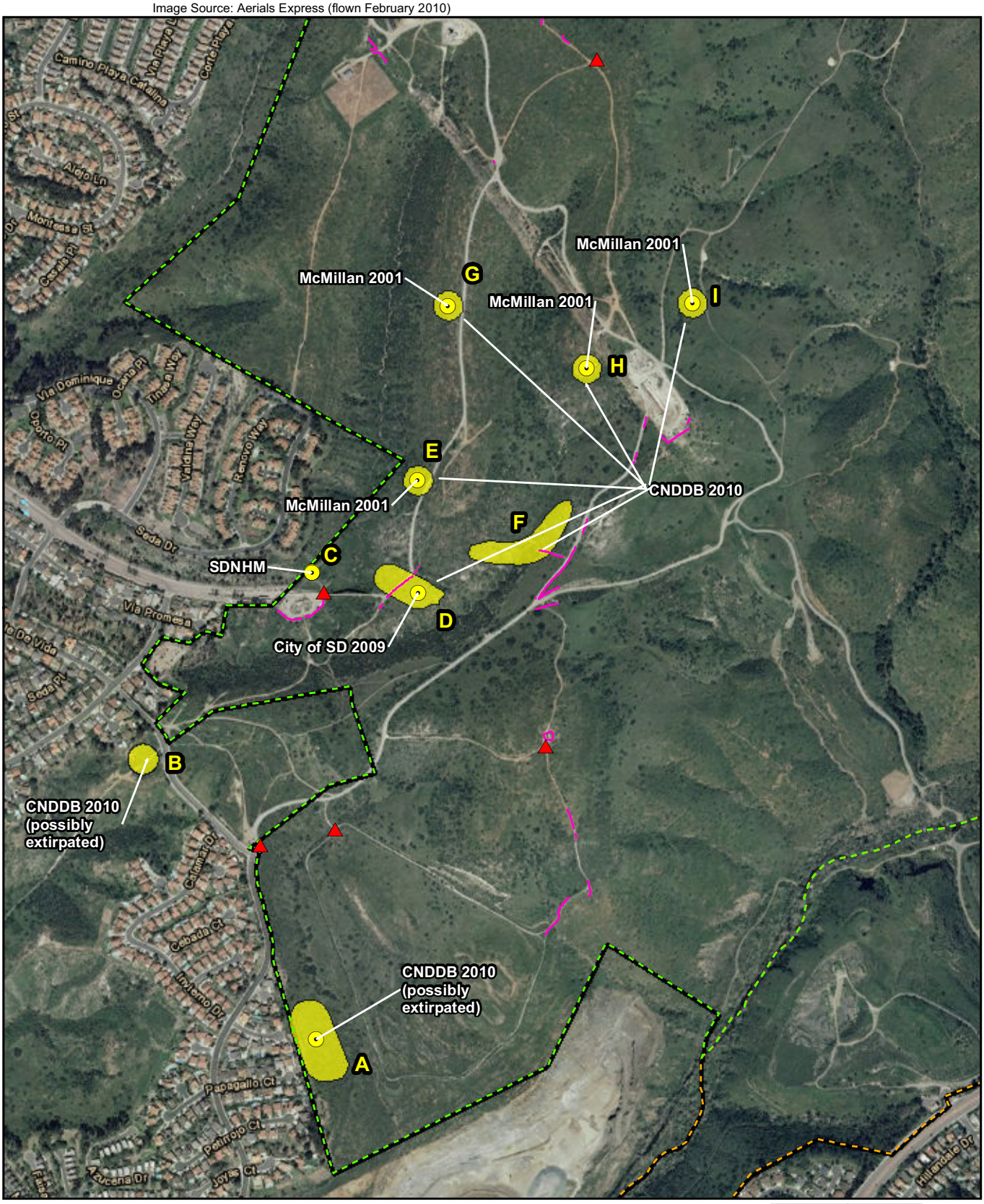

FIGURE 4-1

San Diego Thornmint *(Acanthomintha ilicifolia)*
Detected Occurrences: Mission Trails Regional Park

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Populations A and B are sites which formerly contained vigorous populations of San Diego thornmint (Table 4-7). Surveys within populations A and B in 2010 were negative and noted extensive habitat destruction and degradation. The surveyor noted that the populations were "possibly extirpated." Confirmation of extirpation of vegetative structures and seed bank of San Diego thornmint at these sites is recommended.

TABLE 4-7
SIZE OF POPULATIONS A AND B OVER TIME

Year	Population A	Population B
1980	400-600	-
1986	-	200
1994	200-300	-
2010	0	0

A small section of the West Sycamore area contains available habitat and is adjacent to known San Diego thornmint locations within Sycamore Canyon. This area has a moderate to high potential for additional populations of San Diego thornmint to occur.

4.2.1.4 Anthropogenic Threats at MTRP

4.2.1.4.1 Invasive Non-native Species

Non-natives species present the highest priority threat to all extant populations of San Diego thornmint, including those at MTRP (USFWS 2009). For example, false brome (*Brachypodium distachyon*) at Area D has increased from 15 percent cover in 2006 to 80 percent cover in 2010 and 2012 (Figure 4-2) in a pattern that has been documented at San Diego thornmint sites throughout San Diego County. Experiments conducted in controlled and natural environments have shown that biomass and seed production of San Diego thornmint are negatively affected by the density and proximity of competitors, both grasses and forbs (Bauder and Sakrison 1999). The variation in level of effect has been related to growth habit, with tall, dense species such as wild oats (*Avena* sp.) more effectively limiting access to nutrients, light, water, and space (Bauder and Sakrison 1999). While limiting or removing competition in controlled or natural environments significantly increased fecundity or associated biomass factors, weeding in the field has not been shown to increase seedling survivorship except during above-average rainfall years.

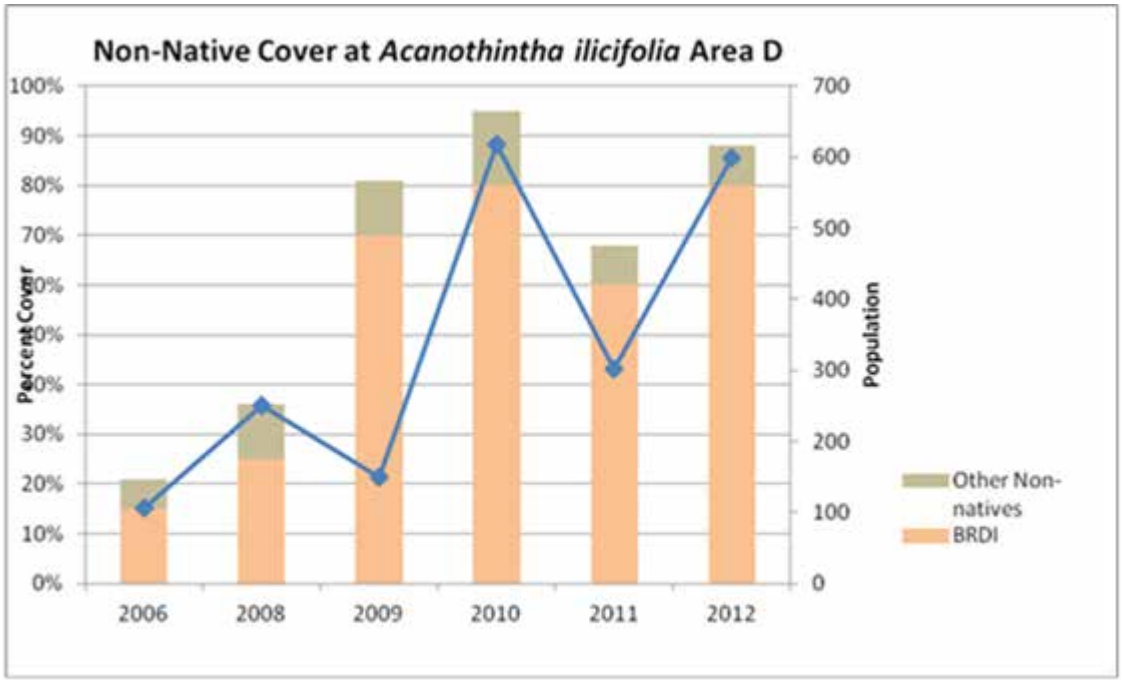


Figure 4-2: Comparison of purple false brome (BRDI) and other non-native species cover at Area D over time

In addition to direct competition for resources, large, dense weed stands may inhibit potential pollinators from gaining access to flowers and thereby decrease fecundity (Bauder and Sakrison 1997, 1999). Resulting thatch may also limit the patches of bare ground required by native pollinators for nesting, limiting the population of potential pollinators. San Diego thornmint flowers appear to be pollinated during infrequent visits from small (>6 millimeters) generalist flying insects, with bees move effective as successful pollinators (Klien 2009).

4.2.1.4.2 Recreational Activities – Trampling

San Diego thornmint is sensitive to direct mortality from non-motorized recreation activities, including trampling from off-trail hiking and mountain biking (USFWS 2009). Informational and directional signs and fencing effectively limit trampling from the trail to the west in Area D based on a review of routine patrols and annual monitoring surveys (see Figure 4-1).

4.2.1.4.3 Fire and Fire Suppression

According to fire mapping of the area, eight populations (B, C, D, E, F, G, H, and I) of San Diego thornmint at MTRP burned in wildfires in 2003. One population (I) of San Diego thornmint burned in both 1981 and 2003 (see Figure 4-1). Area D experienced limited recruitment during the 2004 growing season, with both the October 2003 fire and below average rainfall (5.18 inches) as potential drivers for population size. For example,

during the very low rainfall year of 2002, thornmint did not germinate at Area D (see Table 4-6). Studies indicate that the thornmint plants can produce up to 115 seeds per plant in good conditions, and that older seeds (>1 year old) germinate under a wider range of conditions (Bauder and Sakrison 1997), but the precise effects of fire on the seedbank are unknown.

4.2.1.5 Management Goals and Objectives

Goal: Maintain and enhance known populations of San Diego thornmint at MTRP (Figure 4-3).

Objective 1: Remove Exotic Weeds within Occupied San Diego Thornmint Habitat

- Continue hand weeding the San Diego thornmint population at Area D with assistance of volunteers in winter and early spring. If funding becomes available, hand weeding may be contracted to a professional crew monitored by personnel familiar with the ecology of and threats to San Diego thornmint.
- Hand weeding should include techniques designed to minimize soil disturbance and the potential of uprooting or damaging the root systems of adjacent San Diego thornmint. Successful hand weeding techniques include using scissors to cut grasses below their crown (basal meristem). This technique will kill annual grasses while minimizing deleterious edge effects of manual weeding (M. Dodero, pers. comm., 2011).
- Hand weeding within occupied habitat should be initiated when absolute exotic weed cover exceeds 25 percent.

Objective 2: Review Status of Subpopulations Outside of Area D

- Review impacts for permitted projects by non-City entities near historic San Diego thornmint populations in MTRP.
- Conduct presence/absence surveys for San Diego thornmint at populations A and B in an average or above average rainfall year to confirm extirpation. In the event that San Diego thornmint is observed, evaluate sites for management.
- Survey remaining population areas (C and E-I) in an average or above-average rainfall year within three years of NRMP adoption if possible. Use a sub-meter global positioning system (GPS) to record population area and the MSCP annual plant monitoring data for general habitat assessment; this will allow information to be compared with existing monitoring data for Area D. Surveys should occur when plants are visible at Area D.
- Evaluate sites for management or reintroduction potential based on population size, habitat quality and ability to protect sites from recreation and utility impacts.

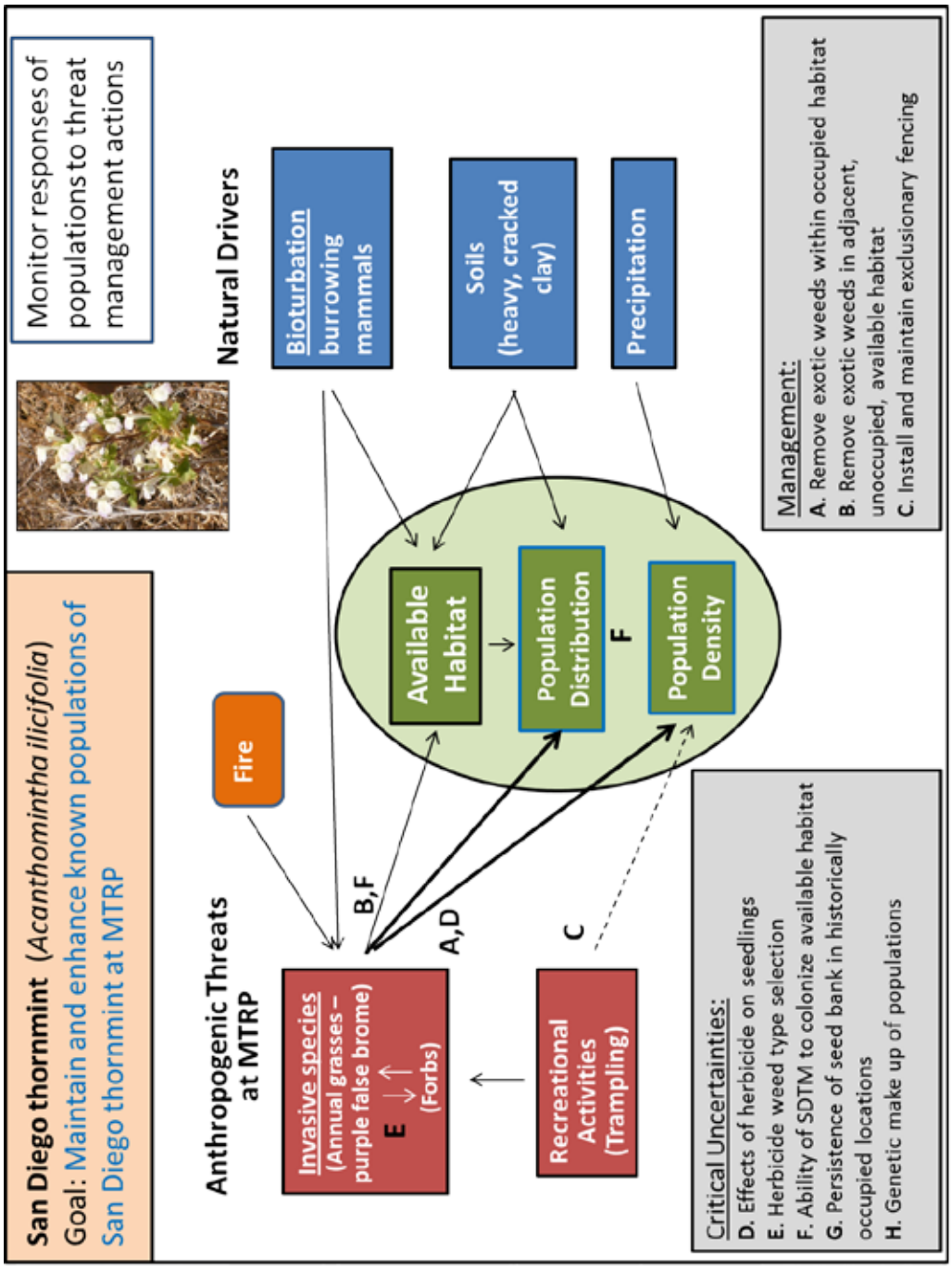


Figure 4-3. Conceptual Model for San Diego Thornmint (*Acanthomintha ilicifolia*) at MTRP

Objective 3: Treat false brome based on CBI-developed methodologies in above-average rainfall years or as directed/determined based on monitoring.

- Expand the area of habitat suitability within the Area D Weed Management Area (WMA) by treating false brome outside the current population, beginning east of the trail with a circle around occupied areas and working outward within appropriate soils (Figure 4-4). As purple false brome (*Brachypodium distachyon*) can germinate several times during a growing season, repeat visits may be required and are at the discretion of the habitat manager.

- Grass-specific weed treatments throughout the San Diego region have resulted in successful eradication of the target species followed by an eruption of non-native forbs; therefore, smaller treatment areas with long-term weeding for diverse species are recommended over short-term single-species treatments over large areas (CBI ongoing).

    - Where appropriate, areas may be dethatched in the fall to reduce the false brome seedbank. All dethatched material should be gathered, bagged, and removed from San Diego thornmint habitat.

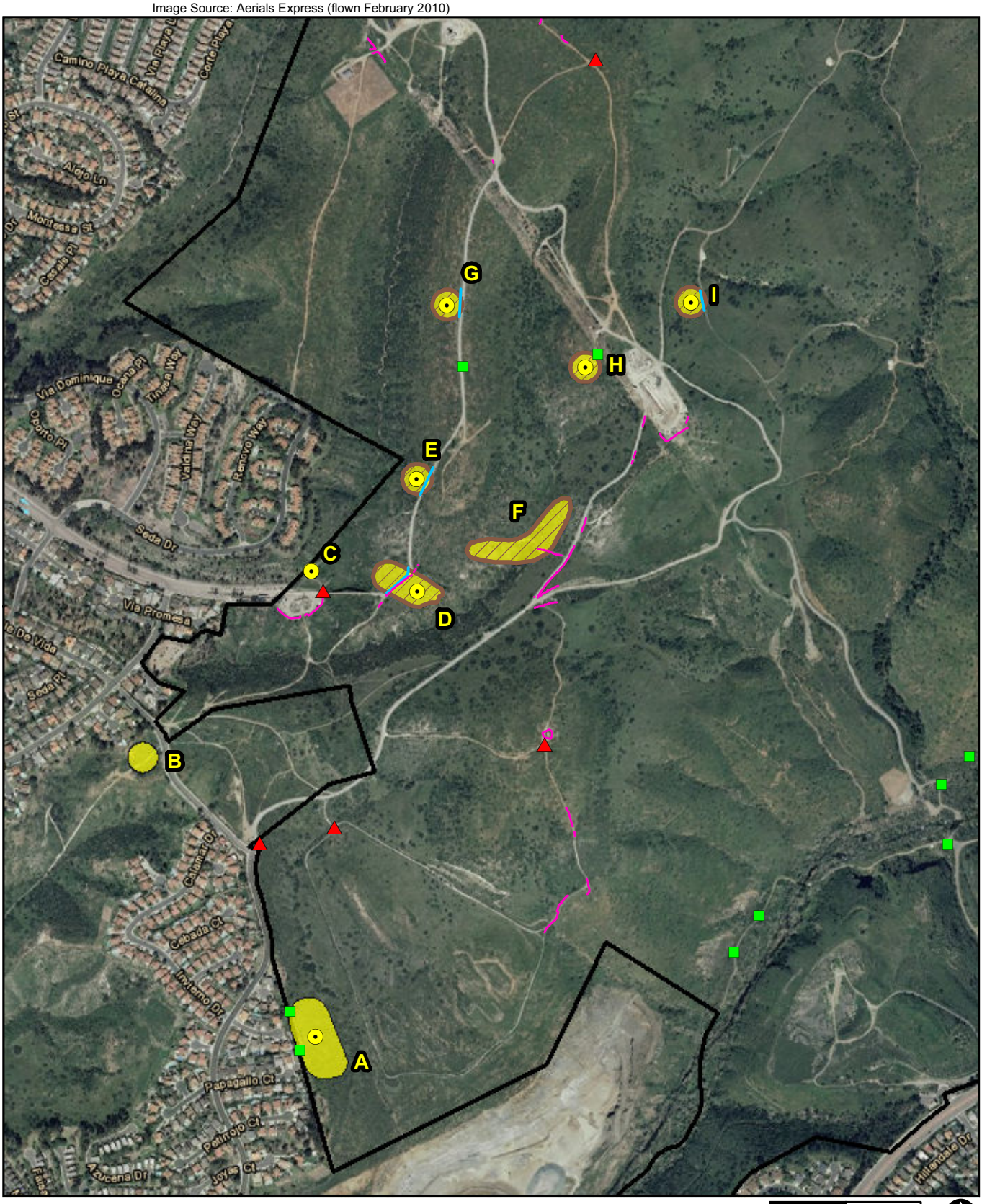
    - Weeding has been shown to significantly affect seed set; however, it significantly affects survivorship in above-average rainfall years only (Bauder and Sakrison 1999). In fund-limited scenarios, weeding should occur preferentially in above-average rainfall years.

    - Limit ancillary negative effects (e.g., trampling) to the clay lens from management actions through careful consideration of management type and implementation (see Section 4.2.1.7).

- Note invasion by woody shrubs into suitable San Diego thornmint soils, especially if fire suppression leads to type conversion. MSCP annual rare plant monitoring data provides photoplots and species percent cover data that can be reviewed to determine changes in habitat over time. Management actions may be necessary if native or non-native shrubs become dominant and compete with San Diego thornmint for access to resources.

- Treatment of exotic weeds within unoccupied habitat within Area D should be initiated when absolute exotic weed cover exceeds 25 percent.

Image Source: Aerials Express (flown February 2010)



Project Boundary

San Diego Thornmint *(Acanthomintha ilicifolia)*

Weed Management Areas

Existing Fencing

Proposed Fencing

Existing Exclusionary Signage

Proposed Exclusionary Signage

0 Feet 1,000

FIGURE 4-4

San Diego Thornmint *(Acanthomintha ilicifolia)*
Management Actions: Mission Trails Regional Park

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Objective 4: Complete Exclusionary Fencing at All Populations at MTRP

- Install fencing between trails and San Diego thornmint populations at sites D, E, G, and I unless these within a utility easement (see Figure 4-4). Fencing installation should occur regardless of survey results (see Objective 2) because the species has been observed following 6+ years of negative survey results at Otay Lakes and Crestridge.

- Exclusionary signage should be installed between trails and San Diego thornmint populations at sites F and H unless these are within a utility easement (see Figure 4-4).

Objective 5: Seed Banking

- Coordinate with SDMMP and other regional stakeholders to establish a seed bank repository of San Diego thornmint that operates in accordance with the Center for Plant Conservation Guidelines.

4.2.1.6 Monitoring

- Monitoring will be based on the MSCP rare plant monitoring protocols which specify both the methods and the locations for monitoring actions. If not included in the current MSCP rare plant monitoring protocols, Area D should be surveyed annually for population and threats, and the population boundary recorded with submeter GPS. Ancillary data, such as a full species and percent cover list, determined to be relevant to preserve-level management will also be collected.

- Weed treatment areas should be monitored using methods comparable to those utilized by CBI during their TransNet-funded false brome study. Treatment methods, including type of herbicide, date of application, number of applicators, and location of application should be documented and submitted to the SC-MTX database. Treatment and results should also be documented annually using a sub-meter GPS to determine effectiveness and change. Short-term studies (<5 years) have not shown a significant relationship between weed reduction and San Diego thornmint survivorship (Bauder and Sakrison 1999); if possible, treatments should be continued and followed for more than 5 years.

4.2.1.7 Minimization of Impacts of Management and Monitoring

In order to minimize soil disturbance and compaction impacts from foot traffic and weeding near existing San Diego thornmint populations, the following minimization measures should be employed during monitoring and management:

- All monitoring and weeding of existing San Diego thornmint should be conducted from outside of population boundaries to the greatest extent practicable.
- Ingress and egress to sites for weed control and monitoring should be minimized.
- All activities should be field supervised by qualified personnel familiar with the ecology and threats of San Diego thornmint.
- Care should be taken to not transport weed seeds on shoes, clothing, or equipment between sites.

4.2.2 San Diego Ambrosia (*Ambrosia pumila*)

4.2.2.1 Background

San Diego ambrosia is federally listed as endangered (USFWS 2002), is a narrow endemic species under the MSCP, and is a CNPS Rank 1B.1 species. This perennial herb in the sunflower family (Asteraceae) emerges from rhizomes in winter and flowers from June to September (Photograph 4-3). San Diego ambrosia is assumed to be wind-pollinated based on the reproductive ecology of similar species within the genus (Johnson et al. 1999). Seeds have not been successfully germinated in greenhouse conditions, while genetic analysis indicates that sexual reproduction is rare but present (Dudek & Associates [Dudek] 2000; McGlaughlin and Friar 2007). A study at MTRP found a distinct genotype at each 0.25 meter^2 plot along a 20 meter transect, indicating limited spatial distribution of clones or genets within and among populations. Compared to research on other narrow endemic or clonal plant species, the regional San Diego ambrosia population contains greater levels of genetic diversity that in turn allow the species to respond to variability in environmental conditions. However, the MTRP site exhibited low genotypic diversity and low habitat quality when compared to other San Diego sites, raising questions about reproductive disadvantages associated with high cover and density of non-native invasive species (McGlaughlin and Friar 2007).

Photograph 4-3: San Diego ambrosia at MTRP.

San Diego ambrosia is found at elevations below 500 feet in western Riverside and San Diego counties, and in northern Baja California. Potential habitat in San Diego County is within terraces associated with creek beds, seasonally dry drainages, and floodplains along the edge of willow woodland or sandy alluvial soils (Reiser 2001), where it occurs in a variety of habitats including disturbed areas in chaparral, coastal scrub, grassland, or vernal pool communities (CNPS 2001, Photograph 4-4). At MTRP, San Diego ambrosia is found within non-native grassland and sparse coastal sage scrub on upper terraces and adjacent hillsides of the San Diego River. Soil testing at sites occupied by San Diego ambrosia in MTRP showed that the species is found in moderately acidic, sandy loam soils that were low in salinity (Dudek 2000). The San Diego ambrosia population at MTRP (CNDDB EO 12) is one of 16 currently extant populations, including seven conserved sites, out of 29 known historic occurrences (USFWS 2010). The MTRP site is the only ‘major’ population of San Diego ambrosia designated by the MSCP for conservation.

Photograph 4-4: San Diego ambrosia habitat within the Mission Gorge area, facing north.

In 1997, San Diego ambrosia within the footprint of Phase 1 of Kumeyaay Campground were translocated prior to construction. Phase 2 of the Kumeyaay Campground has been dropped from consideration, and is not a part of the MTRP Master Plan Update.

This NRMP conforms to the *City of San Diego Mission Trails Regional Park San Diego Ambrosia Management Plan for San Diego ambrosia within MTRP* (Dudek 2000) and implements its recommendations, including:

- 25-foot impact avoidance buffers
- Relocation of redundant MTRP trails
- Fencing and signage management
- Invasive weed removal
- Transplantation and restoration

4.2.2.2 MSCP Conditions of Coverage

Coverage of San Diego ambrosia is dependent on a 10 percent impact threshold at MTRP (the only major MSCP population). Area-specific management directives must include monitoring of transplanted populations and specific measures to protect against detrimental edge effects (MSCP 1998: Table 3-5).

4.2.2.3 Presence within MTRP

San Diego ambrosia within MTRP consists of four subpopulations (A-D) within the San Diego River floodplain within the Fortuna Mountain and Mission Gorge area near Kumeyaay Lake (Figure 4-5). Two smaller populations (A and B) are located within the Mission Gorge area: one south of the Father Junipero Serra Trail near the Old Mission Dam parking area (Occurrence A), and the second on a small hill slope north of the Old Mission Dam (Occurrence B). The largest population is located directly east of the Kumeyaay campground (Occurrence C). A fourth population of transplanted individuals adjacent to the grasslands crossing trail, north of the trail head off of the Father Junipero Serra Trail, consists of individuals removed from impact areas within Caltrans Highway 52 project in 1988 and the City's Kumeyaay Campground project in 1998 (located in a rectangular fenced area). Of these four subpopulations, three burned in wildfires in 1981 (A, B, and D), one burned in both 1981 and 2003 (B), and one (C) has not burned since fire maps have been produced.

Occurrence C has been monitored since 1999 using MSCP rare plant monitoring protocols, with a maximum estimated population size of 205,826 ramets in 2003. In McGlaughlin and Friar's study, the average number of individual stems or ramets per genet was 9.10; therefore, aboveground stem counts represent approximately 10 times the number of genetically unique individuals present (2007). The spatial extent of the population has also been recorded during select monitoring years and may be influenced by rainfall (Figure 4-6).

4.2.2.4 Anthropogenic Threats at MTRP

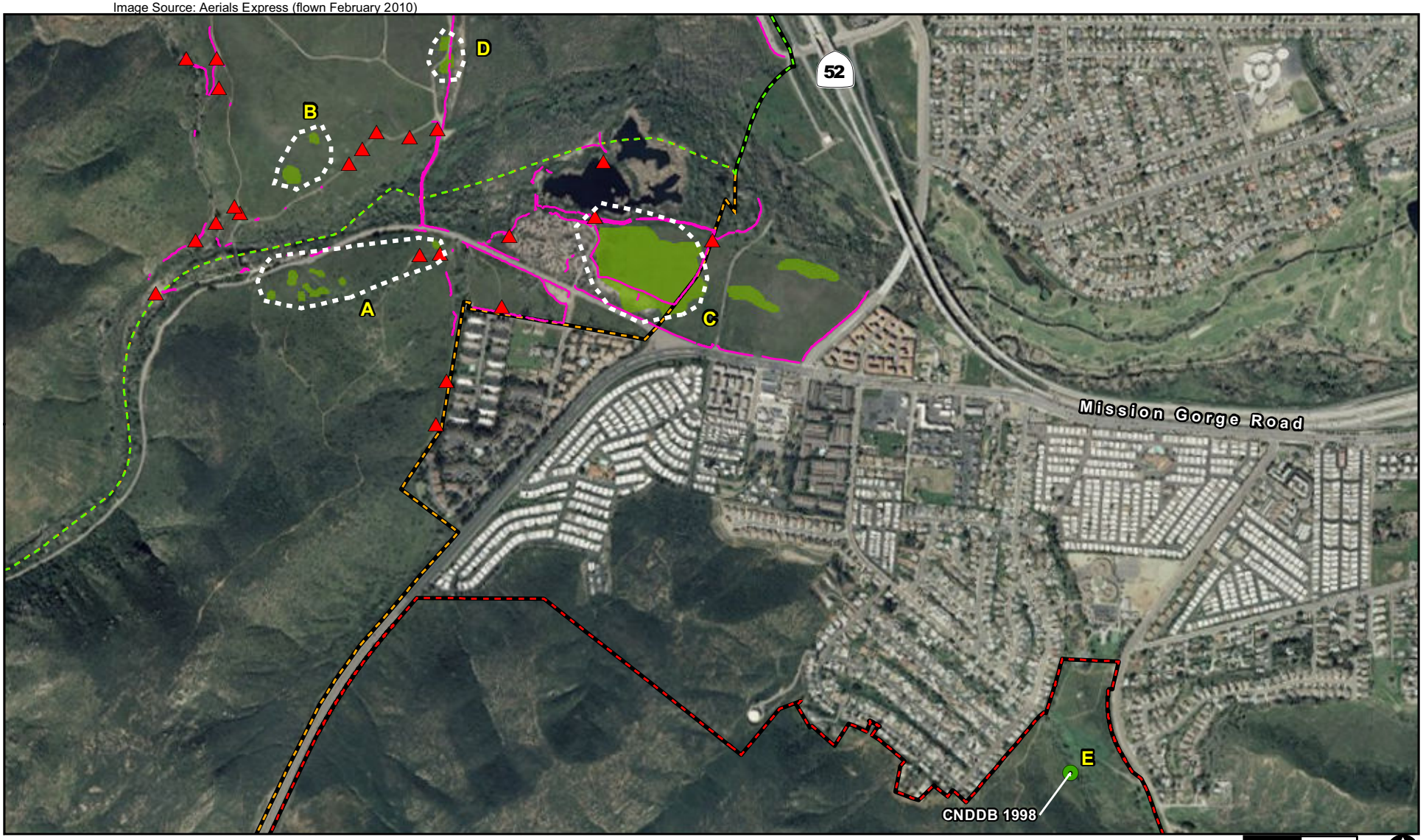
4.2.2.4.1 Development

Although up to 10 percent of the San Diego ambrosia population may be impacted without it being removed from the MSCP covered species list, designation of the species as a narrow endemic species requires that all impacts be avoided, minimized, and mitigated. Within MTRP, projects that would impact San Diego ambrosia, such as Phase 2 of the Kumeyaay Campground, have been removed from the Master Plan Update.

4.2.2.4.2 Invasive Non-native Species

Non-natives species present a significant threat to all extant populations of San Diego ambrosia (USFWS 2010) by competing directly for nutrients, light, water, and space at locations as well as limiting potential extra-floral pollination. Non-native species are a significant threat to the MTRP population where non-native species cover has ranged from 31 percent to 101 percent at Occurrence C from 2006 through 2012, with grasses constituting from 77 percent to 91 percent of total non-native cover. Rattail fescue has shown consistently high relative cover throughout the monitoring period and should be

Image Source: Aerials Express (flown February 2010)



Project Boundary
Fences
Cowles Mountain Area
Mission Gorge Area
San Diego Ambrosia *(Ambrosia pumila)**
Exclusionary Signage
Fortuna Mountain Area
*(All polygons CNDDB 2008)

0 Feet 1,000

RECON

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FIGURE 4-5

San Diego Ambrosia *(Ambrosia pumila)*
Detected Occurrences: Mission Trails Regional Park

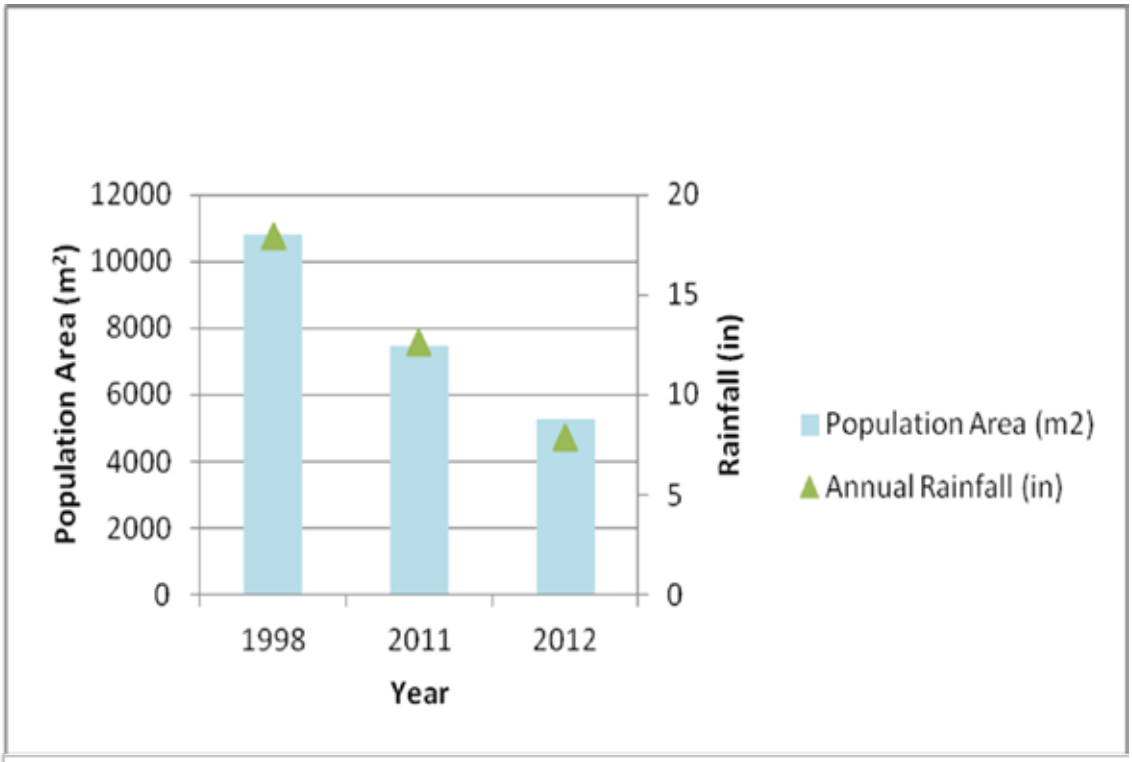


Figure 4-6: San Diego Ambrosia population area at MTRP Occurrence C

addressed as a target species in non-native removal efforts. Small populations are most effectively weeded by hand, while the best management practice for larger patches of San Diego ambrosia is a combination of Fusilade II® and mowing (Center for Natural Lands Management 2009); however, other methods may be used as necessary to address the ineffectiveness of Fusilade II® on rattail fescue.

4.2.2.4.3 Recreational Activities – Trampling

San Diego ambrosia is sensitive to direct mortality from non-motorized recreation activities, including trampling from off-trail hiking and mountain biking (USFWS 2010). Trampling threats to San Diego ambrosia have been controlled at MTRP with a combination of signage, trail control, and fencing, with regular patrols required for maintenance and repair due to weathering and vandalism. Given the high number of visitors, a small percentage of MTRP users will likely disobey signs and cross fenced areas with potential damage to sensitive resources such as San Diego ambrosia.

4.2.2.5 Management Goals and Objectives

Goal: Increase the number of ramets, spatial extent of populations, and reduce stress/threats of San Diego ambrosia at MTRP (Figure 4-7).

Objective 1: Remove Exotic Weeds from Occupied Habitat

- Continue weed treatment at Occurrence C based on *A Comparison of Vegetation Management Techniques to Support Recovery of the Federally Endangered* Ambrosia pumila by Center for Natural Lands Management (2009) and additional studies by M. Kelly and M. Johnson Rocks (2008). This program includes a combination of Fusilade II® treatments and mowing. Continue the adaptive management monitoring program established with input from San Diego State University's Institute for Ecological Management and Monitoring which includes 50 meter transect surveys with species and cover data collected from one meter quadrats placed on alternate sides every five meters. In addition, the boundary of San Diego ambrosia and the boundary of the herbicide area are GPSed annually. In particular, review the effectiveness of treatments on rattail fescue (*Festuca* [=*Vulpia*] *myuros*), which is known to be resistant to Fusilade II®, and revise treatment program as necessary. Following consultation with the appropriate agencies, consider implementation of a pilot project to determine effectiveness of pre-emergent herbicide application to minimize cover of exotic annual plant species and any associated impacts to San Diego ambrosia.

Objective 2: Exclusionary Fencing/Signage

- Continue ranger patrols to monitor the northern edge of the trail 300 feet south of Occurrence B (Figure 4-8a) and install exclusionary signage if signs of trespass are detected. Occurrence A has some exclusionary signage between a trail and the main population of San Diego ambrosia. A small clump of San Diego ambrosia has been observed within Occurrence A near the trail head and is currently unfenced. This small population should be fenced off from the trail head (see Figure 4-8a). In addition, fencing or exclusionary signage should be installed near the Father Junipero Serra Trail pull off area to discourage transit through the population (see Figure 4-8a).

- The main population of San Diego ambrosia (Occurrence C) has been enclosed with exclusion fencing, and educational signage has been posted (Figure 4-8b). Existing fencing and signage at Occurrence C should continue to be inspected and maintained to restrict recreational access to the site.

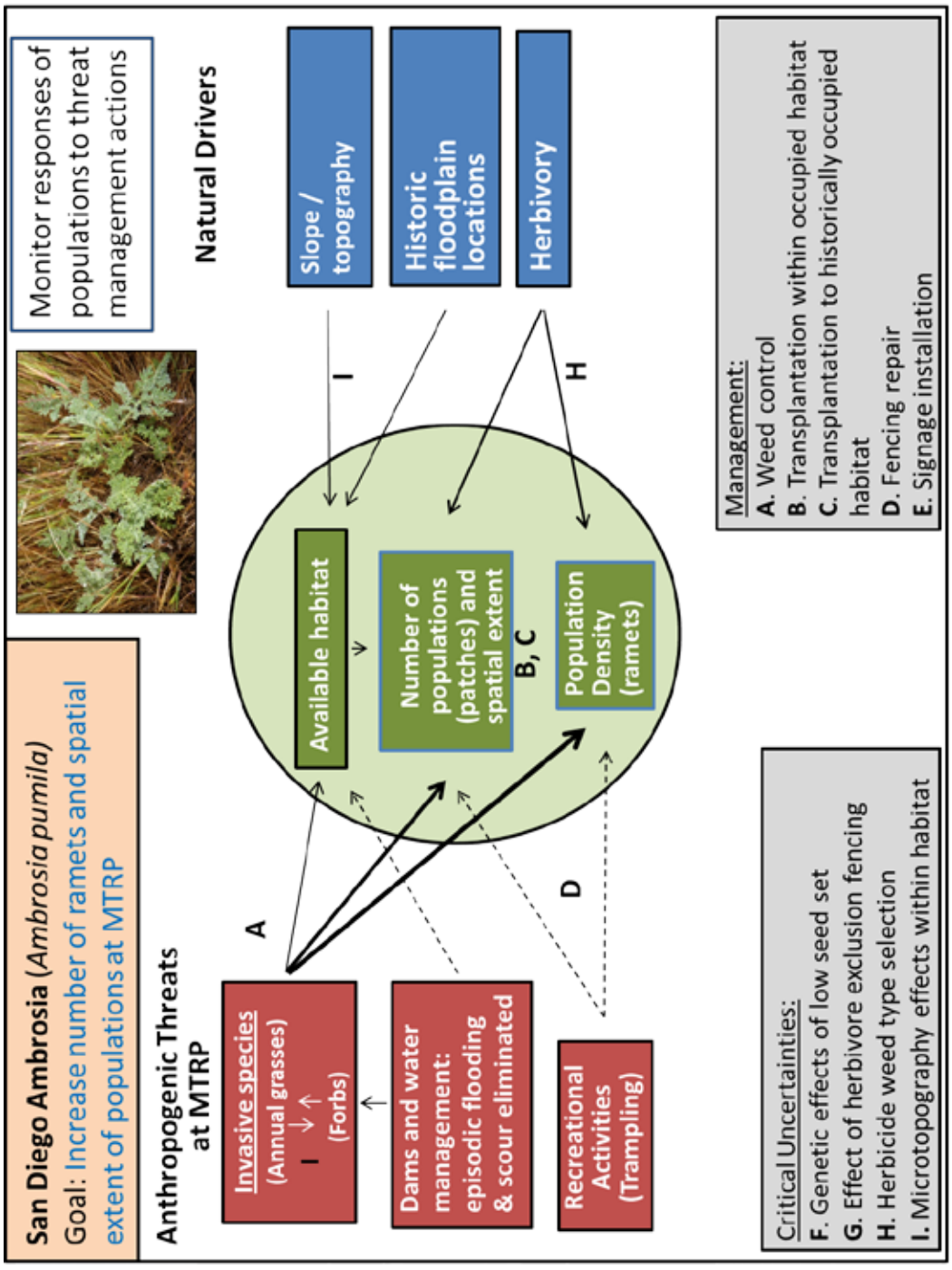
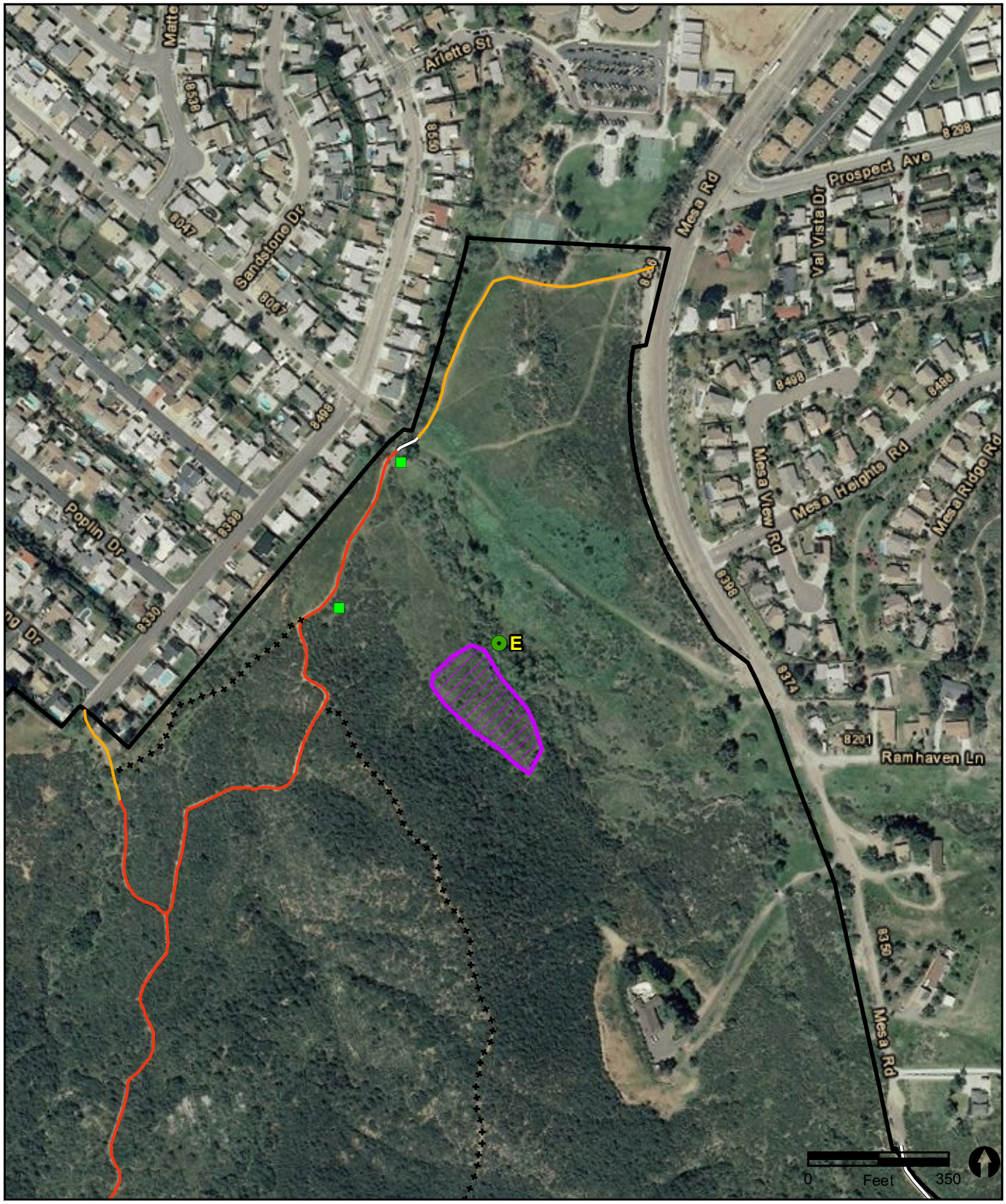


Figure 4-7. Conceptual Model for San Diego Ambrosia (*Ambrosia pumila*) at MTRP

Image Source: Aerials Express (flown February 2010)



Project Boundary

San Diego Ambrosia *(Ambrosia pumila)**
*(CNDDB 2008)

Exclusionary Signage

Proposed Exclusionary Signage

Proposed Transplantation Area

Trail Re-Routes/Closures

Localized Re-route

Planned Closure

Existing Trails-Proposed Use

Other Circulation

Hike/Bike Trail

FIGURE 4-8c

San Diego Ambrosia *(Ambrosia pumila)*
Management Actions: Mission Trails Regional Park

RECON

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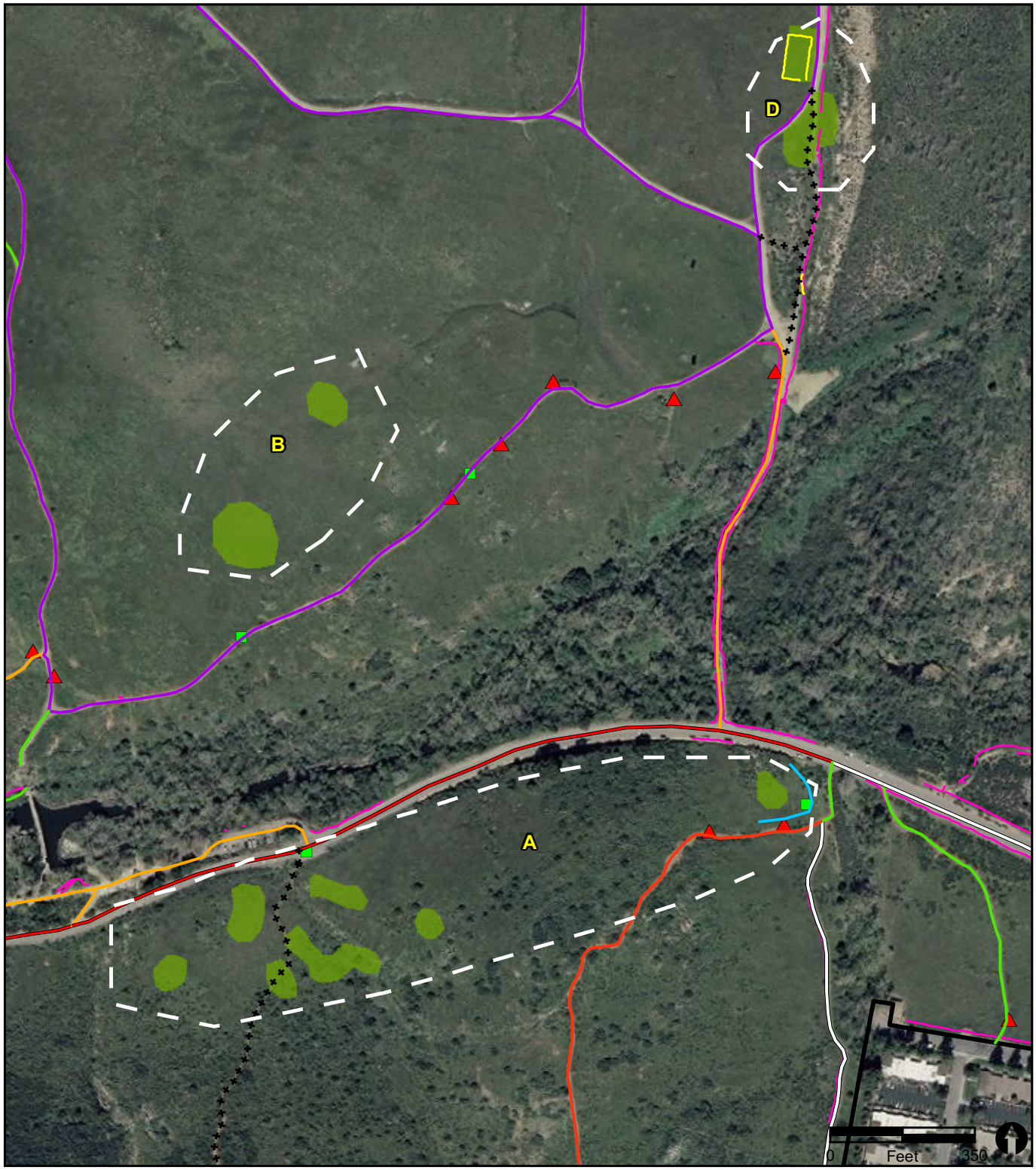
Image Source: Aerials Express (flown February 2010)



Project Boundary

San Diego Ambrosia *(Ambrosia pumila)**

*(All polygons CNDDB 2008)

Exclusionary Signage

Proposed Exclusionary Signage

Fences

Broken Fences

Proposed Fencing

Existing Trails-Proposed Use

Other Circulation

Hiking Trail

Hike/Bike Trail

Multi-use Trail

Class I Multi-use Path

Trail Re-Routes/Closures

Localized Re-route

Planned Closure

FIGURE 4-8a

San Diego Ambrosia *(Ambrosia pumila)*

Management Actions: Mission Trails Regional Park

RECON

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Image Source: Aerials Express (flown February 2010)

Project Boundary

San Diego Ambrosia *(Ambrosia pumila)**
*(All polygons CNDDB 2008)

Exclusionary Signage

Fences

Broken Fences

Existing Trails-Proposed Use

Other Circulation

Hiking Trail

Hike/Bike Trail

0 Feet 350

FIGURE 4-8b

San Diego Ambrosia *(Ambrosia pumila)*
Management Actions: Mission Trails Regional Park

RECON

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- Herbivory exclusion fences have been installed around populations of San Diego ambrosia within Occurrence C. If San Diego ambrosia ramet density and spatial extent increase significantly within testing sites, herbivore exclusion fencing should be extended to other populations within Occurrences A, B, and appropriate patches within C.

Objective 3: Trail Rerouting

- A redundant hiking trail leading from Father Junipero Serra Trail will be removed, as it crosses through a high density of San Diego ambrosia ramets within Occurrence A. It will be rerouted away from the San Diego ambrosia population in the Master Plan Update.

- A 25-foot minimum buffer around known populations should be assumed when conceptually planning any new temporary or permanent impacts, including trails, within MTRP (Dudek 2000).

Objective 4: Transplantation

- The City of San Diego is regularly approached with requests for MTRP to accept translocated San Diego ambrosia under threat of development impact. A historically occupied area (Occurrence E) within the Cowles Mountain area of MTRP, southeast of the main populations of San Diego ambrosia, known to be occupied in 1998 (State of California 2011a), has been identified as a receptor site for San Diego ambrosia transplantation (Figure 4-8c). This site should be reviewed for project-specific suitability and utilized if possible to meet future translocation needs. In addition, any proposed use of the transplantation site for mitigation purposes must be accompanied by compensation and endowment funding for future maintenance and monitoring of the site.

- Alternatively, non-mitigation translocation may occur through collection of parent material for a total of 250 transplants collected from populations within MTRP. Care should be taken to avoid impacts to co-occurring sensitive species, including inconspicuous plant species such as San Diego goldenstar (*Muilla clevelandii*) and variegated dudleya (*Dudleya variegata*).

- Translocation methods should utilize lessons learned from previously failed efforts, as well as the standards provided in Section 12, Park Management Recommendations, in the *City of San Diego Mission Trails Regional Park San Diego Ambrosia Management Plan* (Dudek 2000). If implemented as a non-mitigation project, adaptive management methods should be used to decrease future uncertainty associated with translocation of San Diego ambrosia. Mitigatory transplantation projects may use adaptive management, but will be under the discretionary authority of the permitting agency(s).

- The transplanted population of San Diego ambrosia at Occurrence E should be surrounded by exclusion fencing and added to adaptive management protocols for San Diego ambrosia at MTRP.

4.2.2.6 Monitoring

- Monitoring will be based on the MSCP rare plant monitoring protocols which specify both the methods and the locations for monitoring actions.

- If not included in the current MSCP rare plant monitoring protocols, Occurrences A–D should be surveyed annually for presence/absence and threats, and the population boundary recorded with a submeter GPS. Ancillary data determined to be relevant to preserve-level management will also be collected.

- In addition to MSCP monitoring, transplanted populations of San Diego ambrosia should be monitored for survivorship, recruitment, invasive species, and signs of herbivory by the responsible party. Notes should also be taken on emergent threats to the transplanted population.

- Invasive species treatment projects should utilize an adaptive management monitoring program similar or comparable to the methods established for the Occurrence C weeding treatment (begun in 2011) established with input from San Diego State University's Institute for Ecological Management and Monitoring. The monitoring methodology includes 50-meter transect surveys with species and cover data collected from one-meter quadrats placed on alternate sides every five meters. In addition, the boundary of San Diego ambrosia and the boundary of the herbicide area are GPSed annually.

4.2.3 Variegated Dudleya (*Dudleya variegata*)

4.2.3.1 Background

Variegated dudleya is a CNPS (2001) Rank 1B.2 species and is a narrow endemic species covered by the MSCP. This small succulent perennial in the stonecrop family (Crassulaceae) emerges from a corm in spring and produces yellow flowers in May and June. Its range extends from southwestern San Diego County to Baja California, where it occurs in coastal sage scrub, grassland, and chaparral habitats below 500 feet. It usually grows in open areas of clay soil or cobbly clay soils with sparse to no shrub cover, on isolated rocky substrate in grasslands, and on mima mounds near vernal pools (Reiser 2001). At MTRP, variegated dudleya occurs on clay inclusions within gravelly loam soils (M. Dodero, pers. comm., 2011). Although the largest populations are known from Otay Mesa, it has been reported as far north as Black Mountain Road (State of

California 2011c). This species can be distinguished from many-stemmed dudleya (*D. multicaulis*) by its spoon-shaped, rather than linear, leaves, and from Blochman's dudleya (*D. blochmaniae* ssp. *blochmaniae*) by its yellow, rather than white, flowers. This species is difficult to detect given the small size, cryptic form, and short season of detectability between spring and early summer. This species can be identified based on known species range and vegetative characters state in winter. As the proportion of individuals flowering fluctuates year to year, vegetative sampling should provide a more accurate estimation of population size than floral-based estimates (M. Dodero, pers. comm. 2011).

MTRP includes one of the 11 major MSCP populations (>500 individuals) for variegated dudleya (USFWS and CDFG 1996), which includes FM18 – FM 27, EE1 – EE21, and EE29 – EE33 (Figure 4-9a and 4-9c).

4.2.3.2 MSCP Conditions of Coverage

Area-specific management directives must include species-specific monitoring and specific measures to protect against detrimental edge effects to this species, including effects caused by recreational activities (MSCP 1998: Table 3-5).

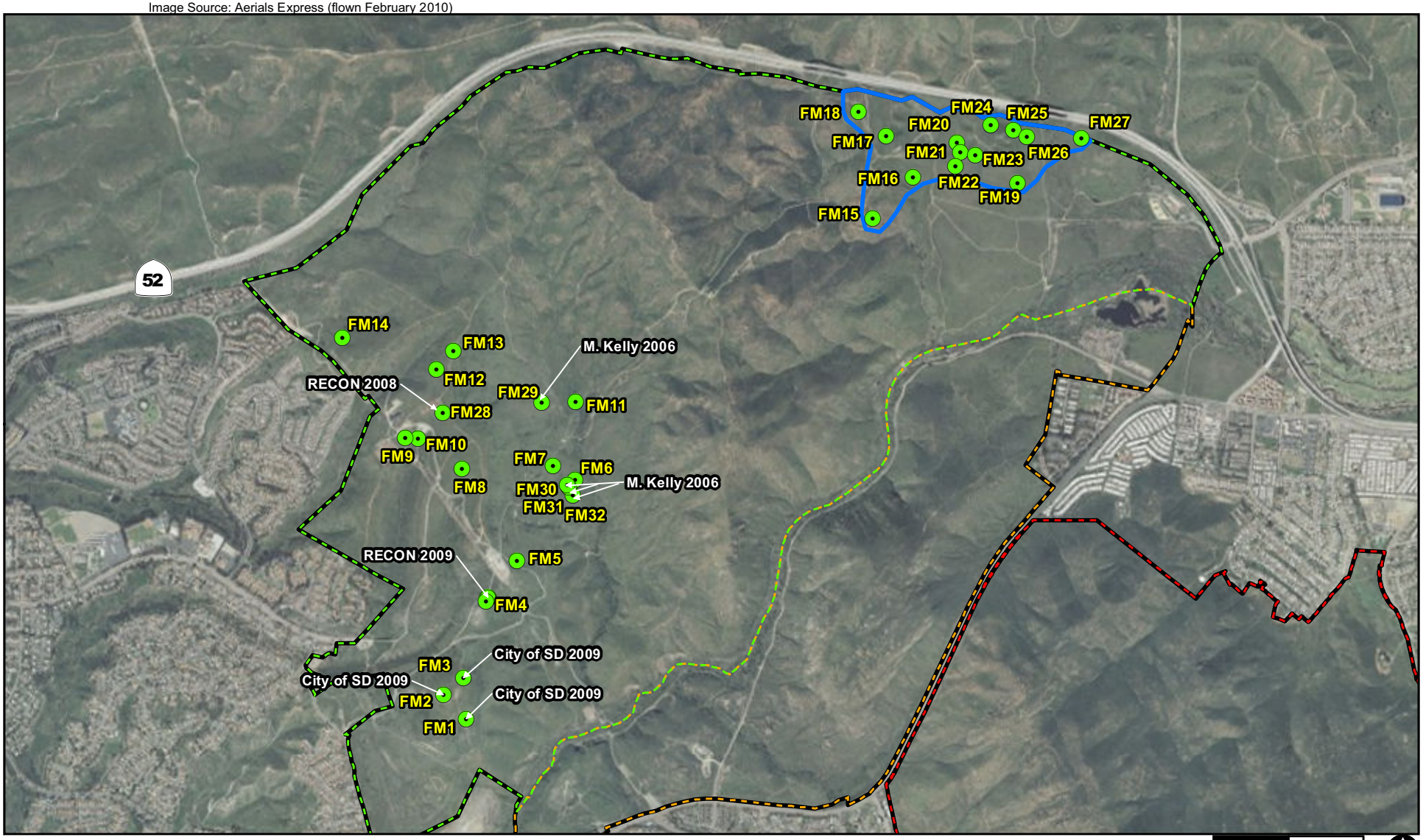
4.2.3.3 Presence within MTRP

Variegated dudleya is a highly cryptic species with an associated low detectability; thus, surveys conducted for the species may constitute a sampling of the total population of variegated dudleya at MTRP. Several surveys have been conducted within the NRMP boundary. A total of 97 subpopulations of variegated dudleya within the Lake Murray, Fortuna Mountain, and East Elliott areas (McMillan Biological Consulting and Conservation Biology Institute 2002, RECON 2000, State of California 2011c, City of San Diego 2009, see Figures 4-9a-c). Of these 97 known subpopulations, 53 are found on lands currently owned by the City. The remainder are located on parcels owned by private parties and other public jurisdictions within the City MHPA and projected MTRP boundaries (Table 4-8).

TABLE 4-8
VARIEGATED DUDLEYA LOCATION PARCEL OWNERSHIP WITHIN MTRP

Parcel Ownership	Lake Murray	Fortuna Mountain	East Elliott	Total
City of San Diego	2	34	17	53
Poway Unified School District	-		1	1
Private	-		29	29
Sycamore Landfill	-		14	14
TOTAL	2	34	61	97

Image Source: Aerials Express (flown February 2010)



Project Boundary

MSCP Major Populations

Variegated Dudleya *(Dudleya variegata)**
(*All species points are McMillan 2001 unless otherwise noted.)

Cowles Mountain Area

Fortuna Mountain Area

Mission Gorge Area

0 Miles 0.5

RECON

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FIGURE 4-9a
Variegated Dudleya *(Dudleya variegata)*
Detected Occurrences: Mission Trails Regional Park

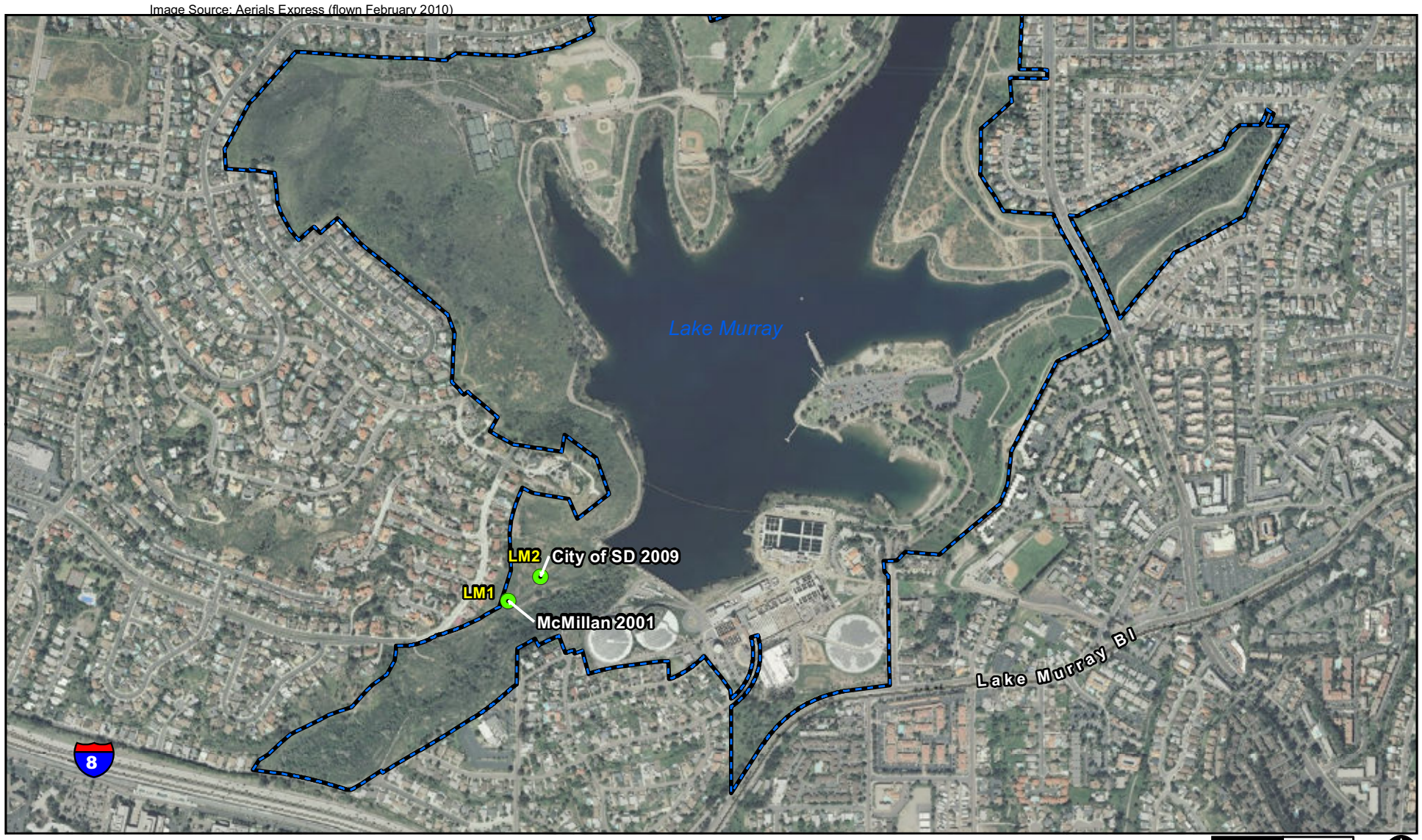

FIGURE 4-9b
Variegated Dudleya *(Dudleya variegata)*
Detected Occurrences: Mission Trails Regional Park

RECON

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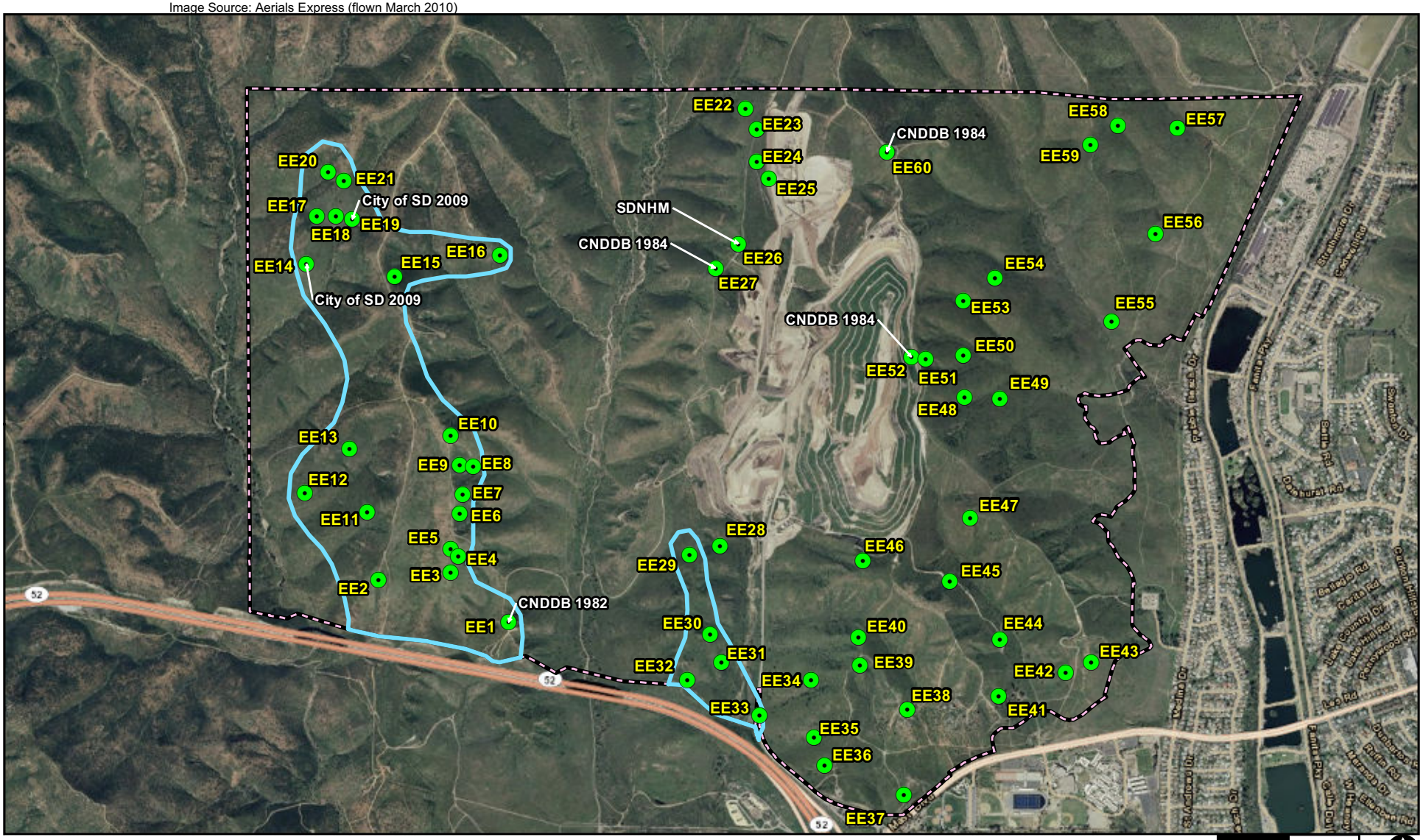
Image Source: Aerials Express (flown March 2010)



RECON

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FIGURE 4-9c

Variegated Dudleya *(Dudleya variegata)*
Detected Occurrences: East Elliott

A population of 1500 individuals was transplanted from a housing site near MTRP into the Fortuna Mountain area in 2004. After multiple plantings and five years of maintenance a total of 2860 plants were recorded within the transplantation area (RECON 2008). A sample of existing populations within MTRP has been monitored by volunteers, City staff, or City consultants since 2001, with the exception of 2007 (see Table 4-9).

TABLE 4-9
YEARLY SURVEYS ON VARIEGATED DUDLEYA ON SELECTED SITES WITHIN MTRP

Year	Number of Site(s) Surveyed	Census/Estimate	Surveyor
2001	2	316	McMillan and CBI
2002	1	0	WRI
2003	21	2368	Kelly and volunteers
2004	17	2085	City of San Diego
2005	4	2878	Kelly and volunteers
2006	6	1850	City of San Diego
2008	7	640	City of San Diego
2009	7	200	City of San Diego
2010	7	1785	City of San Diego
2011	7	47	City of San Diego
2012	7	2649	City of San Diego

While variegated dudleya populations at the monitored sites within Fortuna Mountain area (FM1–FM 3) have generally remained steady or increased from 2004–2012 (Figure 4-10), those within East Elliott (EE14, EE19, EE21) have decreased significantly over the same period (Figure 4-11). Additional information is needed to determine if these findings are an anomaly resulting from limited sample size or if they are reflective of a general trends within the geographic areas of MTRP.

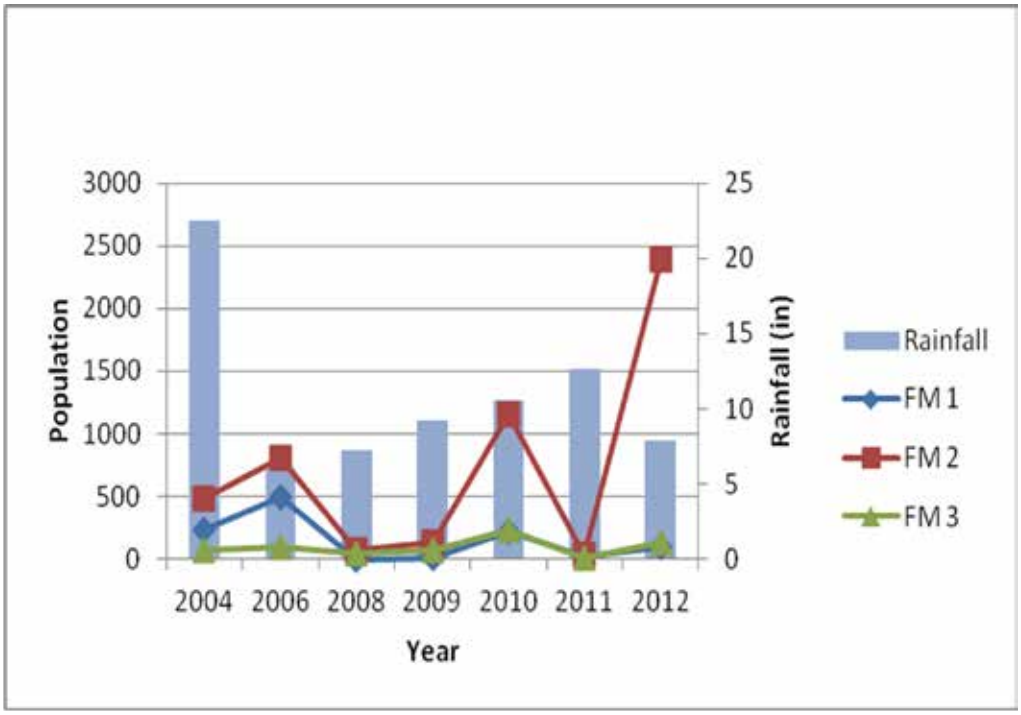


Figure 4-10: Three selected populations of variegated dudleya within the Fortuna Mountain area. Population size overlaid with rainfall over time.

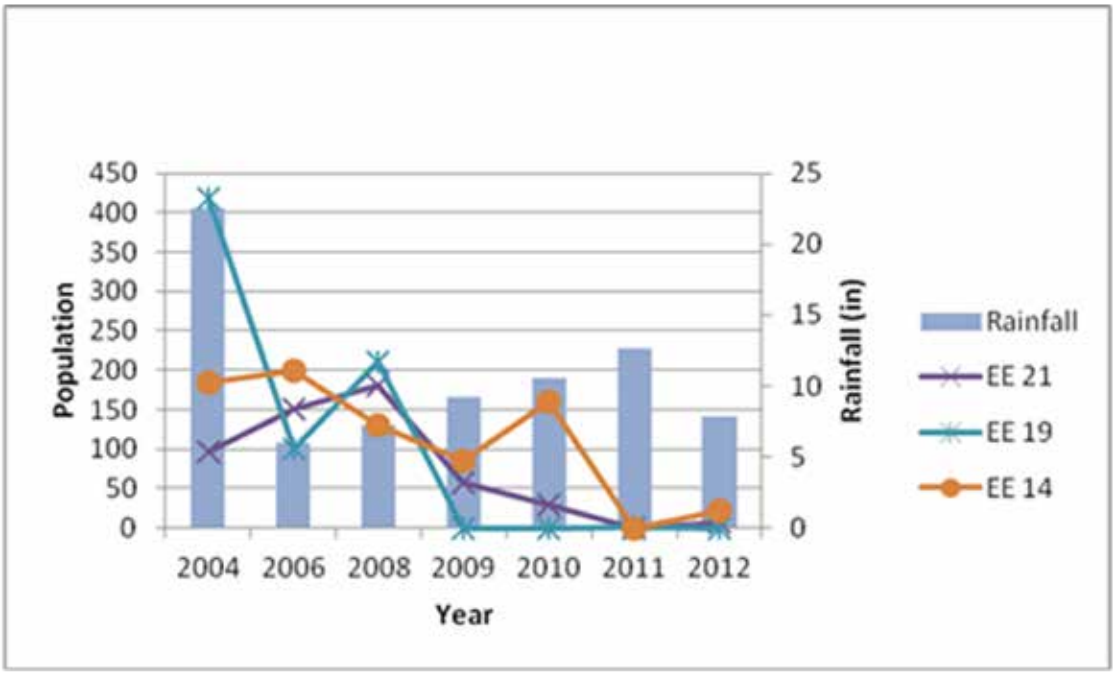


Figure 4-11: Three selected populations of variegated dudleya within the East Elliott area. Population size overlaid with rainfall over time.

4.2.3.4 Anthropogenic Threats at MTRP

4.2.3.4.1 Development

The East Elliott area, and its large constituent populations of variegated dudleya, is not considered completely conserved. The City owns many parcels within the East Elliot area, but the remainder is owned by private landowners. Of the 60 populations of variegated dudleya that have been observed within the East Elliott area, 70 percent are located on private or semi-private parcels (29 on private property, 13 on Sycamore Landfill property) That being said, the threat of development impacts to variegated dudleya is low, as the remaining private parcels within the East Elliott area are located within a City MHPA. The MHPA designation and the variegated dudleya's status as a narrow endemic add significant development constraints to avoid, minimize, and mitigate impacts to the species.

4.2.3.4.2 Invasive Non-native Species

Non-native plant species are the highest priority threat to variegated dudleya, including those at MTRP (Regan et al. 2006), as they directly compete for nutrients, light, water, and space. Based on the sample of monitored sites at MTRP, non-native grasses are more prevalent than non-native forbs: species with over 20 percent cover at variegated dudleya sites include wild oats, false brome, rattail fescue, and filaree (*Erodium* sp.; City of San Diego monitoring data 2006, 2008–2012). Non-native forbs and grasses can colonize disturbed areas as an indirect result of fire, road and trail building, and altered hydrology.

The large size and density of invasive weeds (relative to the diminutive size of variegated dudleya) may inhibit potential pollinators from accessing flowers, and thus decrease reproductive success. Variegated dudleya occurs in areas with soil crusts susceptible to invasion by non-native plant species once disturbed. After weed invasion, a cyclical disturbance pattern has been observed with burrowing mammals colonizing variegated dudleya populations, exacerbating weed control by bioturbating the soil as well as directly eating dudleya shoots and corms, which then promotes the establishment of even more non-native plant species (M. Dodero, pers. comm., 2011).

4.2.3.4.3 Recreation – Trampling & Trail Building

Variegated dudleya is sensitive to direct mortality from non-motorized recreation activities, including trampling from off-trail use (Regan et al. 2006). Trails through or near variegated dudleya populations increase the likelihood of trampling, dispersal of non-native plant species, and off-road vehicle use. In addition, recreational encroachment can provide a vector (via biological crust disturbance and seed transport) for aggressive non-native plant species to invade variegated dudleya habitat (Mark Dodero, pers. comm. 2011).

In addition to trampling impacts, variegated dudleya cannot withstand clearing, soil compaction, or erosion associated with trail building activities. Locations with variegated dudleya often have sparse shrub cover and are likely to be targeted for both official and unauthorized trail building.

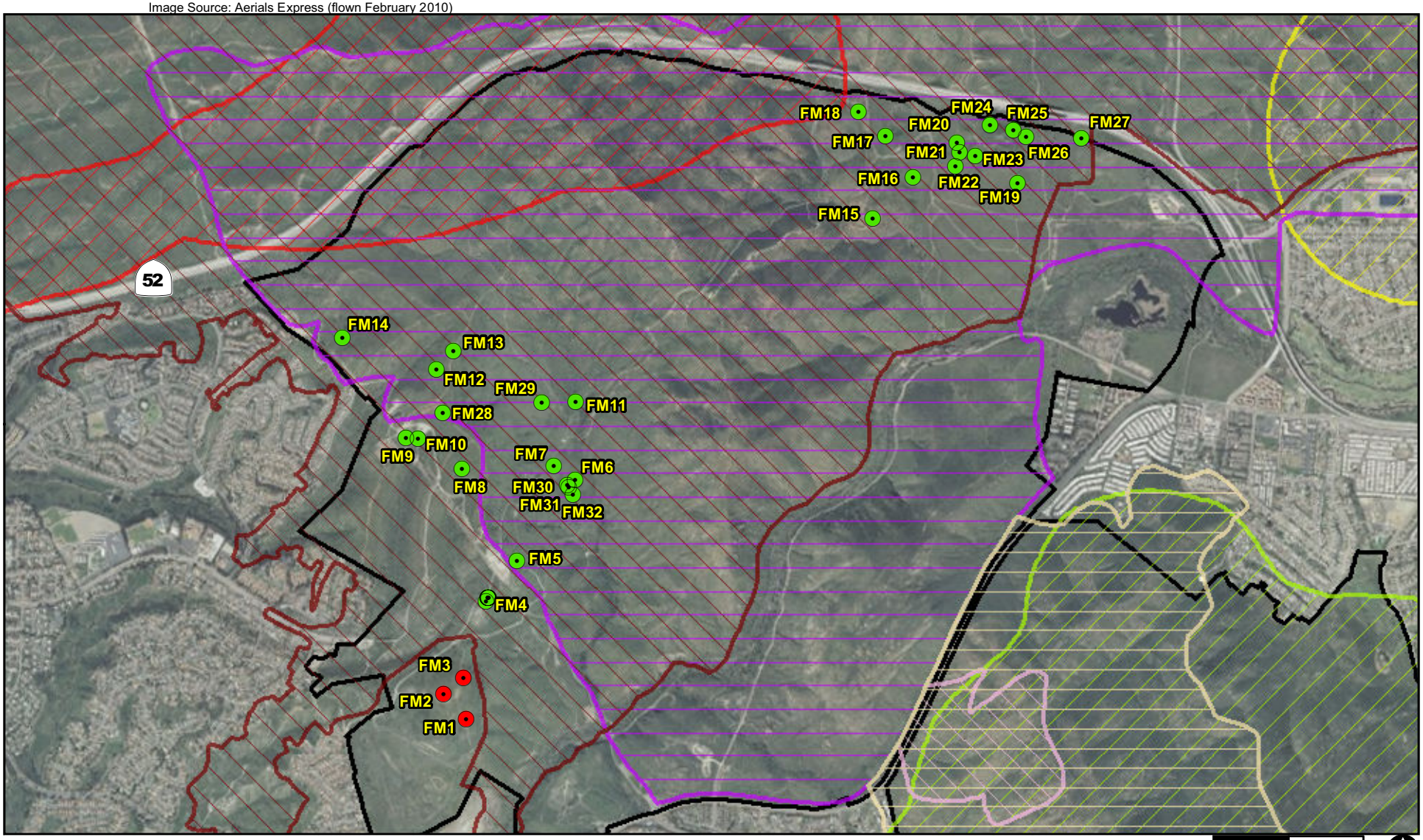
A minimum buffer of 50 feet is recommended to separate trail use from existing populations of variegated dudleya. The Master Plan Update associated with this document has incorporated the recommended buffer into trail design and planning. In some cases existing utility and access roads were not able to be rerouted outside of the 50-foot variegated dudleya buffer due to additional environmental impacts associated with rerouting and/or lack of discretionary authority (SDG&E and SDCWA utility roads).

4.2.3.4.4 Fire

Although, as a corm species, variegated dudleya is somewhat resistant to direct mortality due to wildfires, associated weed invasion and type change can degrade available habitat to a point where it becomes unsuitable. According to fire mapping of the area, 79 populations of variegated dudleya burned in wildfires in both 1981 and 2003 (Figures 4-12a-c). An additional four populations, burned only in 2003 (FM4, FM8-10; see Figures 4-12a), including the monitored sites within the East Elliott area. The two populations of variegated dudleya within the Lake Murray area are located within an area that is mapped to have burned in 1944 (LM1-2; see Figures 4-9b) Three populations of variegated dudleya are located in areas with no recorded history of wildfire (FM1-3; see Figure 4-12a).

The main impact of fires to variegated dudleya is the habitat change associated with frequent wildfires. In particular, the seral species colonization (exotic grasses, forbs, and burrowing mammals) of variegated dudleya habitat following disturbance by fires can significantly impact habitat availability and quality of existing populations. The wildfires in 2003 and subsequent wet winter have provided ample opportunities for exotic annual weeds to colonize many of the variegated dudleya populations at MTRP. High population numbers at some of the sampling sites in 2004 are likely a result of the increased growth and higher detectability associated with a high rainfall year and the lack of competitive vegetative cover following a wildfire. Subsequent years show a general trend of decline at some of the sampled sites, though the sample size (n=6) is too small to detect change for all populations of variegated dudleya at MTRP.

Image Source: Aerials Express (flown February 2010)



Project Boundary

Fire Burn History

- 1939
- 1942
- 1944
- 1981
- 1983
- 1988
- 2003

Variegated Dudleya *(Dudleya variegata)*

- Update Surveys
- City of San Diego

0 Miles 0.5

RECON

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FIGURE 4-12a

Variegated Dudleya *(Dudleya variegata)*

Management Actions: Mission Trails Regional Park

Image Source: Aerials Express (flown February 2010)

Project Boundary

Fire Burn History

1944

Variegated Dudleya *(Dudleya variegata)*

Update Surveys

City of San Diego

0 Feet 1,000

RECON

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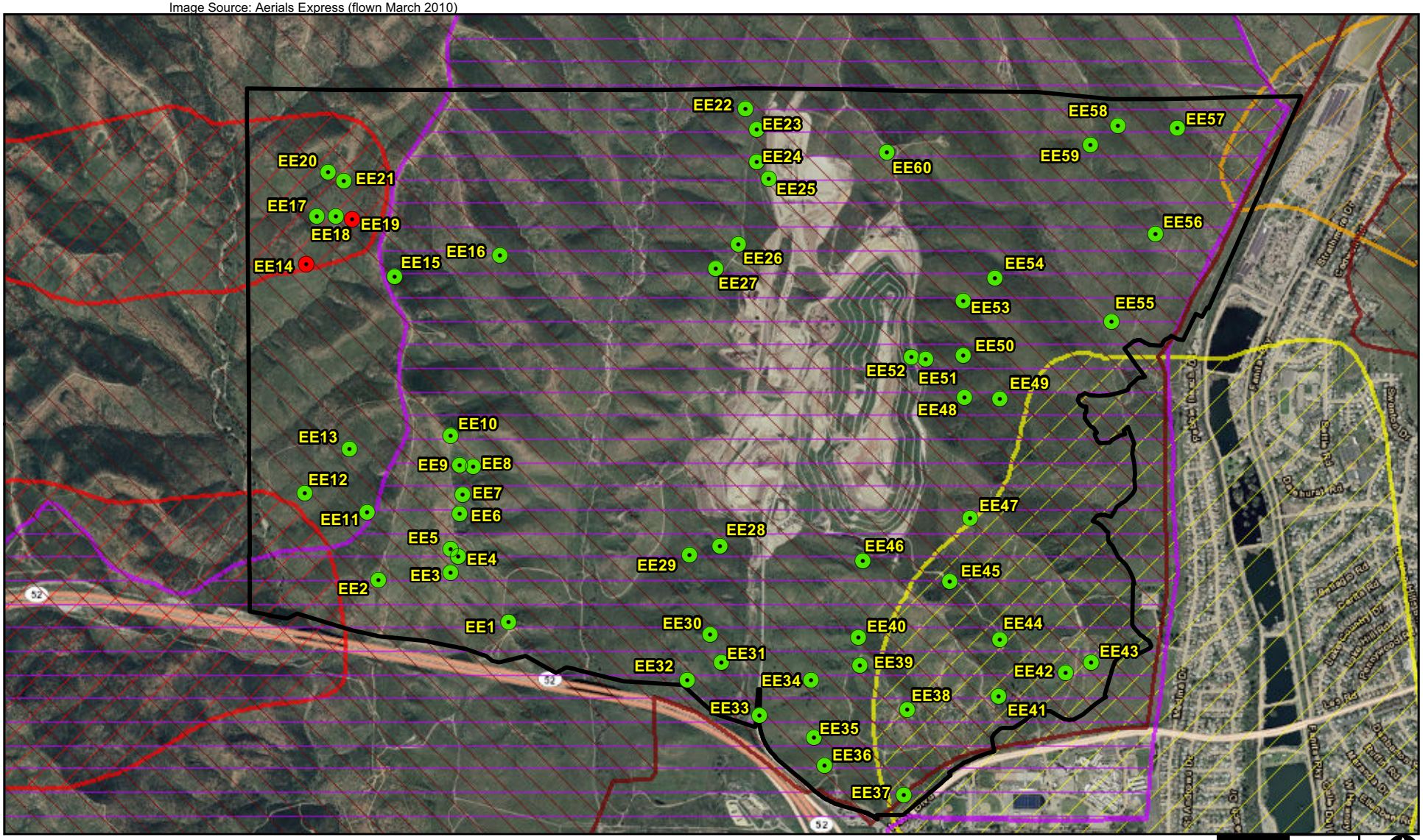
FIGURE 4-12b

Variegated Dudleya *(Dudleya variegata)*

Management Actions: Mission Trails Regional Park

Image Source: Aerials Express (flown March 2010)



Project Boundary

Fire Burn History

1939

1941

1942

1981

2003

Variegated Dudleya *(Dudleya variegata)*

Update Surveys

City of San Diego

RECON

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FIGURE 4-12c

Variegated Dudleya *(Dudleya variegata)*
Management Actions: East Elliott

4.2.3.5 Management Goals and Objectives

Goal: Maintain known populations of variegated dudleya at MTRP (Figure 4-13).

Objective 1: Update Baseline Surveys

- Update baseline survey data for all conserved populations of variegated dudleya at MTRP which have not been monitored in the five years previous to NRMP adoption to assess persistence following large-scale fires and evaluate current threats. It is recommended that these surveys be conducted when plants are visible at the monitored sites. Known reference sites within MTRP should be used to calibrate survey timing to confirm estimated plant phonologies. According to baseline data, many populations of variegated dudleya (EE1-13, EE15-17, EE20, EE22-57, FM4-27, and LM1) have not been surveyed or monitored since McMillan's MSCP rare plant surveys in 2001 (see Figure 4-12c). As new sites are acquired, surveys should be conducted at sites identified in the baseline surveys using the above methodology or similar.

- If negative results are observed at historic variegated dudleya subpopulations during baseline update surveys, repeat surveys on target subpopulations for two seasons (calibrated with reference sites). If a population is not observed after two surveys under good conditions, the site should be considered abandoned and revisited once per decade.

Objective 2: Threats Assessment and Prioritization

- Data from updated baseline surveys should be used to prioritize management actions and locations. Management prioritization should evaluate each population separately based on manageable threats. The following qualitative threats analysis framework can be used to prioritize MTRP populations for management.

  i) Exotic species cover

  0-1 % = Trace
  1-5 % = Low
  5-25% = Moderate
  25-50% = High
  50-100% = Dense

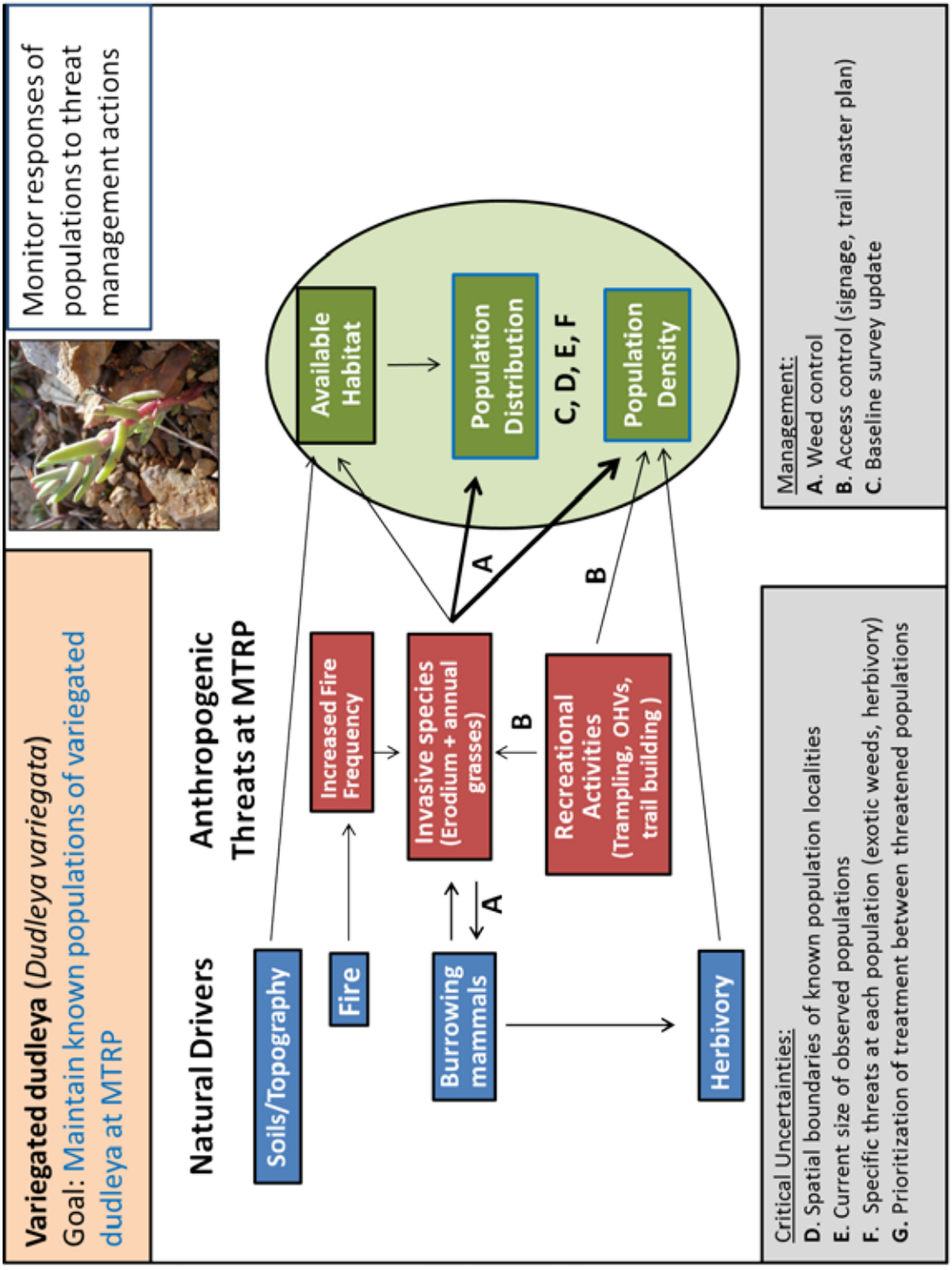


Figure 4-13. Conceptual Model for Variegated Dudleya (*Dudleya variegata*) at MTRP

ii) Mammal Burrows and Soil Tailings

+ Presence vs. absence
+ Intensity (percentage of ground surface affecred)
  1-5 % = Low
  5-25% = Moderate
  25-50% = High
  50-100% = Dense
+ Burrowing species (if known)

iii) Evidence of unauthorized recreation (bike tracks, bootprints, hoofprints, trash)
Presence vs. absence

iv) Proximity to Unauthorized Recreation

Trail through population	= Extreme
Trail adjacent to population	= High
Trail within 50 feet of population	= Moderate
Trail within 250 feet of population	= Low
Trail >250 away from population	= Trace

v) Fire History

Objective 3: Manage threatened variegated dudleya populations

- Using the results of Objective 2 (above), implement a subpopulation specific management program to address discrete threats of individual populations. Highly threatened subpopulations should be treated first.

- Management tools for variegated dudleya populations at MTRP include:
  + Invasive species control
  + Exclusion fencing and signage
  + Trail closure-reroute

4.2.3.6 Monitoring

- Monitoring will be based on the MSCP rare plant monitoring protocols which specify both the methods and the locations for monitoring actions.

- If not included in the current MSCP rare plant monitoring protocols, a subset of the population within MTRP should be surveyed annually for presence/absence and existing/emerging threats. The population boundary should be recorded with a submeter GPS. Ancillary data determined to be relevant to preserve-level management may also be collected.

Selection of the sites to be monitored should be based on historic monitoring in order to maintain a long-term dataset, while also representing a wide spectrum of geographic variability, fire history, and topography. If quantitative data are collected, a sufficient number of sites should be monitored to meet the sample size requirements of the appropriate statistical analysis.

- The remainder of the recorded populations will be monitored initially in a baseline survey update (see Objective 1).

4.2.4 Willowy Monardella (*Monardella viminea*)

4.2.4.1 Background

Willowy monardella is listed as an endangered species by the State of California (2011c) and the federal government (USFWS 1998), and is a covered species under the MSCP. This perennial herb in the mint family (Lamiaceae) has tiny silvery hairs, narrow leaves, grows up to two feet tall, and has small, pale rose-lavender flowers from June to August (Hickman 1993, State of California 2011c; Photograph 4-5). Individual plants grow in clumps of one to four individuals, which can make accurate population estimates difficult. In MTRP, its microhabitat is the upper terraces and sandy banks of seasonal washes in open riparian scrub (Reiser 2001). At MTRP, willowy monardella is found within open riparian scrubs dominated by broom baccharis (*Baccharis sarothroides*) within the floodplains on ephemeral streams in the East Elliott and West Sycamore areas. Other habitat requirements include ephemeral stream hydrology with regular flood regimes (and associated scour), sandy alluvial terraces, and a limited herbaceous understory (USFWS 2008; Photograph 4-6). Willowy monardella is known from fewer than 11 sites in San Diego County. MTRP does not contain an MSCP-designated major population of this species.

The total population of willowy monardella is considered to be declining. Of the 26 known/historic populations of willowy monardella, eight extant populations remain, seven of which are located on reserve lands. The regional population is considered to be in decline (USFWS 2008, 2012), and the West Sycamore population has declined substantially during the 2000–2012 monitoring period (Figure 4-14; City 2000–2012 monitoring reports). Some studies suggest a lack of reproduction/recruitment as a factor in population decline (Rebman and Dossey 2006), which may be supported by the decreased number of individuals/shoots per clump over time at West Sycamore (Figure 4-15; City 2000–2012 monitoring reports). “Clumps” are defined as the number of individuals within one foot of one another. Multiple ‘plants’ are often found within a ‘clump’ and additional research is needed to determine if individuals within a clump represent a clone or distinct genetic individuals (City of San Diego 2005).

Photograph 4-5: Willowy monardella within the West Sycamore area at MTRP.

Photograph 4-6: Willowy monardella habitat within the East Elliott area of MTRP.

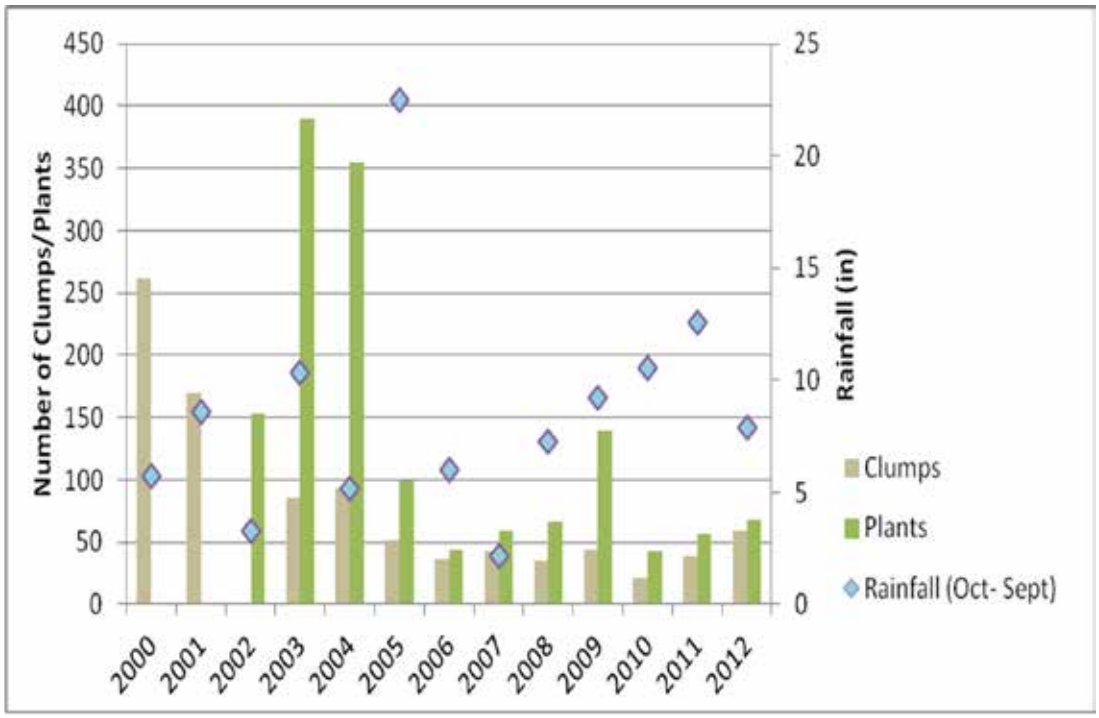


Figure 4-14: Population size (clumps vs. plants) of willowy monardella at Occurrence A within the West Sycamore Area

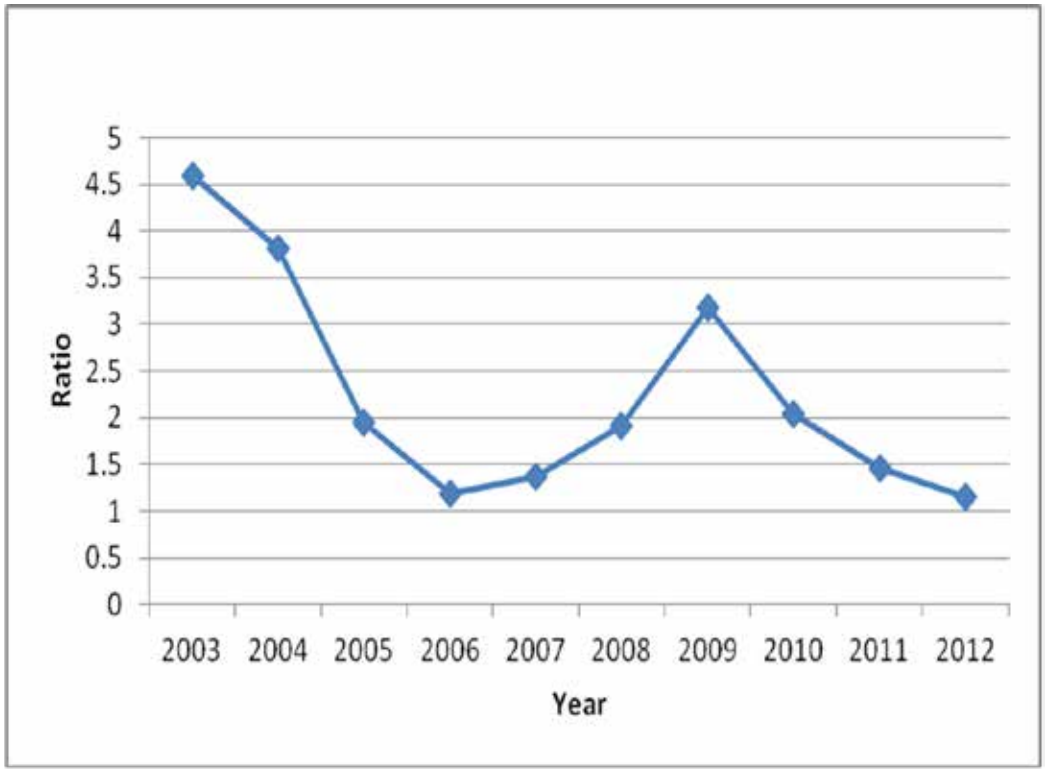


Figure 4-15: Clump to individual ratio of willowy monardella Occurrence A at West Sycamore area.

4.2.4.2 MSCP Conditions of Coverage

Area-specific management directives must include specific measures to protect against detrimental edge-effects (MSCP 1998: Table 3-5).

4.2.4.3 Presence within the MTRP

As shown in Figures 4-16a and b, several populations of willowy monardella have been observed within the East Elliott and West Sycamore areas of MTRP. A large population (Occurrence C) of willow monardella occurs in sparse riparian scrub in the Spring Canyon drainage of the East Elliott area (State of California 2011c), and is currently monitored by Mike Kelley and Cindy Burrascano of CNPS. Two populations of willowy monardella have been observed in the West Sycamore area (Occurrences A and B). Occurrence A is currently monitored by the City. From 2000 to 2012, Occurrence A has ranged from a high of 261 clumps (2000) and 390 individuals (2003), to a low in 2010 of 21 clumps and 43 individuals (see Figure 4-14) (City monitoring reports 2000–2012).

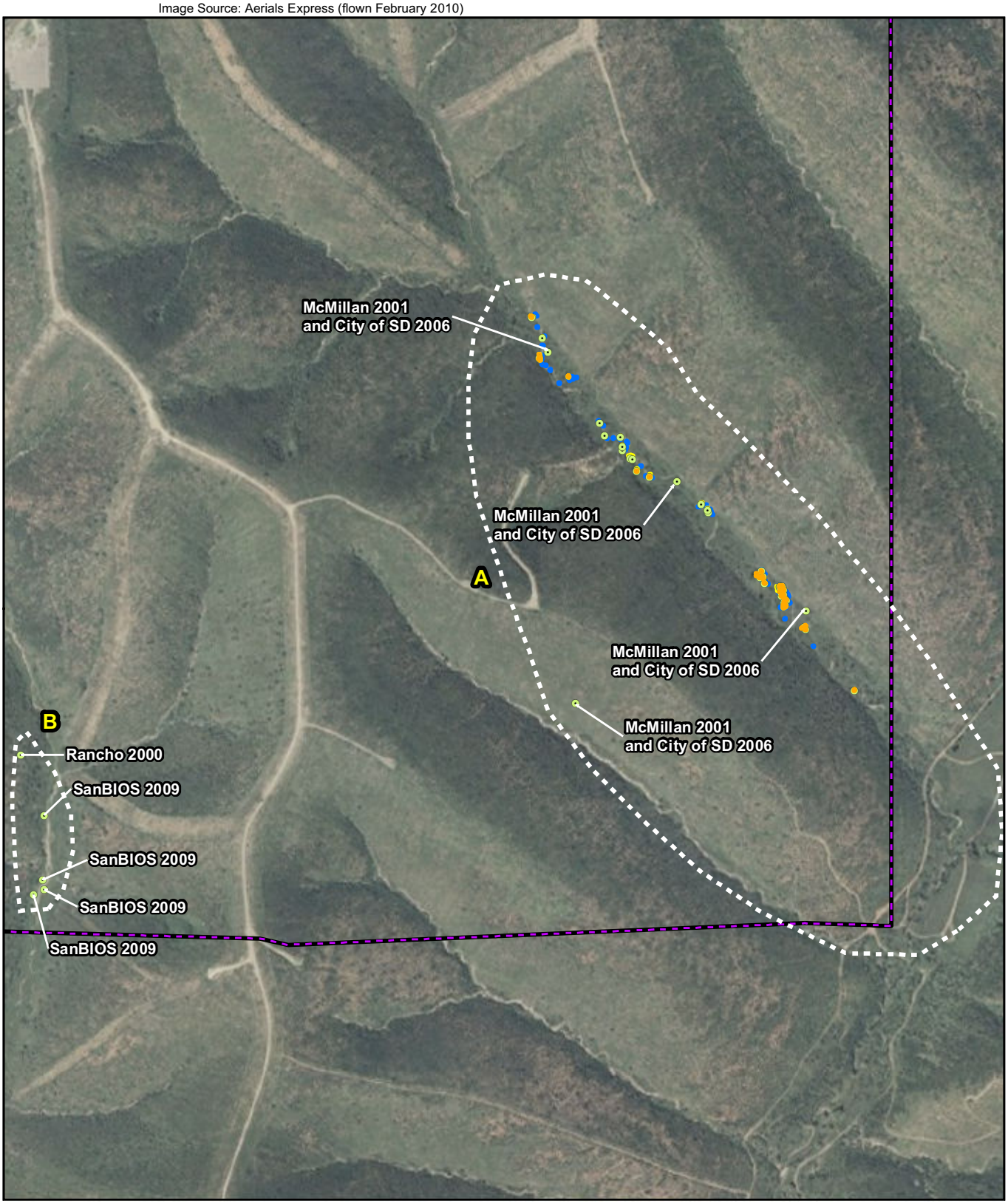
4.2.4.4 Anthropogenic Threats at MTRP

4.2.4.4.1 Invasive Non-native Species

Non-natives species present a significant threat to all extant populations of willowy monardella, including all occurrences at MTRP (USFWS 2008). Non-native plants, especially non-native grasses such as ripgut and red brome grasses (*Bromus diandrus* and *Bromus madritensis* ssp. *rubens* respectively), compete directly with willowy monardella for nutrients, light, water, and space at locations within MTRP. At the West Sycamore site, total non-native plant cover has ranged from 23 - to 74 percent, with non-native grasses comprising 80 to 96 percent of the total within the 2006–2012 monitoring period (City of San Diego 2006–2012). Invasive plants have been shown to colonize disturbed areas as an indirect result of fire, road and trail building, and altered hydrology, and may partially explain (in conjunction with loss of habitat due to erosion) the willowy monardella populations at West Sycamore that maintained their levels in 2004 after the 2003 fire, followed by a crash when non-native grasses at high densities replaced the burned chaparral after the high rainfall of 2005 (B. Miller, pers. comm. 2012; Figures 4-14 and 4-15).

At the nearby Miramar occurrence, population areas that are heavily invaded by non-native grasses have fewer adult willowy monardella plants than areas with limited non-native grasses (TierraData 2011 in USFWS 2012).

Image Source: Aerials Express (flown February 2010)



0 Feet 500

Project Boundary

West Sycamore Area

Willowy Monardella *(Monardella viminea)**

(*All species points are City of SD 2006 unless otherwise noted.)

City San Diego Observations

2001 2005

2003 2007

FIGURE 4-16a

Willowy Monardella *(Monardella viminea)*
Detected Occurrences: West Sycamore

RECON

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Image Source: Aerials Express (flown March 2010)

Project Boundary

East Elliott Area

Fire Burn History

1981

2003

Willowy Monardella CNDDB 2000
(Monardella viminea)

CNPS 2000

CNPS 2011

McMillan 2001

RECON 2011

0 Feet 800

RECON

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FIGURE 4-16b

Willowy Monardella
(Monardella viminea)
Detected Occurrences: East Elliott

4.2.4.4.2 Erosion

Willowy monardella requires an ephemeral hydrologic regime that includes periods of flood usually less than 48 hours in duration (USFWS 2012) that cause scour and remove non-native annual plants and their seed from willowy monardella habitat. Populations of willowy monardella at MTRP are found within smaller watersheds that are isolated from the direct effects of urban runoff and large-scale flooding increases due to development seen in other willowy monardella populations in San Diego (see for example White and Greer 2006). Erosive effects caused by extreme water flows within these water sheds have been implicated in habitat degradation within MTRP, especially at Occurrence A. Anecdotal evidence and City monitoring data points to stream channels becoming increasingly characterized by degradational indicators such as undercut banks, channel entrenchment, and a floodplain which no longer carries water at high flows, especially after the sequence of fire to remove soil-stabilizing vegetation in 2003 followed by large floods in 2005. The West Sycamore monitoring data show that willowy monardella populations maintained their levels in 2004 after the 2003 fire and then decreased significantly following the high rainfall of 2005, probably due to a combination of direct habitat loss from erosion and competition from invasive species. Excessive erosion in stream channels causing channel entrenchment, bank undercutting, and reduction of flow pathways has been implicated in the degradation of willowy monardella habitat in the West Sycamore area (B. Miller, pers. comm. 2011).

4.2.4.4.3 Recreation – Trampling

Willowy monardella is sensitive to direct mortality from non-motorized recreation sources, including trampling from off trail hiking and mountain biking (USFWS 2008). In addition, recreational encroachment can provide a vector (via soil disturbance and seed transport) for aggressive non-native plant species to invade healthy willowy monardella. Currently, Occurrence C occurs within a floodplain which contains two trails frequently used by hikers and for mountain biking. The Master Plan Update associated with this document has recommended closing these hiking/biking trails and the reduction of the extent of an existing access road through the habitat at Occurrence C. Occurrence A and B are within the West Sycamore area and currently do not have authorized trail use. Proposed trail corridors within the watershed of Occurrence B will incorporate a 100-foot design buffer and appropriate exclusionary signage to avoid trampling impacts to willowy monardella (see Section 4.2.3.4: Objective 3).

4.2.4.4.4 Fire and Fire Suppression

While fire can theoretically lead to direct mortality of willowy monardella as well as reduction of the seed bank, all occurrences burned within MTRP in 2003 continue to persist. At the nearby Miramar site, studies showed the willowy monardella resprouted from their root systems after a 2003 fire that burned 98 percent of the population (Rebman and Dossey 2006 in USFWS 2012). Based on MSCP monitoring data, it

appears that fires indirectly impact the species through habitat conversion from native to non-native species after fire disturbance and increased erosion and sedimentation.

Fire suppression, especially the cutting of fire breaks within willow monardella watersheds, can lead to increased rates of erosion and hydrologic inputs into the floodplains of occupied habitat. Fire breaks were cut during the 2003 wildfires in the flood plains of all three occurrences of willowy monardella at MTRP.

4.2.4.5 Management Goals and Objectives

Goal: Stabilize and maintain known populations of willowy monardella at MTRP (Figure 4-17).

Objective 1: Erosion Control

- Perform an initial hydrological evaluation to identify erosive hydrological inputs into the watershed at Occurrence A. The hydrological evaluation should include recommendations for appropriate erosion control.

- Adaptive management actions including erosion control and further minimization of hydrologic peak flows into the floodplains should be initiated on entrenched (>1.4 entrenchment ratio) stream reaches (Rosgen 1997). More extensive and intrusive stream restoration actions, including stream bank excavation and/or efforts to raise channel elevation, will need to be part of a stream restoration plan and coordinated with state and federal water agencies.

- Install erosion control measures at identified anthropogenic hydrologic inputs within the watershed of Occurrence A. Many of these inputs appear to enter the watershed from a previously graded ridgeline at the northern edge of the watershed and at the terminus of utility access roads (Figures 4-18a-b). Erosion control structures may include straw wattles, gabions, and water bars.

- Coordinate with SDG&E to control erosional flows emanating from the utility access road on western slope (lat: 32.9247, long: -116.99449) of the Occurrence A watershed (see Figure 4-18a).

- Access to Occurrence A is from the southeast via an access road through the County of San Diego Goodan Ranch Sycamore Canyon Preserve. Work crews and monitoring staff should coordinate with the preserve prior to entry: (858) 513-4737.

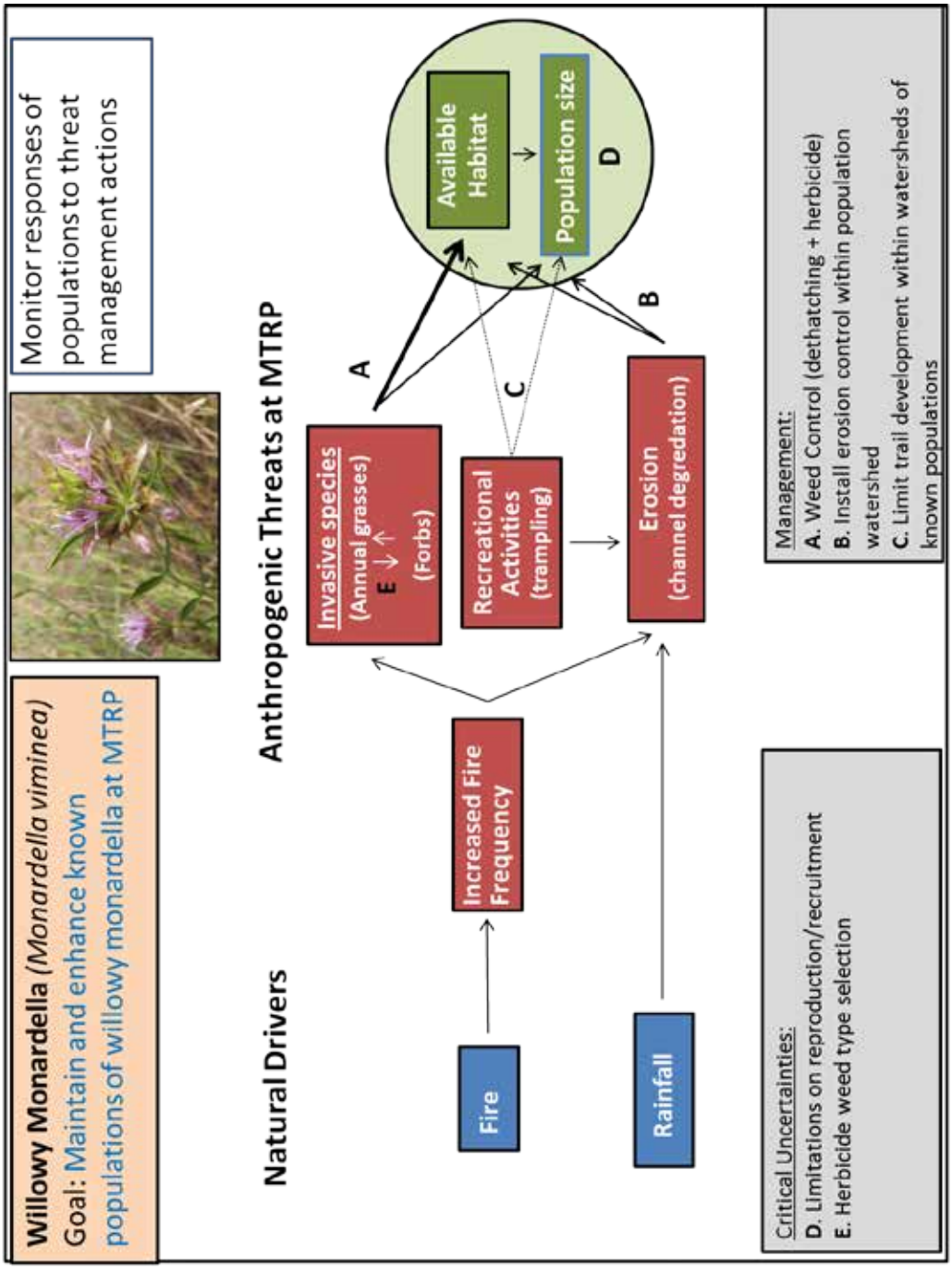
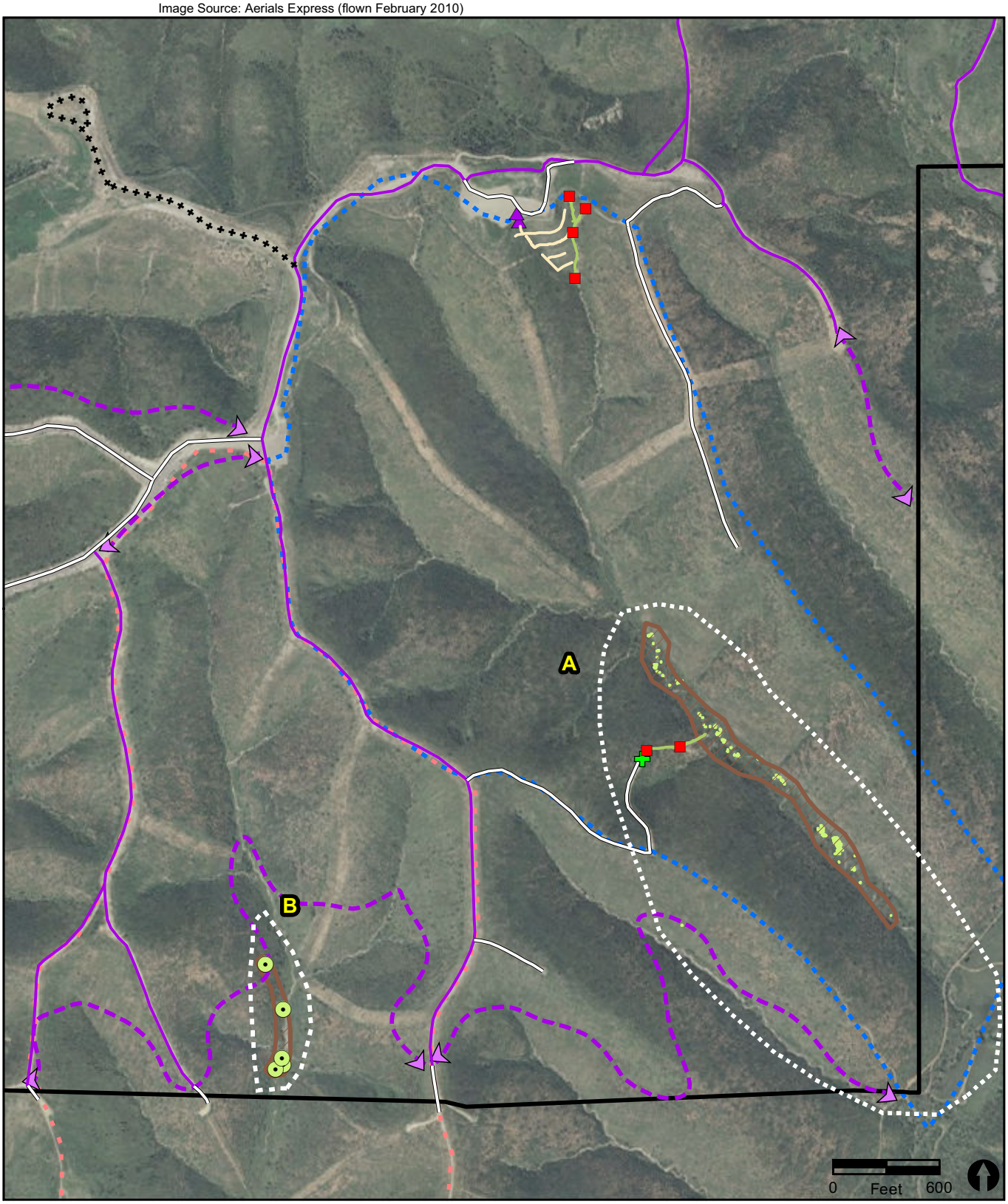


Figure 4-17. Conceptual Model for Willowy Monardella (*Monardella viminea*) at MTRP

Image Source: Aerials Express (flown February 2010)



Project Boundary
Watershed of Population A
Watershed of Population B
Weed Management Area
Willowy Monardella *(Monardella viminea)*

Anthropogenic Erosional Feature
Brow Ditch
Drain
Proposed Erosion Control
SDG&E Access Road Erosion

Trail Re-Routes/Closures
Planned Closure

Proposed New Trails
Multi

Existing Trails-Proposed Use
Other Circulation
Multi-use Trail

RECON

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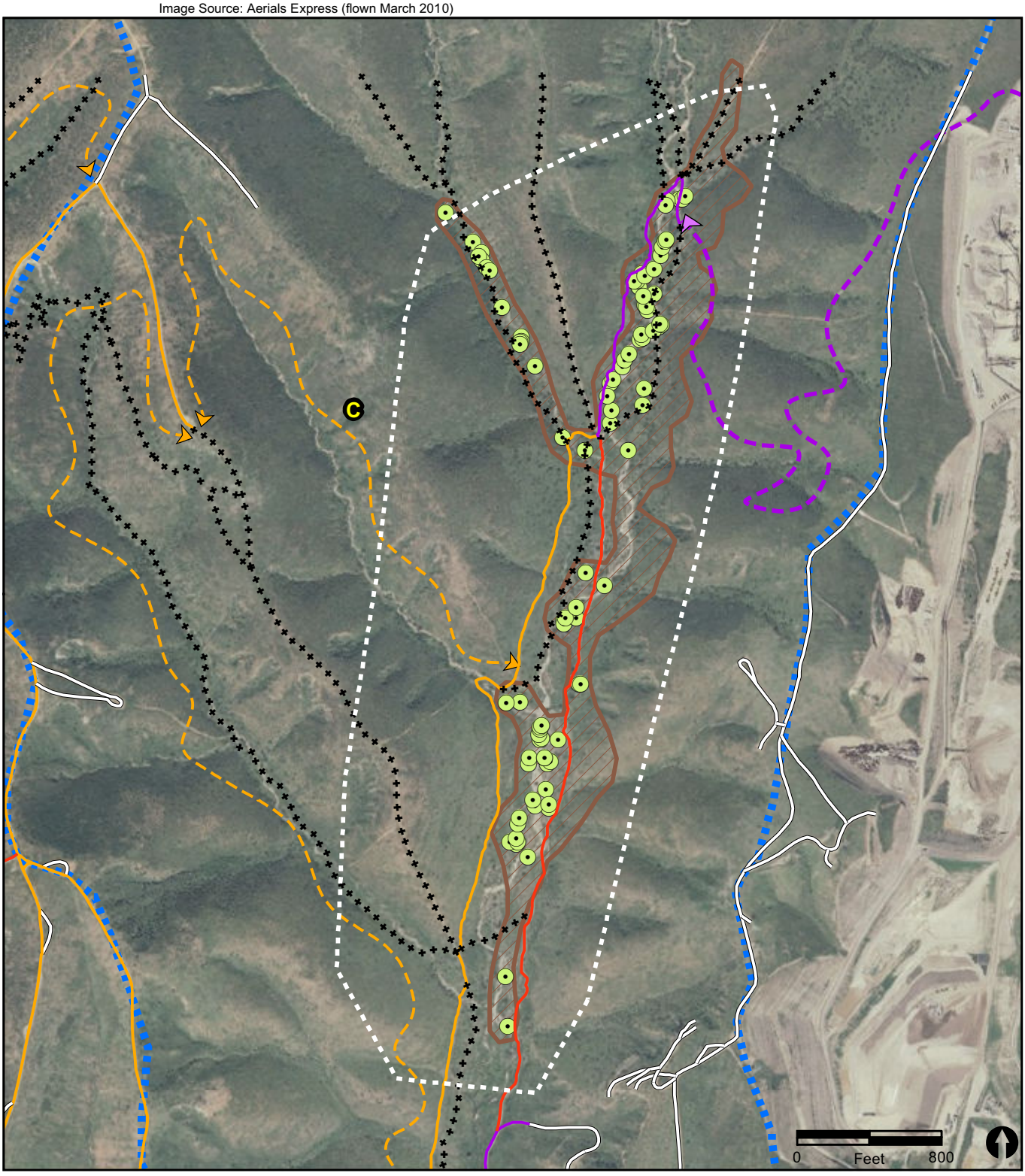
FIGURE 4-18a

Willowy Monardella *(Monardella viminea)*
Management Actions: West Sycamore

Image Source: Aerials Express (flown March 2010)



Project Boundary

Watershed of Population C

Weed Management Area C

Willowy Monardella (*Monardella viminea*)

Trail Re-Routes/Closures

Localized Re-route

Planned Closure

Proposed New Trails

HikeBike

Multi

Existing Trails-Proposed Use

Other Circulation

Hike/Bike Trail

Multi-use Trail

FIGURE 4-18b
Willowy Monardella
(Monardella viminea)
Management Actions: East Elliott

RECON

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Erosion control monitoring

Entrenchment ratio monitoring should be conducted within selected reaches of the watershed of Occurrence A to assess stream channel stability before and after the installation of erosion-control devices. A total of three cross-sections of the stream channel were selected in 2010 for monitoring by the City (see Figure 4-12a). In order achieve statistical power to detect change over time; a larger sample size will be needed and Before-After Control-Impact paired design should be used (Smith 2002, see below).

Research Question: Does entrenchment ratio change correlate with erosion control actions?

Data collected: Initially, a set of baseline summary statistics should be collected for reaches within Occurrence A (treatment area) and Occurrence B (control area). These initial statistics should include mean entrenchment ratio and standard deviation. Entrenchment ratio is calculated by the following equation:

$$\text{Entrenchment ratio} = \frac{\text{Flood-prone width}}{\text{Bankfull width}}$$

For a full discussion of flood-prone width and bankfull width, see Applied River Morphology (Rosgen and Silvey 1996). For channel entrenchment classifications, see Table 4-10 (Rosgen 1997).

TABLE 4-10
CHANNEL ENTRENCHMENT CLASSIFICATIONS

Entrenchment Classification	Entrenchment Ratio
Entrenched	< 1.4
Moderately entrenched	1.4 – 2.2
Slightly entrenched	> 2.2

Entrenchment ratios should be sampled within both reaches before and after erosion control measures are installed.

Sample size: 30 samples per reach collected annually over three seasons

Statistical Analysis: Generalized linear model ANOVA with repeated measures as a fixed effect. A baseline distribution should be designated after the initial round of data is collected. The following parameters for this statistical design were calculated using G*Power version 3.1.5 (Faul et. al. 2009).

P-value: 0.05
Effect Size: 0.56
Power: 0.956

Sample Size: 30
Groups: 2

Objective 2: Exotic Weed Removal from Occupied Habitat

- If needed, dethatch in a five-foot radius around selected individuals within willowy monardella WMAs (see Figures 4-18a-b). Dethatching should occur in fall. Currently, upland exotic grasses have invaded the drainage floodplains and terraces within willowy monardella habitat. No plants with a wetland indicator status should be removed from the flood plain as a part of dethatching. Wetland indicator status for plants can be found on the USDA website (2012). If wetland plants become a threat to willowy monardella, a separate strategy including agency coordination and permitting may need to be implemented.

- As weed density and low recruitment have been implicated in willowy monardella decline, a recruitment study tied to weed control efforts would be a cost effective way to determine the effectiveness of management actions.

  Research question: Does dethatching have an effect on willowy monardella recruitment?

  Experimental design: A paired experimental design with 46 paired samples (pair = one treated and one untreated clump in close proximity) within one watershed (Occurrence C).

  Data collected: Dethatched - (Y/N)
  Recruitment - #

  Sample Size: 46 pairs

  Statistical Analysis: T-test (calculated using G*Power 3.1.5)

p-value:	0.05
Confidence Interval:	10
Effect size:	0.5
Power:	0.954
Sample size:	46 (paired)

Objective 3: Trail Reroute & New Trail Impact Minimization

- Currently, two informal trails run through the floodplain within willowy monardella habitat at Occurrence C. These trails will be closed or rerouted as a part of the Master Plan Update associated with this document (see Figure 4-18b). In addition, the extent of an existing access road through the floodplain of Occurrence C will be reduced.

- In order to prevent unauthorized trail development within the West Sycamore area and to minimize encroachment into MCAS Miramar, a new trail corridor is proposed within the watershed of Occurrence B. Prior to final trail design and construction, the following is recommended.

  1) Willowy monardella survey update within any occupied watershed potentially impacted by trail development.

  2) 100-foot minimum design buffer from observed willowy monardella individuals.

  3) Pre-construction entrenchment surveys should be conducted within the occupied watershed.

  4) Monitoring of individuals and channel stability should be conducted for five years following construction to detect change as a result of trail design and inform adaptive management (see Objective 1 monitoring).

  5) Adaptive management should focus on limiting additional hydrologic inputs as a result of trail presence to occupied watersheds.

Objective 4: Exclusion Fencing/Signage

- Exclusion fencing and educational signage should be installed on City property near existing trails or upon development of proposed trails near Occurrence C (see Figure 4-18b).

- After the East Elliott and West Sycamore areas are fully acquired by the City, signage and access barriers should be installed and maintained at all MTRP gates to prevent unauthorized recreational uses.

4.2.4.6 Monitoring

- Adaptive management monitoring will follow recommendations in Objectives 1 and 2

- MSCP monitoring will be based on the MSCP rare plant monitoring protocols, which specify both the methods and the locations for monitoring actions.

- If not included in the current MSCP rare plant monitoring protocols, the West Sycamore population should be surveyed annually for presence/absence and threats, and individuals and clumps recorded with a submeter GPS. Ancillary data determined to be relevant to preserve-level management may also be collected.

4.2.5 Coastal Cactus Wren (*Campylorhynchus brunneicapillus couesi*)

4.2.5.1 Background

The coastal cactus wren is a CDFG species of concern and is a MSCP covered species (Unitt 2008). This subspecies ranges from southern Orange County through San Diego County into extreme northwestern Baja California (Proudfoot et al. 2000). The coastal cactus wren can be observed year-round within coastal sage scrub and maritime succulent scrub vegetation communities of coastal lowlands (Photograph 4-7; Unitt 2004). Coastal cactus wrens require thickets of cholla (*Cylindropuntia* sp.) and/or prickly pear (*Opuntia oricola*) cacti in which to build their nests. Coastal cactus wrens often build secondary nests, which are used for roosting and nesting for subsequent broods (Proudfoot et al. 2000). Nesting occurs from March through July; fledglings remain in the nest until September. The cactus wren diet consists mainly of grasshoppers, beetles, ants, wasps, butterflies, moths, spiders, and occasionally vegetation, reptiles, and amphibians (Proudfoot et al. 2000).

Coastal cactus wrens have been shown to disperse from 0.6 to 1 mile on average from home territories in Orange County (Atwood et al. 2002; Bontrager and Gorospe 1995; Preston and Kamada 2011). The coastal cactus wren observed at MTRP is within the West Sycamore area and is approximately 1.2 miles southeast of a wren observed in 1990 (although this area is now developed) and 3.25 miles northwest of a wren observed near Santee Lakes in 1990. In order to facilitate genetic exchange and population distribution expansion, management should include the restoration or enhancement of cactus patches (available cactus wren habitat) at distances relative to their ability to disperse.

Regionally, coastal cactus wren populations have declined precipitously in the last two decades due primarily to habitat loss and fragmentation (Rea 1990). Periodic drought when combined with regional habitat fragmentation can constitute an exacerbating factor for other threats (such as wildlife) to coastal cactus wren. Drought can weaken the vigor of resident birds and under extreme conditions can cause reproductive failure and/or population reduction through mortality (Bolger et al. 2005). Although most small birds have life spans of several years and many can survive to reproduce in more favorable years, unusual cases of consecutive years of drought may actually result in depressed populations over large areas, especially for resident species.

Photograph 4-7: Coastal cactus wren habitat within the West Sycamore subarea of MTRP.

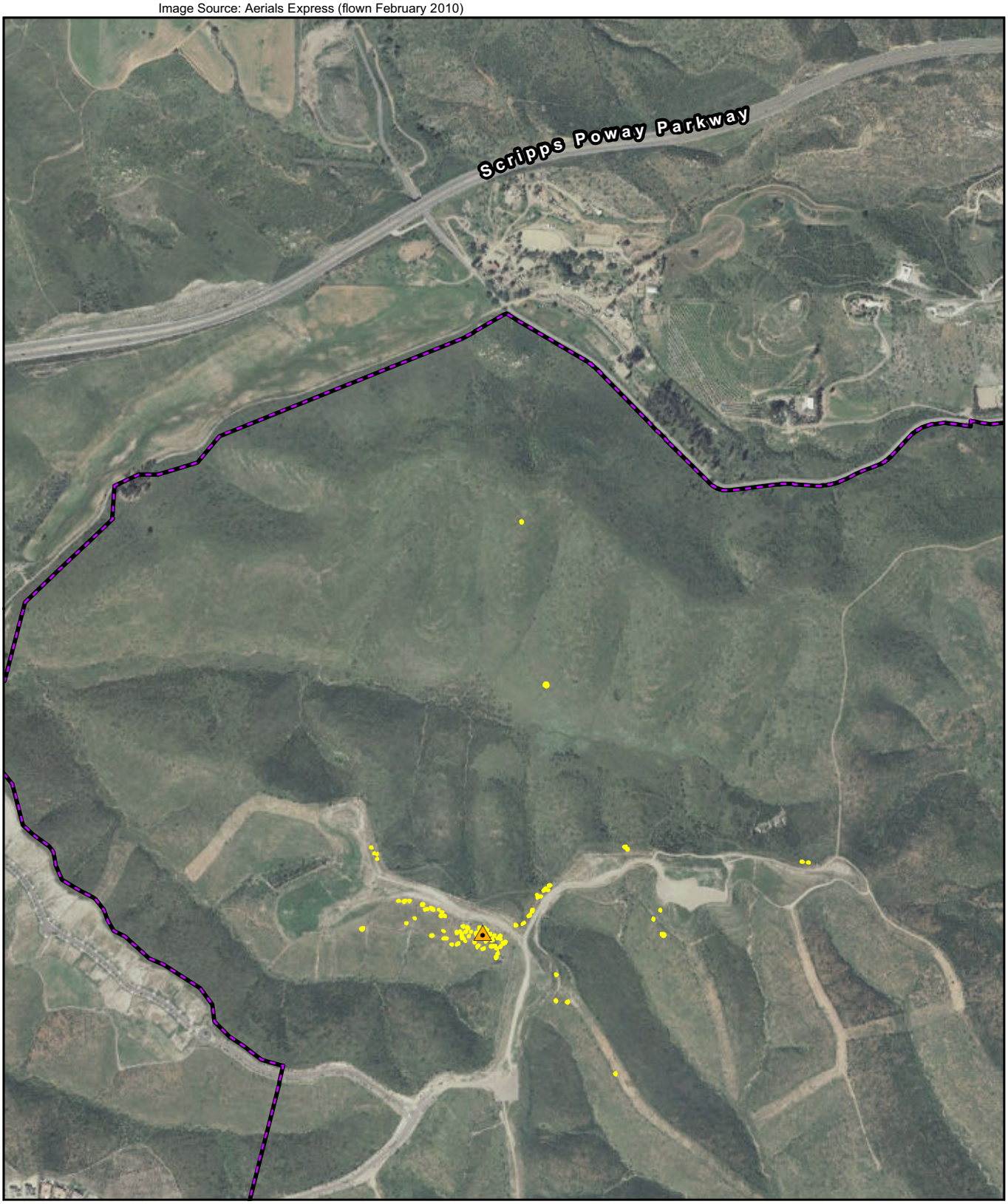
4.2.5.2 MSCP Conditions of Coverage

Area-specific management directives must include restoration of maritime succulent scrub habitat, including propagation of cactus patches, active/adaptive management of cactus wren habitat, monitoring of populations within preserves, and specific measures to reduce or eliminate detrimental edge effects. No clearing of occupied habitat may occur from the period February 15 through August 15 (MSCP 1998: Table 3-5).

4.2.5.3 Presence within the MTRP

One cactus wren was observed in a large stand of prickly pear on the West Sycamore area by RECON biologists during vegetation surveys in 2011. In general, MTRP does not contain large concentrations of dense cacti, the exception being a large patch in the West Sycamore area (Figure 4-19). Regionally, coastal cactus wren has been reported to east and southeast of the MTRP (State of California 2011b, Figure 4-20).

Image Source: Aerials Express (flown February 2010)



Project Boundary

West Sycamore Area

Cactus Patches

San Diego Cactus Wren (RECON 2011)
(*Campylorhynchus brunneicapillus couesi*)

0 Feet 1,000

FIGURE 4-19
San Diego Cactus Wren
(*Campylorhynchus brunneicapillus couesi*)
Detected Occurrences: West Sycamore

RECON

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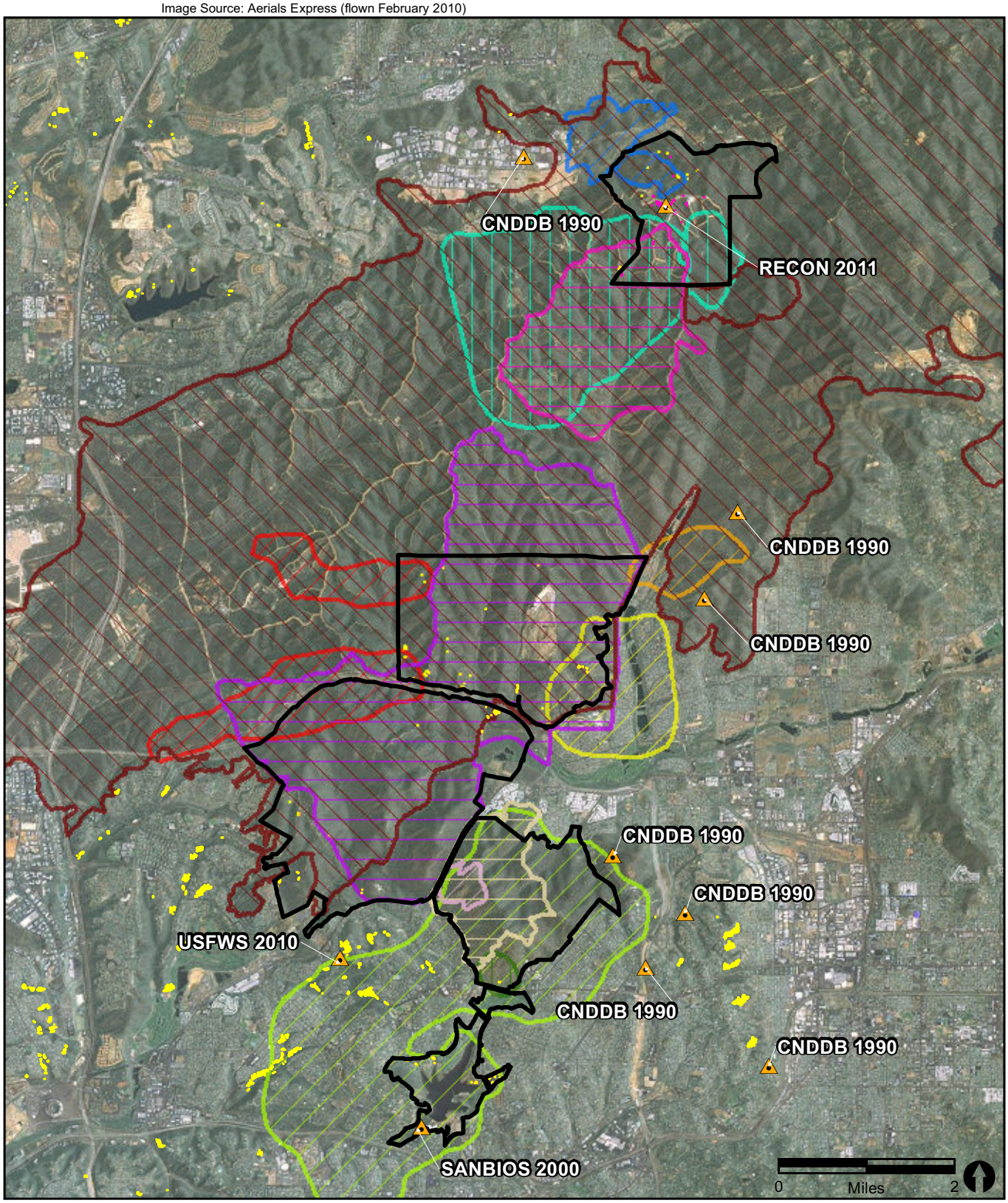
Image Source: Aerials Express (flown February 2010)



Project Boundary

Cactus Patches (RECON 2011)

Cactus Patches (MSCP Surveys 2009-2011)

San Diego Cactus Wren (*Campylorhynchus brunneicapillus couesi*)

Fire Burn History

1939
1941
1942
1944
1950
1968
1981
1983
1986
1988
1995
2003

FIGURE 4-20

San Diego Cactus Wren (*Campylorhynchus brunneicapillus couesi*) and Cacti: Regional Habitat Connectivity

RECON

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4.2.5.4 Anthropogenic Threats at MTRP

4.2.5.4.1 Fire

Wildfire has been identified as a major threat to coastal cactus wren habitat in southern California (Rea and Weaver 1990). Large cactus stands, despite their succulent growth form, are sensitive to mortality from wildfire. Vegetation loss removes habitat shelter and productivity, rendering an area unsuitable for coastal cactus wren, which, in combination with isolation through or resulting from habitat fragmentation, can cause localized extinctions. After a wildfire, it can take many years for cactus patches to recover to a sufficient size to be used by coastal cactus wren (Proudfoot et al. 2000, Solek and Szijj 2004).

4.2.5.4.2 Invasive Non-native Species

Cactus wren habitat within the West Sycamore area is currently invaded by a population of purple fountain grass, an exotic perennial grass. The fountain grass has invaded the ridgeline along an access road and historically developed areas. Exotic grasses pose a threat to coastal cactus wren by providing an easily ignitable fuel source, contributing to the intensity of wildfires and the destruction of cactus wren habitat. In addition, as coastal cactus wrens feed on insects in interstitial spaces between shrubs, non-native grasses in the area occupy and degrade potential foraging habitat.

4.2.5.5 Management Goals

Goal: Establish and sustain a persistent population of coastal cactus wren within the West Sycamore area at MTRP (Figure 4-21).

Objective 1: **Reduce combustible fuels within Cactus Wren Management Area**

- Woody and herbaceous vegetation should be brushed within the cactus wren management area (CWMA) if it is determined that the density of these species is threat to the cactus patch(es) (Figure 4-22). Native shrubs should be the last to be thinned (see steps 4 and 5) after non-natives and dead biomass are removed. California gnatcatcher, an MSCP covered species which uses native shrubs as habitat, has not been observed within or near the CWMA (nearest CNDDB location is 0.5 mile north). Vegetative debris from thinning can be aggregated and left on-site (if native) or removed and disposed within a landfill (exotic species). Fuel removal from within the CWMA should be prioritized as follows:

    1) Treat and remove exotic species: The CWMA is infested with purple fountain grass (*Pennisetum setaceum*). Purple fountain grass should be cut and sprayed with an appropriate herbicide.

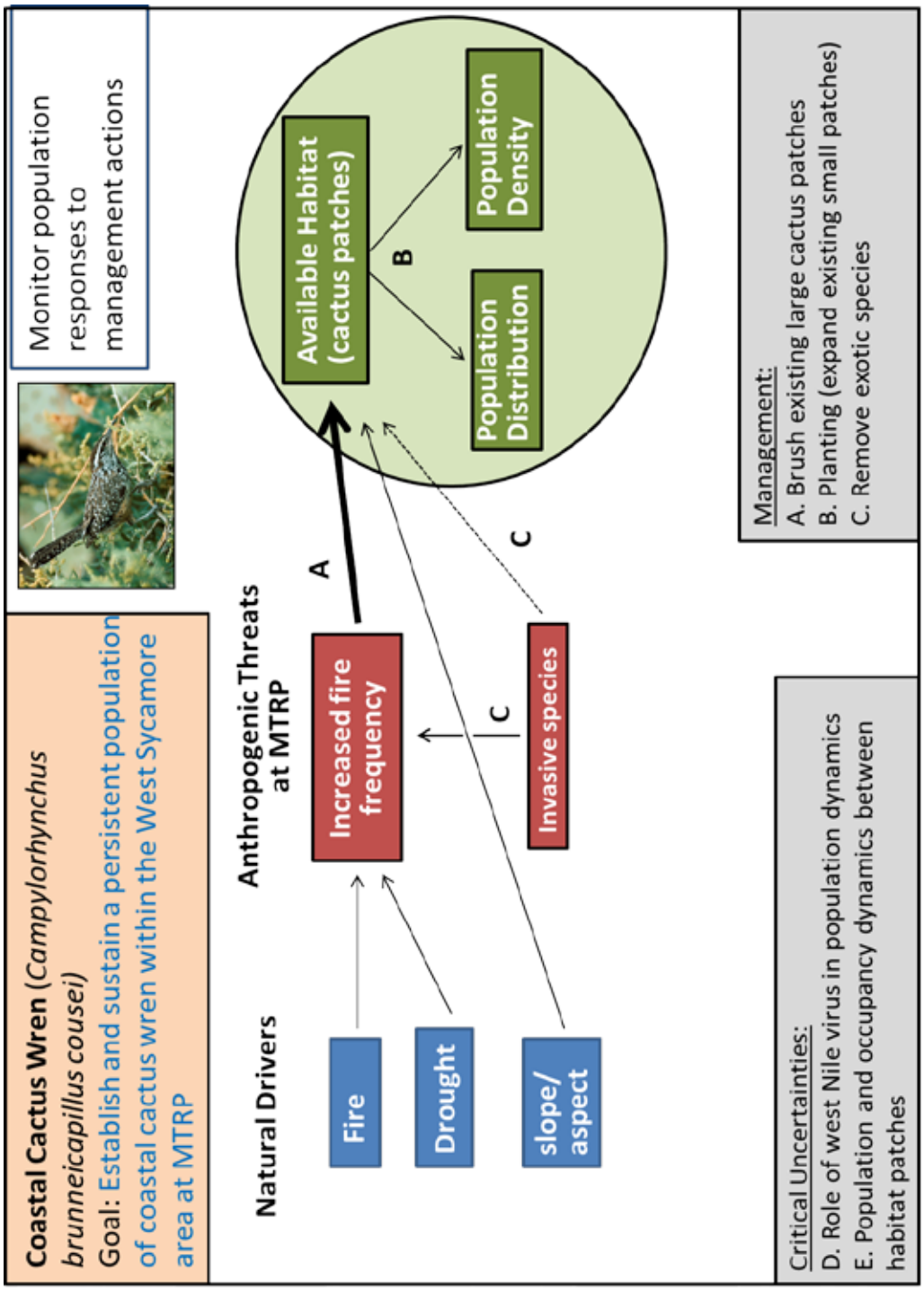
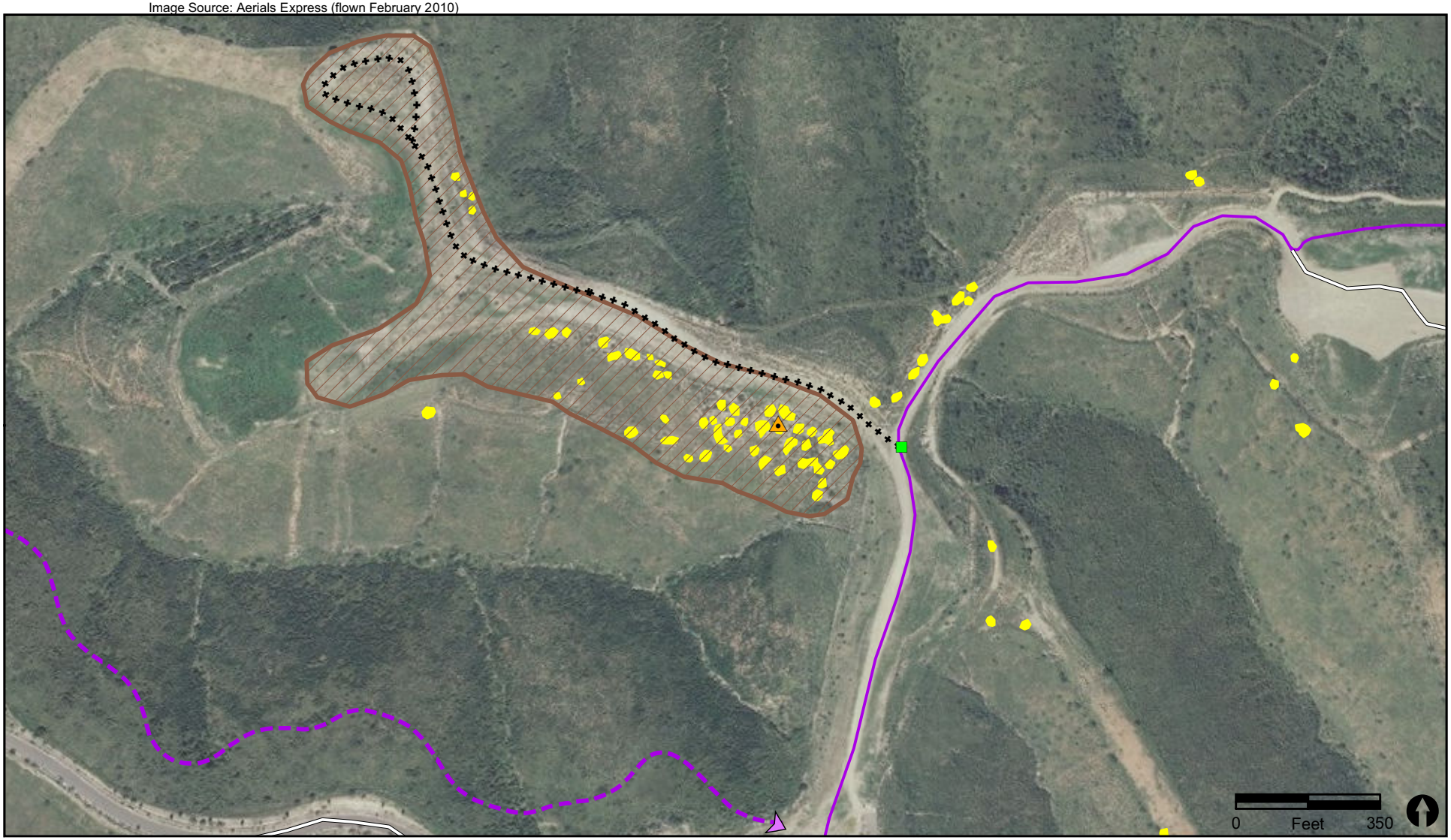


Figure 4-21. Conceptual Model for Coastal Cactus Wren (*Campylorhynchus brunneicapillus cousei*) at MTRP

Image Source: Aerials Express (flown February 2010)



San Diego Cactus Wren Management Area
- •Brush Management
- •Exotic Species Removal
- •Cacti Transplantation

Cactus Patches

San Diego Cactus Wren (*Campylorhynchus brunneicapillus couesi*)

Proposed Exclusionary Signage

Trail Re-Routes/Closures

Planned Closure

Proposed New Trails

Multi

Existing Trails-Proposed Use

Other Circulation

Multi-use Trail

RECON

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FIGURE 4-22

San Diego Cactus Wren (*Campylorhynchus brunneicapillus couesi*) Management Actions: West Sycamore

2) Remove dead biomass/accumulated thatch.

3) Prune large, woody native shrubs: Prune large native shrubs (laurel sumac [*Malosma laurina*]) up from ground to reduce fire ladder effects and total available fuel load of individuals.

4) Selectively thin remaining coastal sage scrub vegetation around a 15-foot perimeter of existing cactus patches: Cut sagebrush mechanically at their base, leaving roots in place. As coastal sagebrush in considered a primary component of MSCP-covered costal California gnatcatcher habitat, it should be selectively brushed only when priorities 1–3 have been completed.

- Vegetation thinning should occur outside of bird nesting season after the end of both the growing season and bird nesting season (August 15-February 15).

Objective 2: Enhance and expand cacti distribution and density within Wren Management Area

- Cactus pads harvested from local prickly pear and cholla stock should be planted within the coastal cactus wren management area to increase the density of cacti and the quality of cactus wren habitat (see Figure 4-22).

Objective 3: Trail Reroute

- Proposed trail use in West Sycamore area will avoid the CWMA (see Figure 4-22). In addition, an existing access road along the ridge line within the CWMA will be closed.

4.2.5.6 Monitoring/Surveys

- Conduct presence/absence coastal cactus wren surveys annually. As coastal cactus wrens are year-round residents, surveys should be conducted twice per year (once during breeding season, once in winter).

- Establish photo points within and facing vegetation management areas using a handheld GPS. Photo monitoring should be conducted in conjunction with vegetation monitoring every three years. Photos will be used to qualitatively track the expansion of cactus distribution and density within the CWMA.

- Use relevé vegetation sampling to monitor vegetation within cactus wren management area. Relevé vegetation monitoring will track the relative cover of cactus species in comparison of woody and herbaceous fuels within the CWMA. Relevé monitoring will also be used to identify exotic species densities and inform adaptive management actions. In addition to typical relevé monitoring,

cacti coverage estimates should be grouped in to height classes to track growth and development of cacti transplantations (Table 4-11).

TABLE 4-11
CWMA CACTI HEIGHT CLASSES
(feet)

Low	>1
Intermediate	1-3
Mature	>3

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4.3 Priority Management Guilds at MTRP

4.3.1 Cliffs and Rocky Outcrops

4.3.1.1 Background

MTRP contains two types of high-slope, bare rock habitats: rocky outcroppings and quarry cliff faces. The quarry cliff faces at MTRP are two sets of abandoned rock quarries and are located on the northwest side of the San Diego River, just northeast of the San Diego River crossing and access road. The quarry cliff faces are aligned on a southeast-facing aspect, have nearly vertical slopes, and have numerous fractures and crevices (Photograph 4-8).

Photograph 4-8 Jackson Drive quarry cliff face, MTRP, facing northwest.

In addition, granite boulder outcroppings are located just above and northwest of the midpoint of the San Diego River within MTRP. They are quite extensive, spanning approximately 200 meters of the hillside above the river, and have mainly a southeast-facing aspect. They have been formed naturally and are composed of numerous large, obelisk-shaped boulders that are vertically oriented with moderate amounts of fracturing (Photograph 4-9).

Photograph 4-9: West Kwaay Paay rocky outcropping, MTRP, facing northeast.

The inaccessibility of cliffs and rocky outcropping provide moderate amount of protection from predation and are used as roosting and nesting sites by sensitive species (Table 4-12). With few exceptions, bird nests are protected by federal law (Migratory Bird Treaty Act, as amended, 16 United States Code §§ 703-712). In addition to nesting locations, cliffs and rocky outcroppings' height and wide field of view provide perching opportunities for raptors.

TABLE 4-12
SENSITIVE SPECIES OBSERVED WITHIN THE CLIFFS AND ROCKY OUTCROPPING MANAGEMENT GUILD AT MTRP

Species	MSCP Covered?
Big free-tailed bat	No
Pocketed free-tailed bat	No
Western mastiff bat	No
Western red bat	No

Focused surveys for nesting raptors were conducted on cliffs and rocky outcroppings at MTRP in 2010 (Clark 2010). Although evidence of perching (whitewash) and one instance of nesting (common raven) was observed at rocky outcropping sites, the majority of cliff nesting and bird foraging activity was observed at quarry cliff sites (Southwest Boundary Quarry and Jackson Drive Quarry).

Focused surveys for roosting bat species were conducted at a total of seven selected rock outcrops and abandoned quarry sites, half of which are directly within the canyon of the San Diego River (RECON 2010). Observed bat activity was greatest at the two pairs of quarries located along the San Diego River; the Southwest Boundary quarry and Jackson Drive quarry (Figure 4-23). Observations of roosting pocketed free-tailed bats (*Nyctinomops femorosaccus*) were made during their post-sunset exodus at these quarries, and high levels of bat activity, including numerous social calls, were recorded and heard at these sites consistent with activity at roosts. The largest of the pocketed free-tailed bat colonies appears to be in the Jackson Drive Quarry. The estimated colony size here at its largest (September 2009) was approximately 30 bats, but there appear to be bats here year-round based on this survey and previous survey work in MTRP. The pocketed free-tailed bat colony size at the Southwest Boundary Quarry appears to be about half of that roosting at the Jackson Drive Quarry. Several other bat species were observed at both these quarry sites, but these appeared to occur in lower numbers. The highly fractured nature of these quarries, their solar radiation-absorbing aspect, and their immediate juxtaposition to productive foraging habitats (San Diego River and scrub hillsides) apparently contribute to making them the most supportive of cliff-roosting bat populations in MTRP.

4.3.1.2 Guild Membership Rules

Cliffs and rocky outcrops identified by previous surveys (Clark 2010 and RECON 2010) at MTRP.

4.3.1.3 MSCP Conditions of Coverage for Covered Guild Species

No MSCP covered species were observed within Management Guild boundaries

4.3.1.4 Threats at MTRP

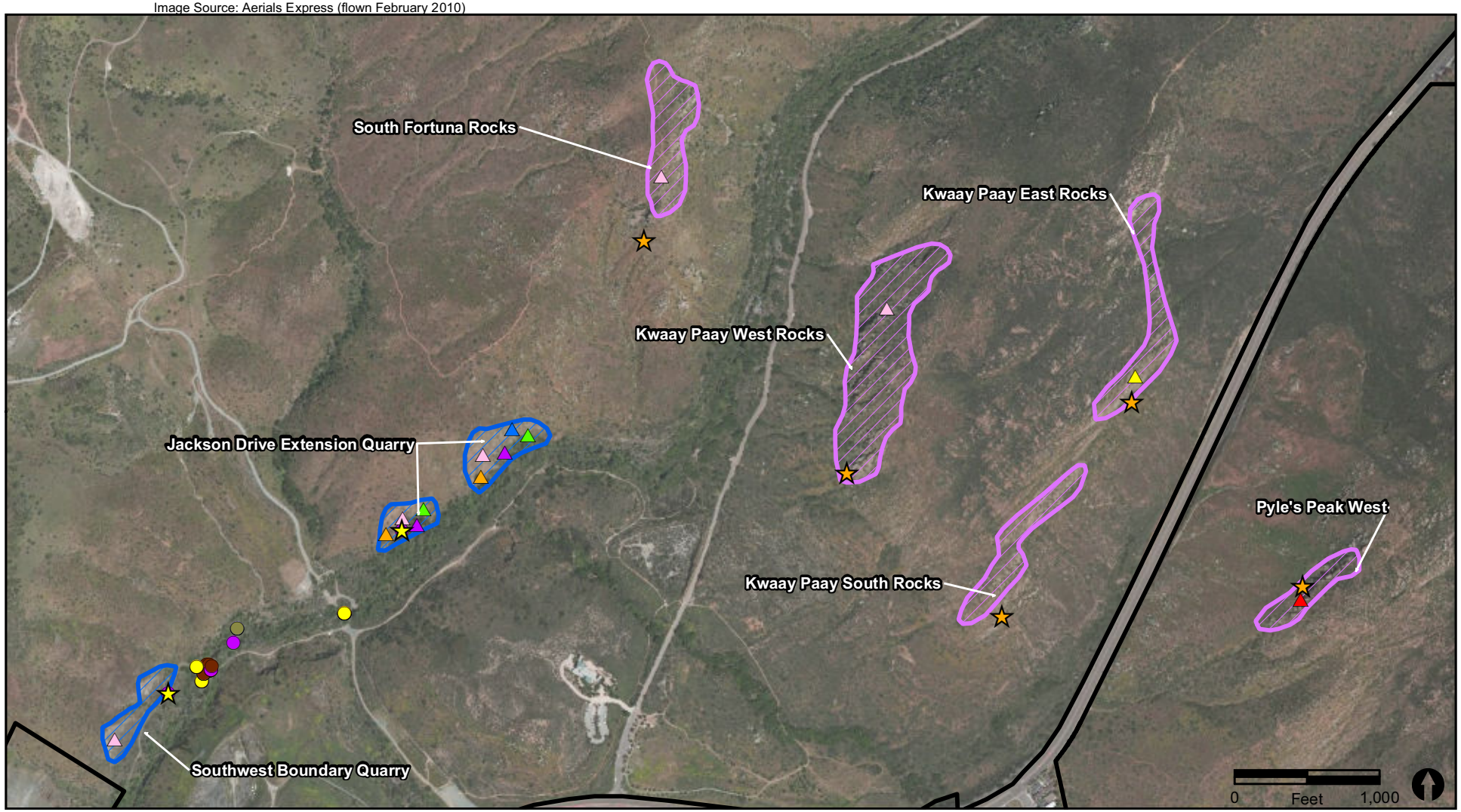
4.3.1.4.1 Recreation – Rock Climbing

Rock climbing is a popular activity at MTRP and can pose threats to wildlife, especially certain sensitive bat and raptor species. Bats with a high degree of roost fidelity (such as the state-sensitive pocked free tail bat) can be significantly affected by rock climbing activities. Other bats which move from roost-to-roost may not be as directly disturbed by rock climbing activities, but may act as disease vectors if recreational activities introduce pathogens into the bat meta-population at MTRP.

4.3.1.4.2 Introduced Disease (Emerging Threat)

White-Nose Syndrome (WNS) is a devastating, rapidly spreading disease observed in bat roosts in the Midwest and East Coast of the United States. The WNS grows on infected bats and inhibits hibernation, causing uncharacteristic behavior and eventual

Image Source: Aerials Express (flown February 2010)



Quarry Cliff Faces

Rocky Outcroppings

Pocketed Free-tailed Bat Roosts (RECON 2010)

Less Than 20 Individuals per Roost

Greater than 100 Individuals per Roost

Species (RECON 2010)

Big Brown Bat

Big Free-tailed Bat*

Brazilian Free-tailed Bat

Greater Western Mastiff Bat

Hoary Bat

Pocketed Free-tailed Bat*

Western Mastiff Bat*

Western Pipistrelle Bat

Western Red Bat*

*Sensitive Species

Species (Clark 2010)

Barn Owl

Cliff Swallow

Common Raven

House Finch

Red Tail Hawk (nest)

Rock Wren

White-throated Swift

RECON

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FIGURE 4-23

Cliffs and Rocky Outcroppings
within Mission Trails Regional Park

starvation. First documented in New York in the winter of 2006–2007, WNS has spread across the eastern United States and Canada, resulting in 90 to 100 percent mortality of bats in hibernaculum where WNS occurs (USFWS 2011). While this fungus has not yet been reported in the western U.S., it is anticipated that WNS will continue spreading to surrounding states, and the potential exists for outbreaks due to human activities in states distant to the currently affected area (USFWS 2011). The mobility of bats, the rapid spread of WNS, and the potential for human-assisted transmission has resulted in guidelines that require a national effort by land owners and resource agencies to avert irreversible losses to bat populations, and associated ecological impacts, throughout North America (USFWS 2011). These guidelines, *A National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats* (USFWS 2011), provide guidance on regulation or restriction of human actions that are likely to pose a risk for spreading WNS, including recreation activities that bring humans in close proximity with bats, such as caving and climbing near roosts and hibernaculum. MTRP contains several rock faces containing large bat roosts which overlap with popular recreational rock climbing activities.

4.3.1.5 Management Goals

Goal: Maintain populations of cliff dwelling and rocky outcrop sensitive species while allowing for recreational activities at MTRP.

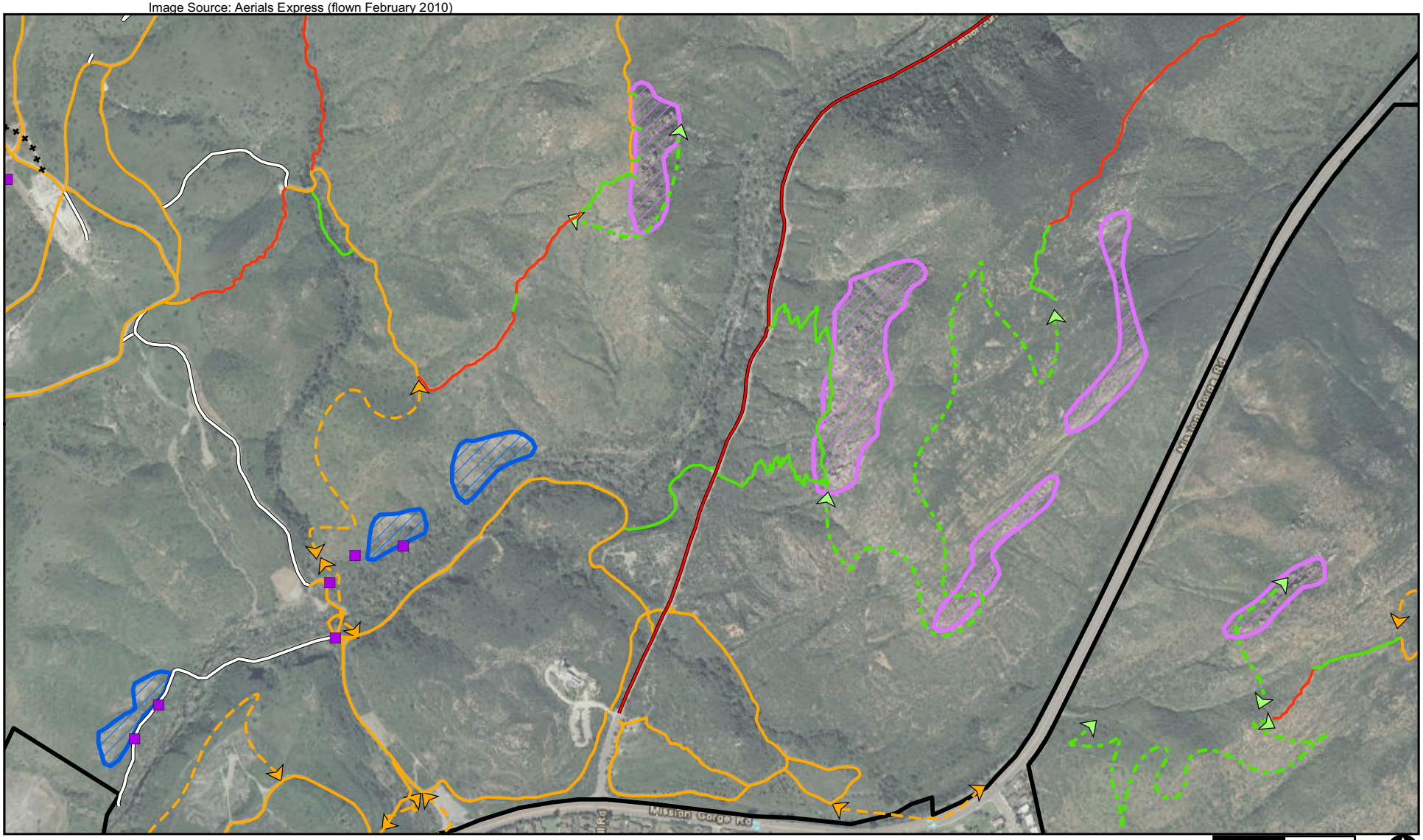
Objective 1: Exclusionary Signage

- As the two quarry cliff faces (Southwest Boundary Quarry and Jackson Drive Quarry) contain resident, state-listed roosting bats with regional emerging threats to bat roosts, it is recommended that these areas are to be protected from recreational disturbance. Currently the access to the Southwest Boundary Quarry is via an infrequently used utility road. This road should remain closed to recreational activities. Exclusionary signage with specific reference to rock climbing restrictions and enforcement should be placed at access points and cliff bases at both quarry locations (Figure 4-24).

Objective 2: Ranger Patrols

- Ranger patrols should be expanded to target unauthorized recreational access on quarry cliff faces (Southwest Boundary Quarry and Jackson Drive Quarry). Patrols should be should be scheduled at random intervals during peak bat breeding and roosting activity (March–September) and can be conducted via binoculars. Violation numbers and type should be tracked and used to inform adaptive management actions (signage, user education, etc.).

Image Source: Aerials Express (flown February 2010)



Quarry Cliff Faces
Rocky Outcroppings
Proposed Exclusionary Signage

Trail Re-Routes/Closures
Localized Re-route
Planned Closure

Existing Trails-Proposed Use
Other Circulation
Hiking Trail
Hike/Bike Trail
Class I Multi-use Path

Proposed New Trails
Hiking
HikeBike

0 Feet 1,000

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FIGURE 4-24
Cliff and Rocky Outcroppings Guilds
Management Action: Mission Trails Regional Park

4.3.1.6 Monitoring

In order to track the response of sensitive species to recommended management actions, surveys for raptors and bats should be conducted as follows:

- Observations and warnings/citations of unauthorized recreational activities (rock climbing) within sensitive roosting sites (Southwest Boundary Quarry and Jackson Drive Quarry) should be tracked by MTRP Park Rangers and the Habitat Manager to inform management actions.

4.3.2 East Elliott Clay Ridgelines

4.3.2.1 Background

The East Elliott area is characterized by a dissected landscape of ridges and drainages over predominantly clay soils. The ridgelines within the East Elliott area were observed in the field and through aerial photography to have plant assemblages distinct from the surrounding vegetation types, including a significant coverage of biological crusts (Photograph 4-10). Distinct characters observed on ridgelines within the East Elliott area include:

- Intact extensive biological soils crusts
- Sparse woody vegetation
- A high number of sensitive species
- Low densities of exotic species

Biological soil crusts, such as those observed in the East Elliott area, have been recognized as a major influence on terrestrial ecosystems (U.S. Department of the Interior 2001). Biological crusts are composed of lichens, fungal hyphae, and cyanobacteria which bind soil particles together to form a “living carpet” between vascular plants.

The open nature of the habitat within this guild provides unique niche opportunities for a variety of sensitive species. The biological crusts on the ridgelines of the East Elliott area of MTRP are correlated with a suite of sensitive species which require a relatively open habitat with an intact soil structure near coastal sage scrub and/or chaparral (Table 4-13). Managing threats to these open habitats as a single management unit should decrease long-term impacts, edge effects, and associated restoration costs to all associated sensitive species. Major threats to the biological crusts on the East Elliott ridgelines include soil disturbance through recreational uses and associated weed colonization (see Section 4.3.2.5).

Photograph 4-10: Detail of soil crusts within East Elliott Clay Ridgeline Guild at MTRP.

TABLE 4-13
SENSITIVE SPECIES WITHIN THE
EAST ELLIOTT CLAY RIDGELINE MANAGEMENT GUILD

Species	MSCP Covered?
Rufus-crowned sparrow	Yes
San Diego Horned Lizard	Yes
San Diego barrel cactus	Yes
San Diego golden star	Yes
Variegated dudleya	Yes
Grasshopper Sparrow	No
Ashy spike-moss	No
Western dichondra	No
Quino checkerspot butterfly	No

Using the membership rules below, a geographic information system (GIS) model was created to map geographic areas for this guild (Figure 4-25).

Image source: Aerials Express (flown March 2010)

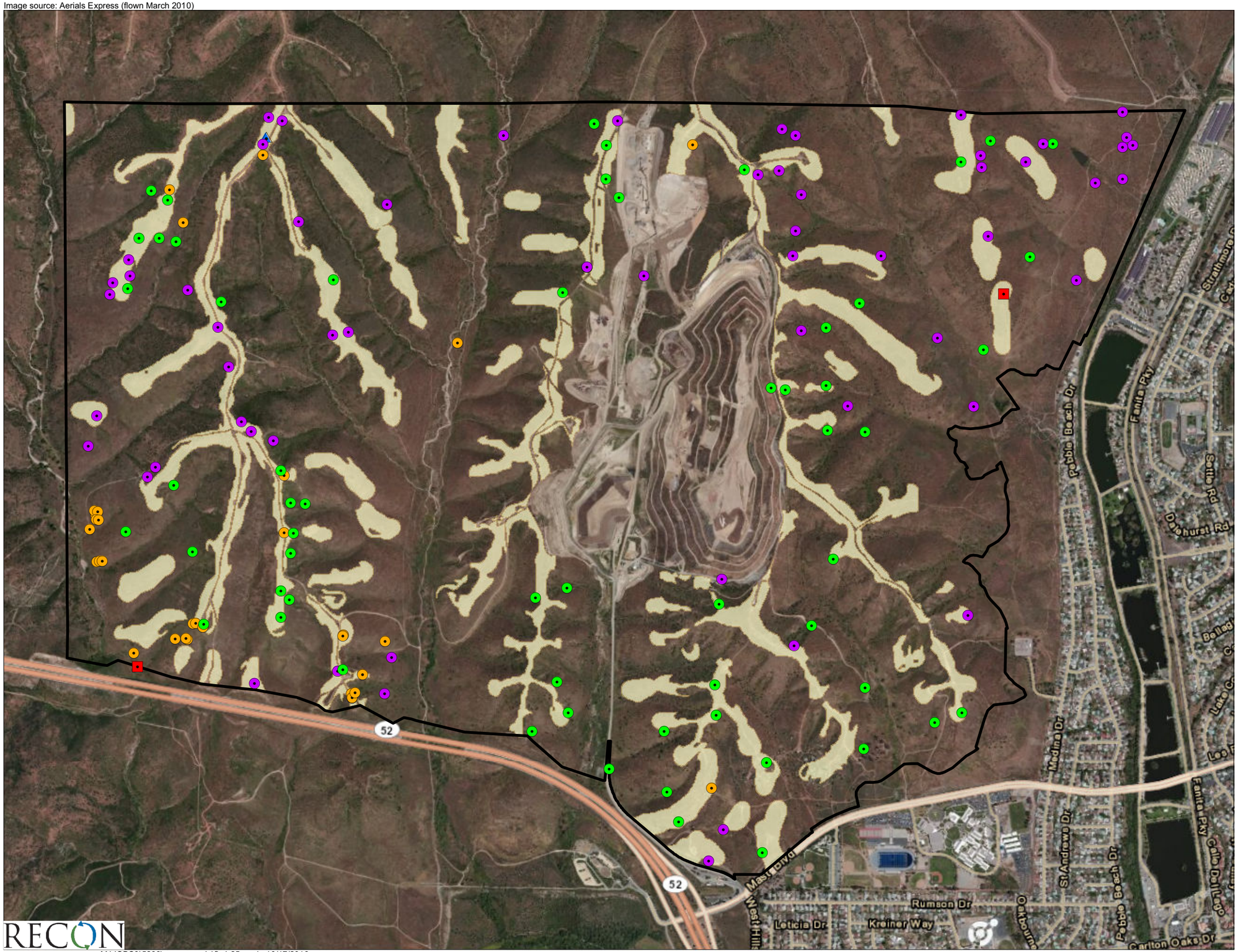

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FIGURE 4-25

East Elliott Clay Ridgeline Guild within Mission Trails Regional Park

4.3.2.2 Membership Rules

- Ridgeline soil crusts at East Elliot

  Using location data taken at the edges of ridgeline soil crusts within the East Elliott area of MTRP, soil crusts appear to occur within ridge topography with slopes less than 19.2 degrees (σ = 4.2 degrees).

- Soil type = Redding cobbly loam

- Mapped as CSS or Chaparral vegetation

4.3.2.3 MSCP Conditions of Coverage for Covered Guild Species

4.3.2.3.1 Rufus-crowned Sparrow

ASMDs must include maintenance of dynamic processes, such as fire, to perpetuate some open phases of coastal sage with herbaceous components (MSCP 1998: Table 3-5).

4.3.2.3.2 San Diego Horned lizard

ASMDs must include specific measures to maintain native ant species, discourage the Argentine ant, and protect against detrimental edge effects to this species (MSCP 1998: Table 3-5).

4.3.2.3.3 San Diego Barrel Cactus

ASMDs must include specific measures to protect against detrimental edge effects and unauthorized collection, and include appropriate fire management/control practices to protect against a too-frequent fire cycle (MSCP 1998: Table 3-5).

4.3.2.3.4 San Diego Golden Star

ASMDs must include specific measures to protect against detrimental edge-effects (MSCP 1998: Table 3-5).

4.3.2.3.5 Variegated Dudleya

ASMDs must include species-specific monitoring and specific measures to protect against detrimental edge effects to this species, including effects caused by recreational activities (MSCP 1998: Table 3-5).

4.3.2.4 Threats at MTRP

4.3.2.4.1 Recreational Activities – Trampling

Recreational activities can disturb biological crusts via soil compaction and direct shearing forces (U.S. Department of the Interior 2001). People have a natural affinity toward open vegetation types and, without proper educational and exclusionary signage, will passively recreate on biological crusts (Belnap and Lange 2001). Recreational uses can also serve as a vector for exotic plant invasion by transporting weed seeds from site to site via boots, tires, or feces.

4.3.2.4.2 Invasive Non-native Species

Invasive annual species pose a significant threat to biological crusts at MTRP. Invasion of biological crusts by annuals grasses has been linked with a sharp decrease in diversity of biological crust coverage and species diversity (Kaltenecker 1997). This is likely caused by decreased available soil surface, shading, and/or a related increased fire frequency.

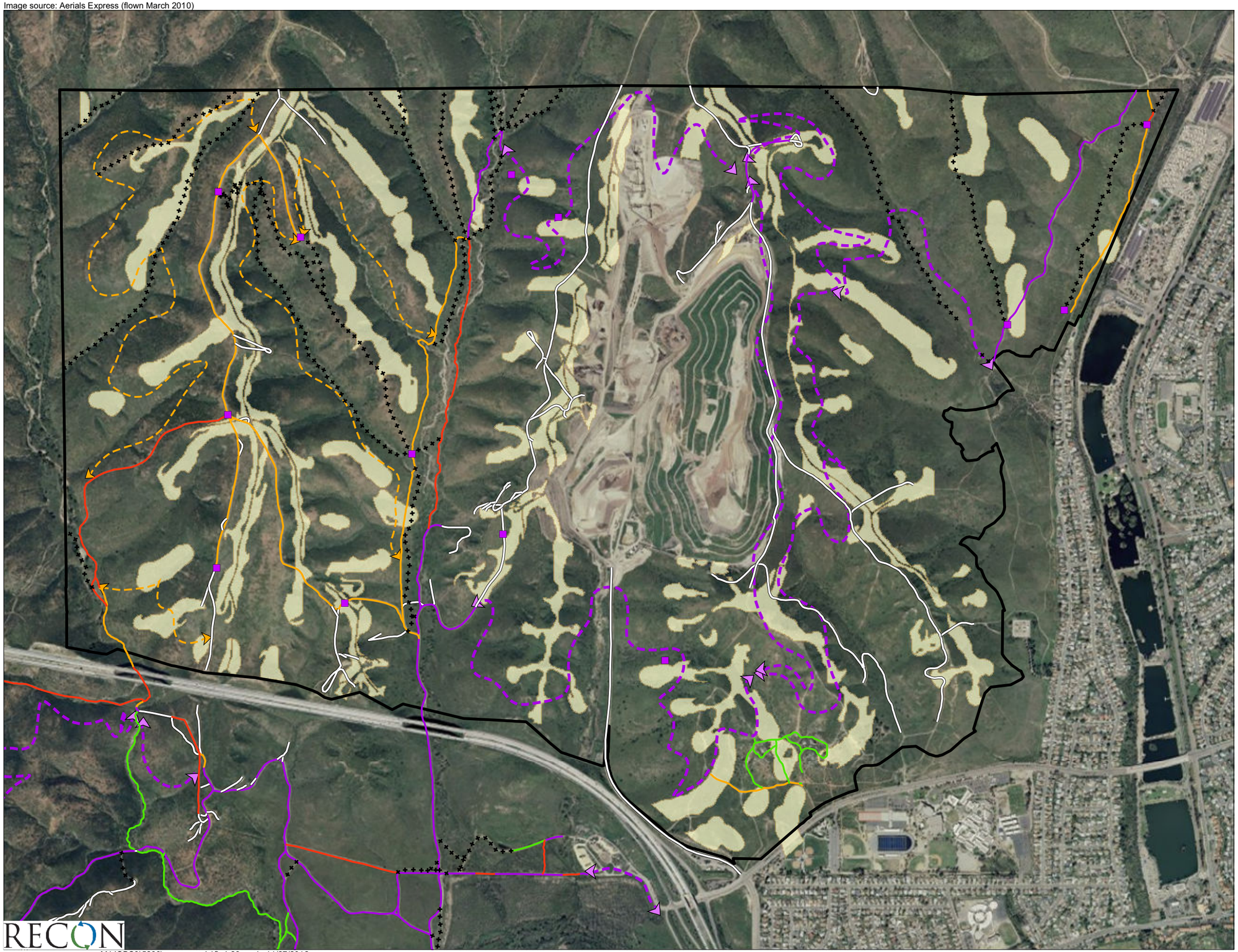
4.3.2.5 Monitoring and Management Goals

Goal: Maintain spatial distribution and biological crust diversity of East Elliott clay ridgelines at MTRP.

Objective 1: Trail Closure / Reroutes

- Several trails currently exist within the management guild boundaries. As the East Elliott area has not yet been fully acquired as a part of MTRP, trails within the guild boundaries are a combination of utility roads (SDG&E) and unauthorized recreational (hiking and mountain biking) trails. As a part of the Master plan Update associated with the document, new trail use within the guild boundaries will be minimized and trail redundancies will be eliminated or rerouted around Management Guild areas when possible (Figure 4-26).

Image source: Aerials Express (flown March 2010)



Project Boundary
East Elliott Clay Ridgeline Guild
Proposed Exclusionary Signage

Trail Re-Routes/Closures
Localized Re-route
Planned Closure

Existing Trails-Proposed Use
Other Circulation
Hiking Trail
Hike/Bike Trail
Multi-use Trail

Proposed New Trails
HikeBike
Multi

0 Feet 1,000

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FIGURE 4-26

East Elliott Clay Ridgeline Guild
Management Actions

Objective 2: Biological Crusts Baseline Survey

- Map spatial extent of biologic crusts within the East Elliott Clay Ridgeline Management Area using a combination of recent aerial visual/infrared photography and ground truthing surveys with submeter GPS. As pedestrian surveys have the potential to transport weed seeds, surveys should be planned to minimize ingress and egress within guild boundaries. This data should be used to refine guild boundaries to accurately reflect the distribution and quality of biological crusts in East Elliott.

- Review vegetation monitoring data collected by the Deutschman Lab at SDSU for locations that fall within the East Elliott Clay Ridgeline Management Area.

- Where data has not been collected by SDSU, use a 0.5-m^2 quadrat to sample coverage of broad morphological groups of biologic crusts at representative locations throughout the guild boundary (Eldrich and Tozer 1996). Morphological groups of biological crusts may include (Belnap and Lange 2001):

  Lichens - *Gelatinous*
  Crustose
  Squamulose
  Fruticose/foliose

  Mosses - *All*
  Short

  This information will be used as a baseline condition to track effects of management actions and the initiating of official trail use within this guild boundary.

Objective 3: Sensitive Plant Species Update

- Sensitive plant species surveys should be conducted within and adjacent (50 foot buffer) to Guild boundaries. Sensitive plant surveys have not been conducted within the East Elliott area since 2001. Wildfires burned 100 percent of the area in 2003. Sensitive plant surveys should be conducted to determine the current status of previously observed populations and the occurrence of new or previously unobserved populations post fire. For efficiency, these surveys can be conducted simultaneously as biological crust surveys (4.3.2.4) and dudleya variegata update surveys (4.2.2.4). Targeted species for the sensitive plant survey are listed in Table 4-14. MSCP covered species should be given priority if funding and timing of surveys is limited. All sensitive species (MSCP covered or otherwise) data collected during surveys should be submitted to the CNDDB.

TABLE 4-14
EAST ELLIOTT CLAY RIDGELINE SURVEY: SENSITIVE SPECIES TARGETS

Species	CNPS Rank	MSCP Covered?
San Diego Thornmint	1B.1	Yes
Del Mar Manzanita	1B.1	Yes
San Diego goldenstar	1B.1	Yes
Orcutt's brodiaea	1B.1	Yes
Wart-stemmed ceanothus	2.2	Yes
Long-spined spineflower	1B.2	No
Summer holly	1B.2	No
Variegated dudleya	1B.2	Yes
San Diego button celery	1B.1	Yes
San Diego barrel cactus	2.1	Yes
Mission canyon blue cup	3.1	No
Robinson's pepper grass	1B.2	No
Little mousetail	3.1	No

Objective 4: Exclusionary Signage

- Place educational panels and/or signage at critical access points within the Management Guild with information regarding the value and sensitivity of biotic crusts (see Figure 4-26). Signage should be located a sufficient distance from crust areas to limit any associated impacts.

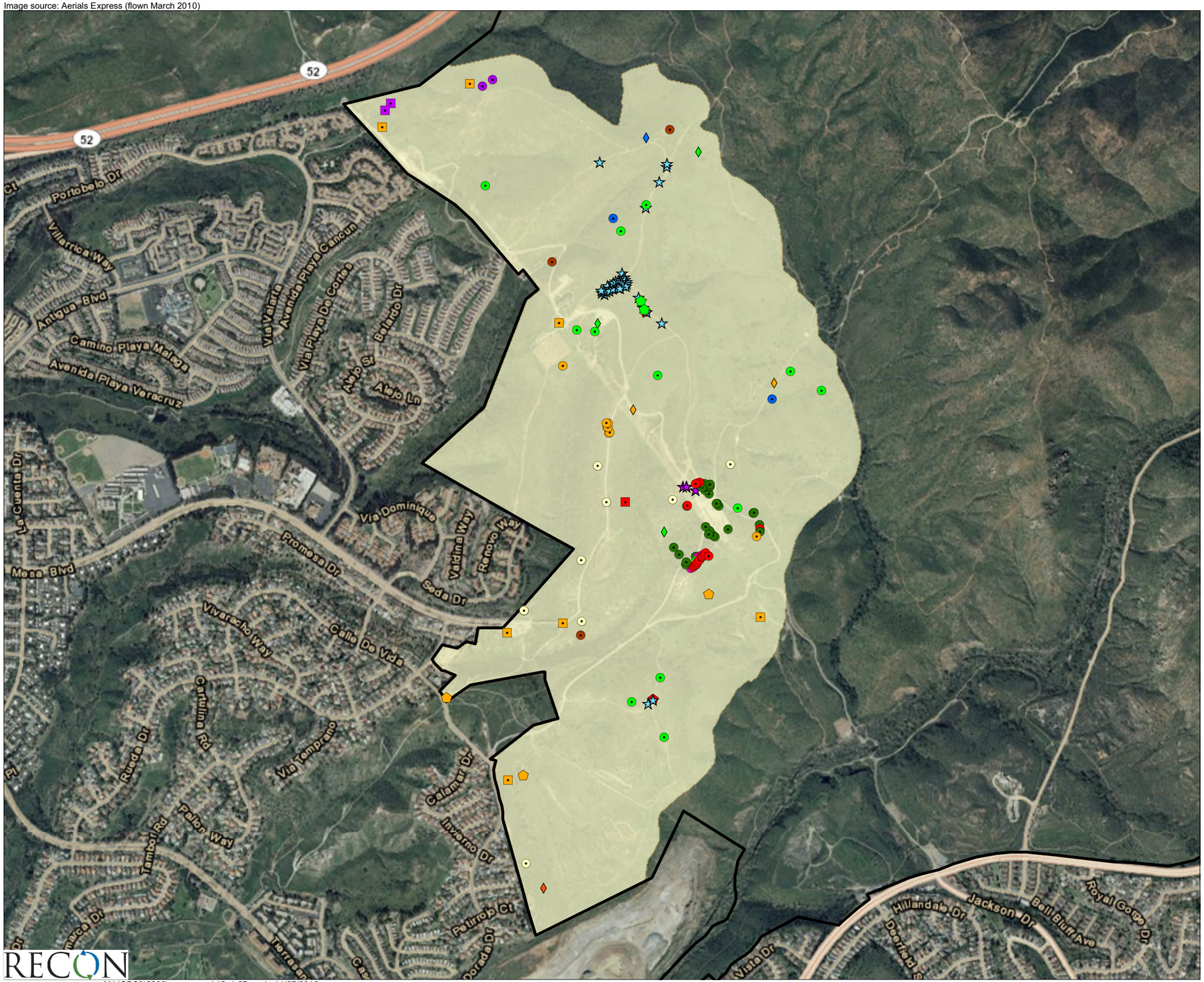
4.3.3 Tierrasanta Clay Ridge

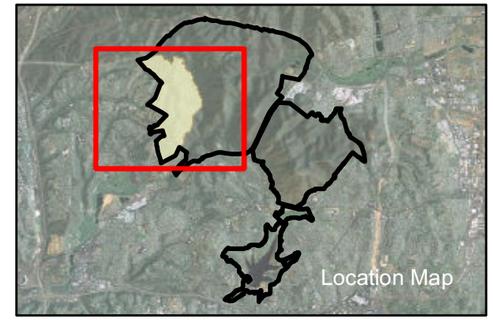
4.3.3.1 Background

The eastern portion of the Fortuna Mountain area contains a broad, dissected clay ridgeline which is vegetated with a matrix of coastal sage scrub, chaparral, and non-native grassland vegetation (Photograph 4-11). As with the East Elliott Clay Ridgelines, these areas contain patches of intact biological soils crusts and a relatively high number of sensitive species. (Figure 4-27 and Table 4-15). Biological crusts are correlated with sensitive species at MTRP and provide unique open habitat with a stable soil structure. As with the East Elliott Clay Ridgeline Management Guild, the protection of biological crusts near Tierrasanta from disturbance has long-term implications to sensitive species and future management costs. The majority of this area was burned in fires in 2003. The Tierrasanta Clay Ridge Management Guild is distinct from East Elliott Clay Ridgeline Management Guild in that these areas:

- Have topographically flat areas which contain vernal pools
- Have a variety of dominant clay soil types
- Contain several major utility corridors (SDCWA and SDG&E)
- Are adjacent to residential development
- Are invaded by false brome on a landscape scale

Image source: Aerials Express (flown March 2010)





- Project Boundary
- Tierrasanta Clay Guild

Sensitive Species

- Ashy Spike-moss
- Decumbent Goldenbush
- Palmer's Grappling Hook
- San Diego Barrel Cactus
- San Diego County Viguiera
- San Diego Goldenstar
- San Diego Thornmint
- Summer Holly
- Western Dichondra
- Woven-spored Lichen
- Variegated Dudleya
- San Diego Desert Woodrat
- Mule Deer
- Black-tailed Jackrabbit
- San Diego Pocket Mouse
- Coastal California Gnatcatcher
- Least Bell's Vireo
- Southern California Rufus-crowned Sparrow
- Western Spadefoot Toad
- Belding's Orange-throated Whiptail
- San Diego Fairy Shrimp
- Vernal Pool
- Quino Checkerspot Butterfly

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FIGURE 4-27

Tierrasanta Clay Guild
Presence within Mission Trails Regional Park

Photograph 4-11: Vegetation present within the Tierrasanta Clay Ridge Management Guild boundary.

TABLE 4-15
SENSITIVE SPECIES OBSERVED WITHIN
TIERRASANTA CLAY RIDGE MANAGEMENT GUILD AT MTRP

Species	MSCP Covered?
San Diego Barrel Cactus	Yes
San Diego Thorn-mint	Yes
Variegated Dudleya	Yes
San Diego Golden Star	Yes
Ashy Spike-moss	No
Western Spadefoot Toad	No
San Diego Fairy Shrimp	No
San Diego County Viguiera	No
Vernal Pools	No

4.3.3.2 Membership Rules

- Fortuna Mountain area
- Clay soils (all)
- Elevation < 800 feet

4.3.3.3 MSCP Conditions of Coverage for Covered Guild Species

4.3.3.3.1 San Diego Barrel Cactus

Area-specific management directives must include specific measures to protect against detrimental edge effects and unauthorized collection, and include appropriate fire management/control practices to protect against a too-frequent fire cycle (MSCP 1998: Table 3-5).

4.3.3.3.2 San Diego Thornmint

Area-specific management directives must include specific measures to protect against detrimental edge effects from surrounding development (MSCP 1998: Table 3-5).

4.3.3.3.3 Variegated Dudleya

Area-specific management directives must include species-specific monitoring and specific measures to protect against detrimental edge effects to this species, including effects caused by recreational activities (MSCP 1998: Table 3-5).

4.3.3.3.4 San Diego Golden Star

Area-specific management directives must include specific measures to protect against detrimental edge-effects (MSCP 1998: Table 3-5).

4.3.3.4 Threats at MTRP

4.3.3.4.1 Invasive Non-native Species

Large portions of the Tierrasanta Clay Ridge Guild contain high densities of exotic annual grasses (RECON 2009). This is likely a result of wildfires burning the area in both 1981 and 2003.

4.3.3.4.2 Recreational Activities – Trampling

The Tierrasanta Clay Ridge Guild boundary is directly adjacent to residential housing, a MTRP entrance, and associated increased levels of recreation traffic. Recreation has been associated with wildlife behavior disturbance, the introduction and spread of exotic weeds, and exotic animal introductions (pets).

4.3.3.4.3 Fire and Fire Suppression

According to fire maps, areas within the Guild boundary have burned both in 1981 and 2003. Most vegetation within the Guild boundary is within a seral successional stage and will continue to develop as long as fire is excluded from within the area.

4.3.3.5 Management Goals

Goal: Maintain habitat quality, spacial extent, and species richness of native species within Guild boundary

Objective 1: Survey Biological Crusts

- Use techniques described in Section 4.3.2.4 to map spatial extent and composition of biologic crusts within the Tierrasanta Clay Ridgeline Guild boundary.

Objective 2: Trail Closure/ Reroute

- Trail redundancies within the Tierrasanta Clay Ridgeline Guild boundary Management Area will be minimized as a part of the Master Plan Update associated with this document. In addition, an existing trail will be rerouted outside of vernal pool watersheds within the Guild boundaries (Figure 4-28).

Objective 3: Implement Vernal Pool HCP Recommendations

- Implement site-specific management recommendations from the Draft City of San Diego Vernal Pool Mitigation and Monitoring Program for Mission Trails Regional Park crafted to stabilize the habitat conditions for sensitive vernal pool species including San Diego fairy shrimp (*Branchinecta sandiegonensis*). These recommendations should be coordinated through restoration planning and include:
    - Create and implement an invasive species control program including weed control and dethatching
    - Where appropriate, increase populations of focal species with historical distributions within the Park, including San Diego button celery (*Eryngium aristulatum*)
    - Create and implement a seed collection/bulking program for focal vernal pool species.

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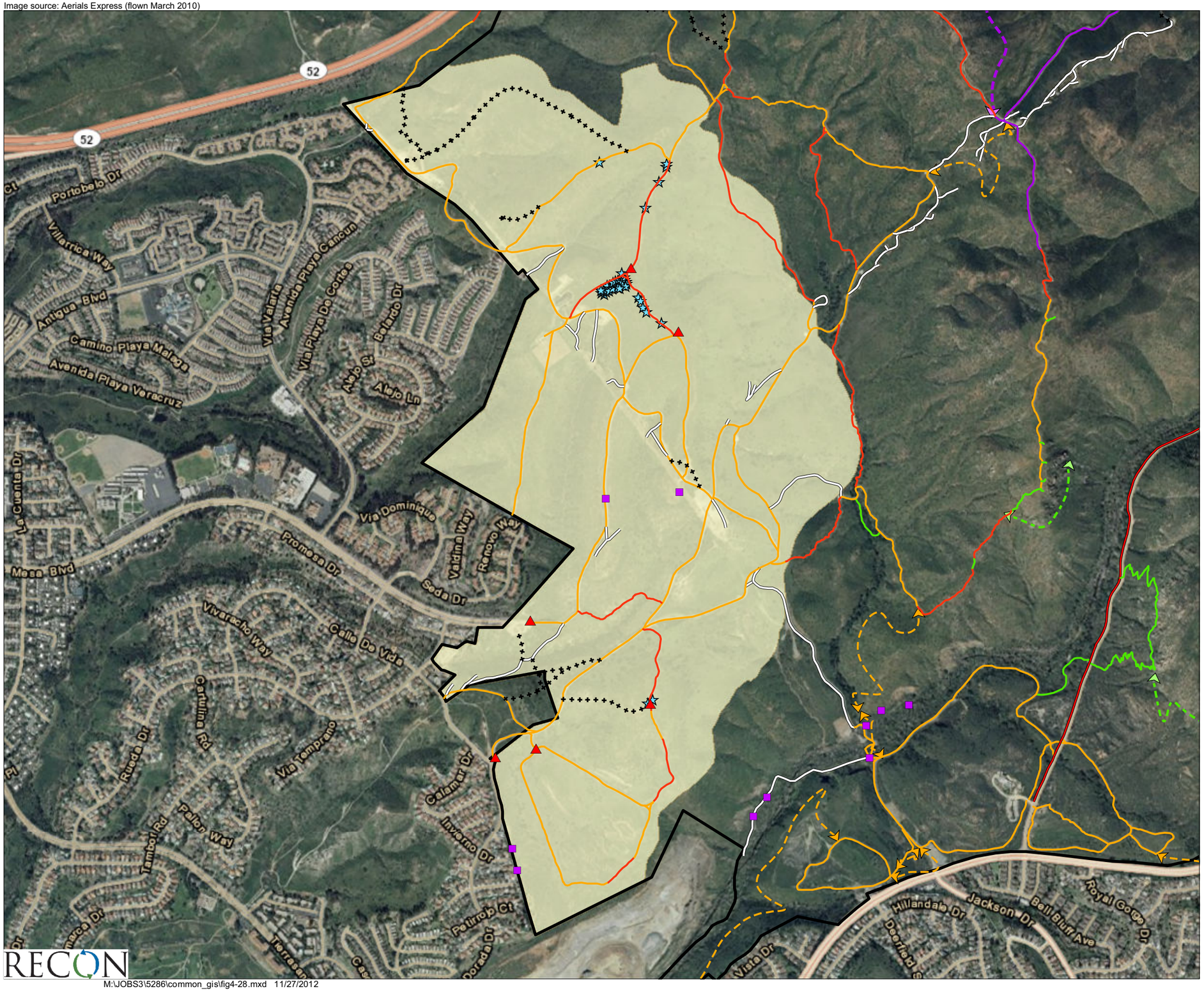
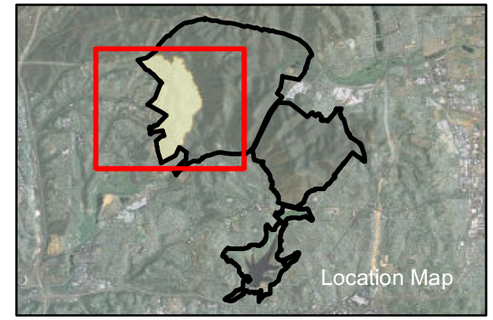
Image source: Aerials Express (flown March 2010)





- Project Boundary
- Tierrasanta Clay Guild
- Exclusionary Signage
- Proposed Exclusionary Signage

Sensitive Species

- Vernal Pool

Trail Re-Routes/Closures

- Localized Re-route
- Planned Closure

Existing Trails-Proposed Use

- Other Circulation
- Hiking Trail
- Hike/Bike Trail
- Multi-use Trail
- Class I Multi-use Path

Proposed New Trails

- Hiking
- HikeBike
- Multi

0 Feet 1,000

FIGURE 4-28

Tierrasanta Clay Guild
Management Actions:
Mission Trails Regional Park

RECON

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4.3.4 Riparian Woodlands

4.3.4.1 Background

Riparian woodlands at MTRP are primarily located within floodplain of the San Diego River within the Mission Gorge area of the MTRP (Figure 4-29). The Mission Trails reach of the San Diego River generally supports mature riparian forest consisting primarily of willows (*Salix* spp.), with fewer cottonwoods (*Populus fremontii*) and yet fewer sycamores (*Platanus racemosa*) (Photograph 4-12). Coast live oak (*Quercus agrifolia*) occurs as scattered individuals or small stands peripheral to the main riparian zone.

The species composition of the riparian forest through MTRP varies little, although the structure is not uniform. The tallest, most uniformly mature forest occurs from the north side of Kumeyaay Lake to the approximate midpoint of the reach, east of South Fortuna Peak. The forest averages 50 to 70 feet tall, with the largest sycamores and cottonwoods reaching 80 feet. The canopy of riparian woodland at MTRP is generally closed and continuous.

Photograph 4-12: Habitats present within the Riparian Woodland Guild at MTRP.

Riparian understory at MTRP is generally diverse and composed of mostly native species (RECON 2010). The riparian woodlands within MTRP contain very few invasive

species due to a comprehensive long-term invasive plant removal project. One instance of giant reed (*Arundo donax*) was observed at the extreme southern (downstream) end of the river (RECON 2009). Within the region, giant reed was removed from the San Diego River directly upstream of the MTRP boundary at Carlton Oaks in 2008/2009 (Lynn and Kus 2010).

Riparian woodlands at MTRP serve as habitat to a variety of sensitive species (Table 4-16). A large, stable population of the federally endangered least Bell's vireo currently occupies habitat within the Riparian Woodland Guild boundary. This population has grown from eight territorial males in 1978 to 21 territorial males in 2010 (Lynn and Kus 2010, Kus and Beck 1998). Southwestern willow flycatcher (*Empidonax traillii extimus*) has been observed, but is not believed to nest within the Guild boundary (RECON 2010).

TABLE 4-16
SENSITIVE SPECIES OBSERVED WITHIN RIPARIAN WOODLANDS AT MTRP

Species	MSCP covered?
Mountain lion	Yes
Mule deer	Yes
Cooper's hawk	Yes
Least Bell's vireo	Yes
Southwestern willow flycatcher	Yes
Belding's orange throated whiptail	Yes
Spiny rush	No
San Diego sagewort	No
Rayless ragwort	No
Purple stemodia	No
Delicate clarkia	No
Yellow warbler	No
White-tailed kite	No
San Diego marsh elder	No
Pocked free-tail bat	No

4.3.4.2 Membership Rules

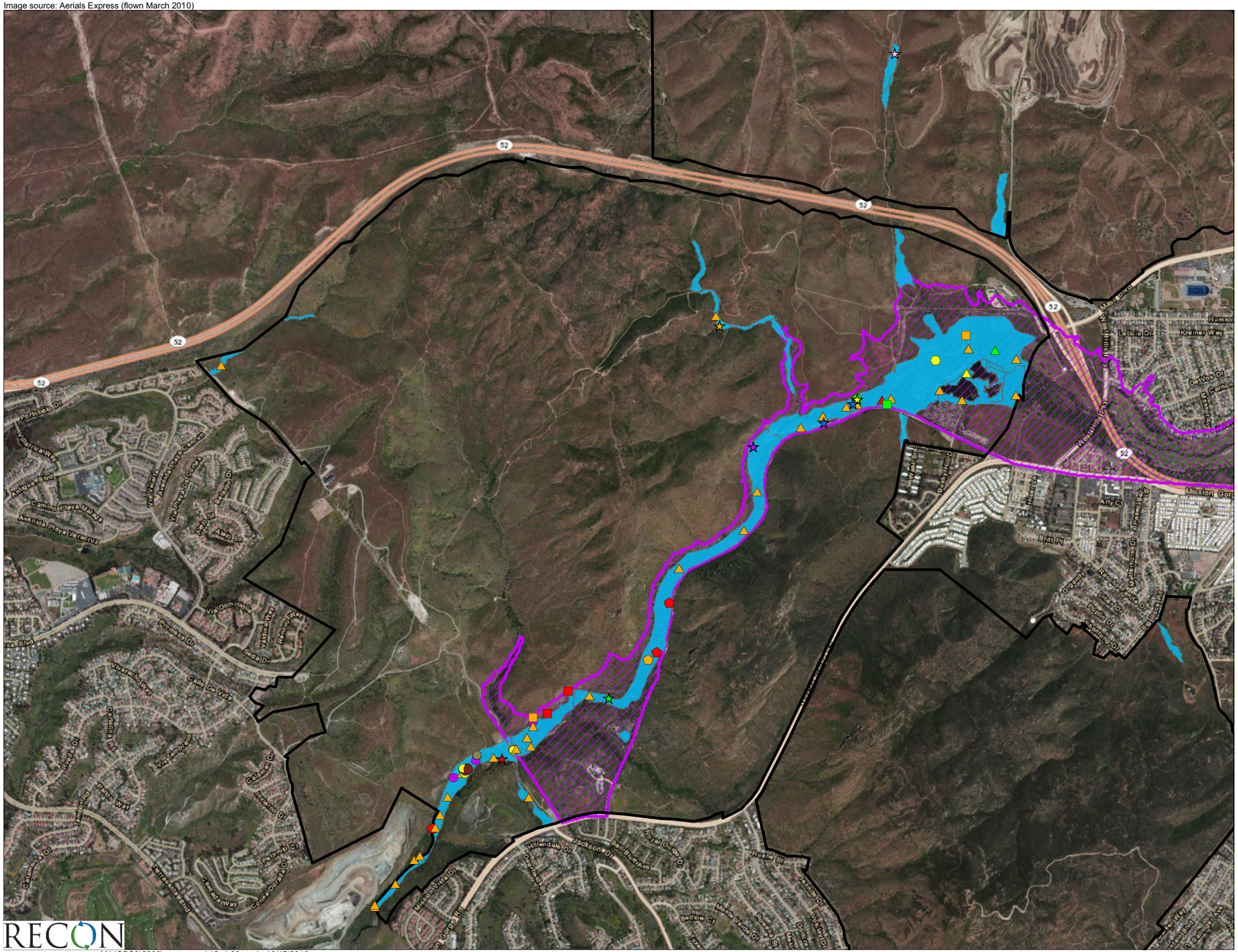
All areas containing SANDAG vegetation community group "Riparian woodlands and Forests."

4.3.4.3 MSCP Conditions of Coverage for Covered Guild Species

4.3.4.3.1 Coopers Hawk

Area-specific management directives must include 300-foot impact avoidance areas around active nests and minimization of disturbance in oak woodlands and oak riparian forests (MSCP 1998: Table 3-5).

Image source: Aerials Express (flown March 2010)



Project Boundary
Riparian Woodland Guild
Least Bell's Vireo Critical Habitat

Riparian Species
- Big Brown Bat
- Big Free-tailed Bat
- Brazilian Free-tailed Bat
- Greater Western Mastiff Bat
- Hoary Bat
- Pocketed Free-tailed Bat
- Western Mastiff Bat
- Western Pipistrelle Bat
- Western Red Bat
- Cooper's Hawk
- Least Bell's Vireo
- Light-footed Clapper Rail
- Southwestern Willow Flycatcher
- Mountain Lion
- Mule Deer
- San Diego Pocket Mouse
- Belding's Orange-throated Whiptail
- Ring-necked Snake
- White-tailed Kite
- Yellow Warbler
- Delicate Clarkia
- Orcutt's Brodiaea
- Purple Stemodia
- Rayless Ragwort
- San Diego Sagewort
- Spiny Rush
- Willowy Monardella

0 Feet 2,000

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FIGURE 4-29

Riparian Woodland Presence within Mission Trails Regional Park

4.3.4.3.2 Least Bell's Vireo

Area-specific management directives must include measures to provide appropriate successional habitat, upland buffers for all known populations, cowbird control, and specific measures to protect against detrimental edge effects to this species. Any clearing of occupied habitat must occur between September 15 and March 15 (MSCP 1998: Table 3-5).

4.3.4.3.3 Southwestern Willow Flycatcher

Area-specific management plans must include measures to provide appropriate successional habitat, upland buffers for all known populations, cowbird control, and specific measures to protect against detrimental edge effects to this species. Any clearing of occupied habitat must occur between September 1 and May 1 (i.e., outside of the nesting period) (MSCP 1998: Table 3-5).

4.3.4.3.4 Belding's Orange-Throated Whiptail

Area-specific management directives must address edge effects (MSCP 1998: Table 3-5).

4.3.4.4 Threats at MTRP

The riparian woodlands at MTRP are relatively healthy and do not have significant unmanaged threats. Several historic threats have the potential of becoming significant if current management is discontinued or if other external factors cause a shift in threat intensity.

4.3.4.4.1 Invasive Non-native Species – Cowbird Parasitism

Brown-headed cowbird brood parasitism has been implicated as a major factor in the decline and low reproductive success of vireos and other riparian birds (Franzreb 1989). Although cowbird females, which search through vegetation for host nests in which to lay their eggs, are highly mobile and adept at locating hosts, it is well documented that local occurrence of cowbirds is enhanced by proximity of agricultural land and grazing livestock, which provide ready food resources in the form of seeds and insects associated with or exposed by the movements of large animals. An equestrian staging area has been built approximately 300 feet north of the San Diego River Flood plain and may act as a source for cowbird invasion, and an associated cowbird trapping mitigation program is in place in the vicinity of the staging area. Additional non-mitigation cowbird trapping has been conducted by both the City and USGS.

4.3.4.4.2 Invasive Non-native Species – Giant Reed

Giant reed displaces native plants and associated wildlife species because of the massive stands it forms, and is also suspected of altering hydrological regimes and reducing groundwater availability by transpiring large amounts of water from semi-arid aquifers (Bell 1997). As giant reed replaces riparian vegetation it reduces habitat and food supply, particularly insect populations for avian species (Frandsen and Jackson 1994), and reduces shade cover to the in-stream habitat leading to increased water temperatures and reduced habitat quality for aquatic wildlife (Franklin 1996).

A comprehensive, long-term arundo removal project within the San Diego River has limited the extent of giant reed within MTRP. Two small populations of giant reed were observed by RECON vegetation surveys in 2010 (RECON 2010). One population was observed within the southwestern end of the San Diego River near the MTRP boundary. The second population was observed on a mesa top south of the Riparian Woodland Guild Management Area, outside of the floodplain of the San Diego River.

4.3.4.5 Monitoring and Management Goals

Goal: Maintain high-quality habitat within riparian woodlands at MTRP.

Objective 1: Continue Cowbird Control Programs

- Coordinate with regional efforts (U.S. Geological Survey [USGS] Western Ecological Research Center) to refine and implement a cowbird trapping program that optimizes benefits to least Bell's vireo both short and long term.

Objective 2: "Search and Destroy" Giant Reed Surveys

- Continue the on-going, long-term invasive plant removal project within the San Diego River riparian area. Giant reed propagules have a potential to enter the Riparian Woodland Management Guild boundaries from upstream sources. "Search and destroy" surveys should be conducted within the Guild Boundary bi-annually or six months after major flood events to identify, map, and remove small infestations of giant reed. Information collected at each identified population should include:

    - GPS location of infestation
    - Size of infestation (square feet)
    - Control method used to remove giant reed
    - Adjacent vegetation community

4.3.5 Coastal Sage Scrub – *Artemisia*/*Eriogonum*

4.3.5.1 Background

The Coastal Sage Scrub – Artemisia/Eriogonum Management Guild is a subset of Diegan Coastal Sage Scrub, a vegetation community comprised low-growing, aromatic, drought-deciduous, soft-woody shrubs that have an average height of three to four feet. California sagebrush (*Artemisia californica*) and flat-topped buckwheat (*Eriogonum fasciculatum*) are found on xeric sites with steep slopes or on clay-rich soils that are slow to release stored water. Coastal sage scrub often occurs on south- or west-facing slopes, but can occasionally occur on north-facing slopes, where the community can act as a successional phase of chaparral development (Figure 4-30a-c and Photograph 4-13). California sagebrush and flat-top buckwheat are a primary habitat component for several sensitive species including the California gnatcatcher (Unit 2004, Atwood and Bontrager 2001). Several sensitive species have been observed utilizing habitat within the management guild boundary (Table 4-17).

Photograph 4-13: *Artemisia californica*-dominated scrub at MTRP.

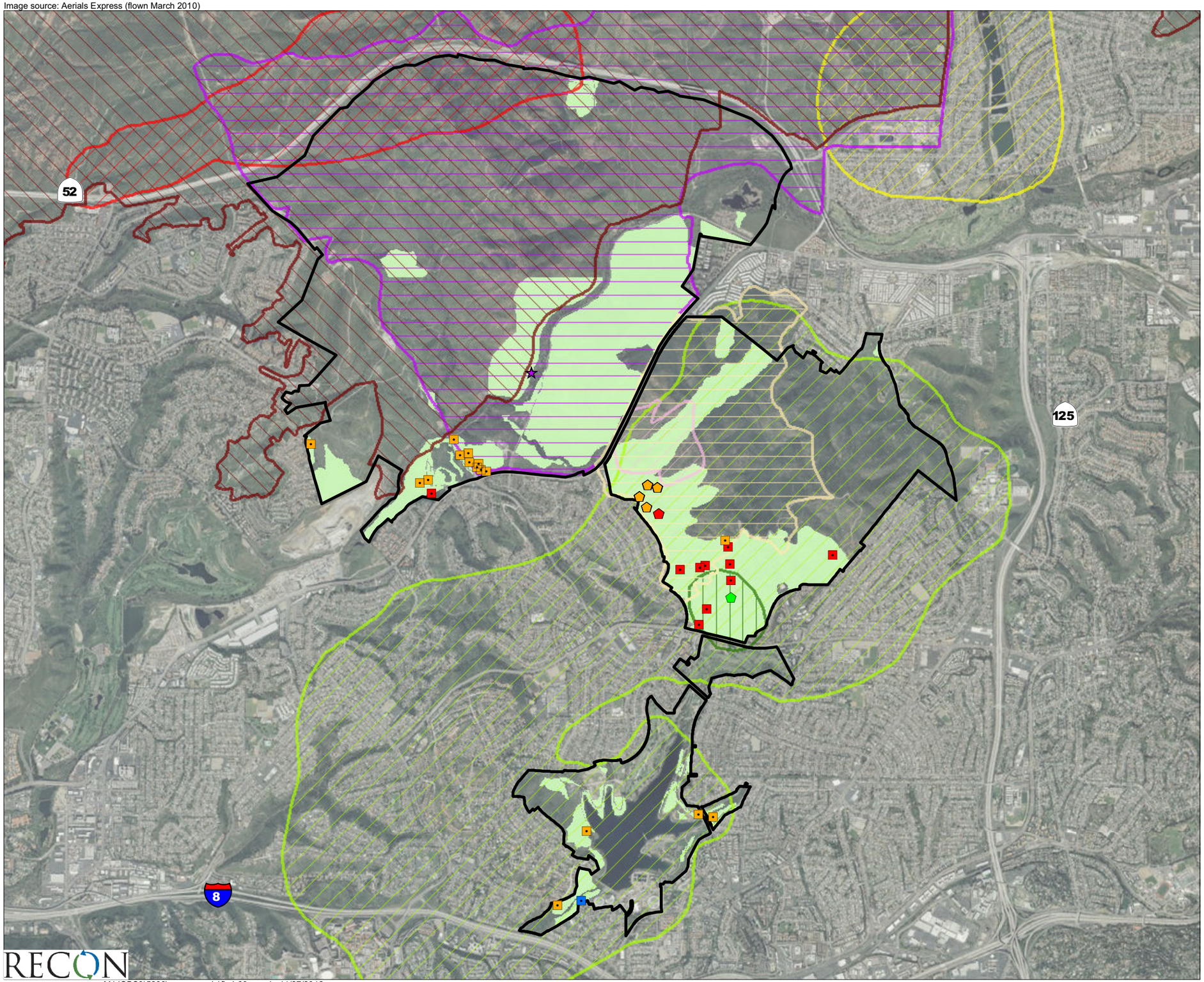
TABLE 4-17
SENSITIVE SPECIES OBSERVED WITHIN THE COASTAL SAGE SCRUB – ARTEMISIA/ERIOGONUM GUILD AT MTRP

Sensitive Species	MSCP Covered?
San Diego barrel cactus	Yes
San Diego golden star	Yes
Variegated dudleya	Yes
California gnatcatcher	Yes
Southern California rufous-crowned sparrow	Yes
Belding's Orange-throated whiptail	Yes
San Diego horned lizard	Yes
San Diego pocket mouse	No
Ashy spike-moss	No
Long-spined spineflower	No
San Diego County viguiera	No
Long-spined spineflower	No
Grasshopper sparrow	No
Coast Patch-nosed snake	No
Coronado Skink	No
Red diamond rattle snake	No
Ring-necked Snake	No
Western Whiptail	No
Quino checkerspot butterfly	No

A GIS model was developed by TAIC in 2002 to identify quality habitat for California gnatcatcher within San Diego County. Primary elements of the model include vegetation community type (sage vs. non-sage), core size (>25 acres), and slope (<40 percent). This model was run for MTRP on vegetation data collected by USDA Forest Service in 2002 and for this NRMP (RECON 2010) (Figure 31a-b, 32a-b, and 33a-b)).

One should be cautious in directly comparing habitat model results from the 2002 and 2010 vegetation datasets, as there are differences in both precision and accuracy between mapping efforts. USDA mapping was created using remote sensing at regionwide at a scale of 1:24,000, while in 2010 vegetation mapping was conducted with a large amount of ground truthing at the preserve level. Preserve-level mapping at smaller scales more precisely captures vegetation edges and is less likely to "lump" large stands of vegetation. In addition, as higher precision, detailed mapping can create a multitude of small polygons, vegetation core size (>25 acres) parameters of the model may be less likely to be met. The result of vegetation lumping at large scales on the TAIC habitat model may be an overestimate of "high" and "very high" quality acres within an area. This may falsely give the appearance of an absolute decrease in habitat acres when, in reality, the change may be a result of differences in overall mapping methods (and associated precision and accuracy). A previous study using the California gnatcatcher habitat model also found that errors within vegetation datasets affected model performance (Winchell and Doherty 2006). At MTRP for example, eastern East Elliott was initially modeled as having "high" and "very high" California gnatcatcher based

Image source: Aerials Express (flown March 2010)



Project Boundary

Coastal Sage Scrub (*Artemisia/Eriogonum*) Guild

Sensitive Species

- San Diego Cactus wren
- Southern California Rufus-crowned Sparrow
- Coastal California Gnatcatcher
- Belding's Orange-throated Whiptail
- Coast Patch-nosed Snake
- Red Diamond Rattlesnake
- Quino Checkerspot Butterfly

Fire Burn History

- 1939
- 1942
- 1944
- 1981
- 1983
- 1986
- 1988
- 2003

0 Miles 0.5

FIGURE 4-30a

Coastal Sage Scrub (*Artemisia/Eriogonum*) Guild within Mission Trails Regional Park

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Image source: Aerials Express (flown March 2010)

Project Boundary

Coastal Sage Scrub (*Artemisia/Eriogonum*) Guild

Sensitive Species

- San Diego Barrel Cactus
- Southern California Rufus-crowned Sparrow
- Coastal California Gnatcatcher

Fire Burn History

- 1939
- 1941
- 1942
- 1981
- 2003

0 Feet 1,000

FIGURE 4-30b

Coastal Sage Scrub (*Artemisia/Eriogonum*) Guild within East Elliott

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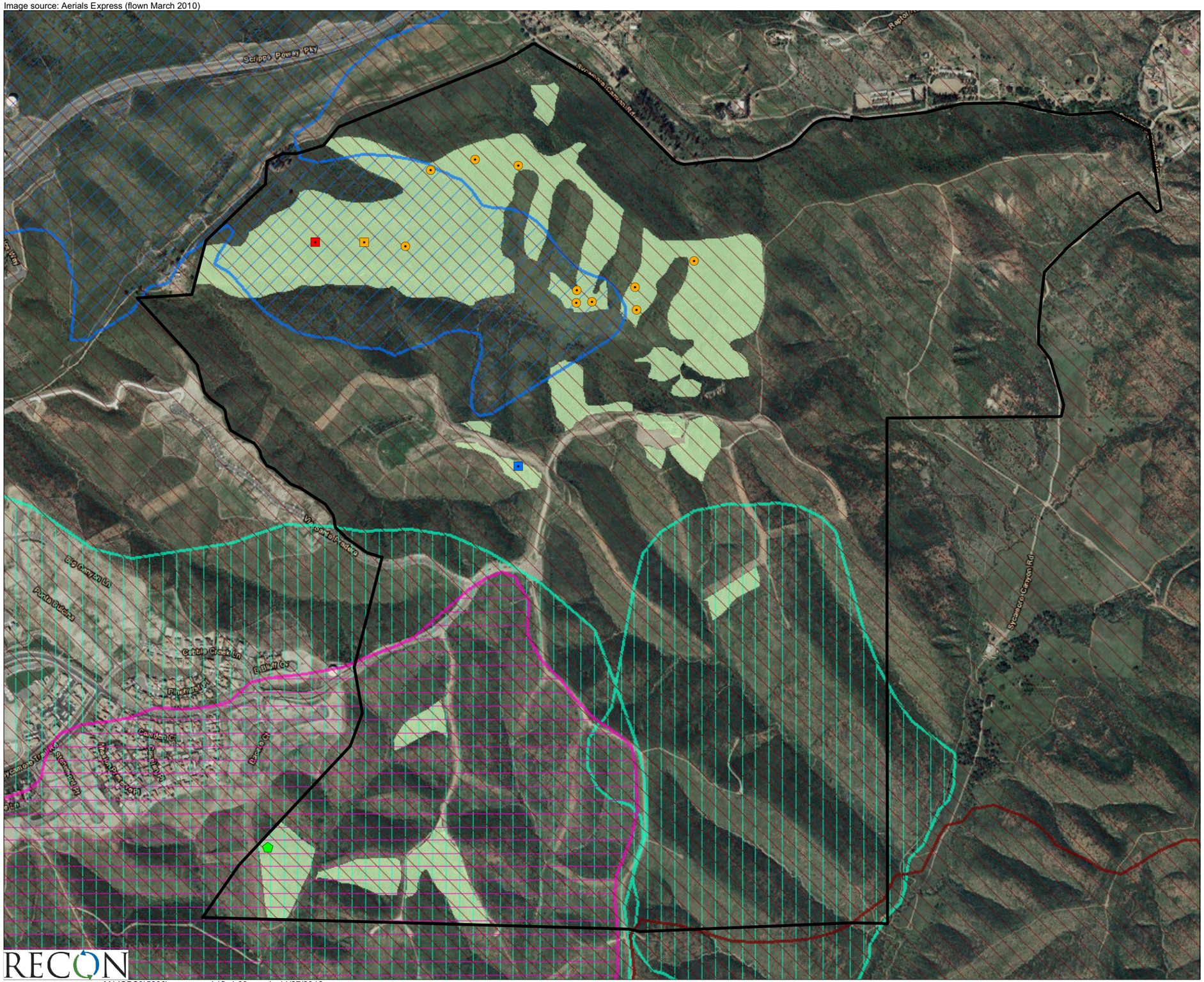
Image source: Aerials Express (flown March 2010)



Project Boundary

Coastal Sage Scrub (*Artemisia/Eriogonum*) Guild

Sensitive Species

- San Diego Barrel Cactus
- San Diego Cactus wren
- Southern California Rufus-crowned Sparrow
- Coastal California Gnatcatcher
- Coast Patch-nosed Snake

Fire Burn History

- 1950
- 1968
- 1995
- 2003

0 Feet 1,000

FIGURE 4-30c

Coastal Sage Scrub (*Artemisia/Eriogonum*) Guild within East Elliott

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Image source: Aerials Express (flown March 2010)

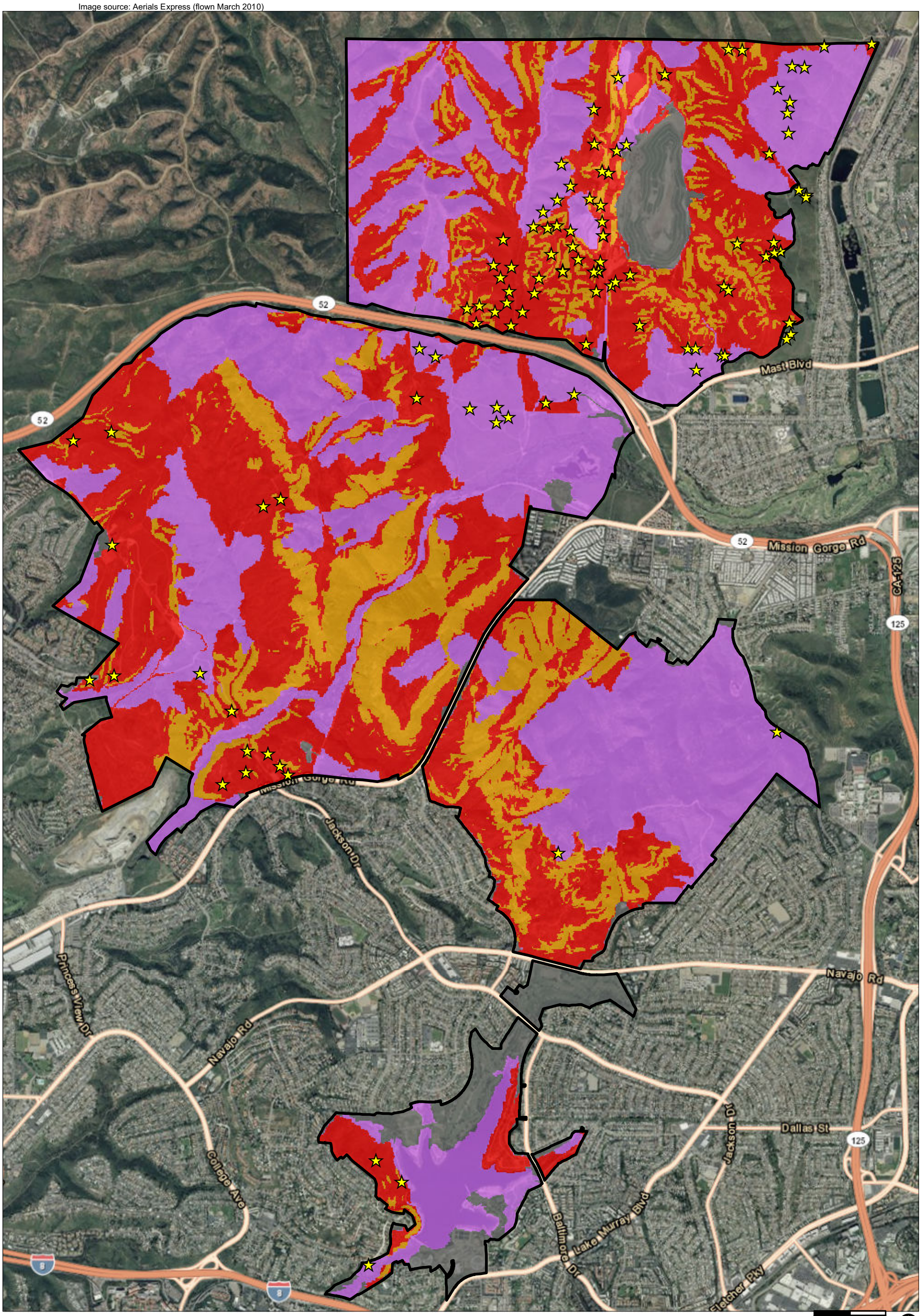

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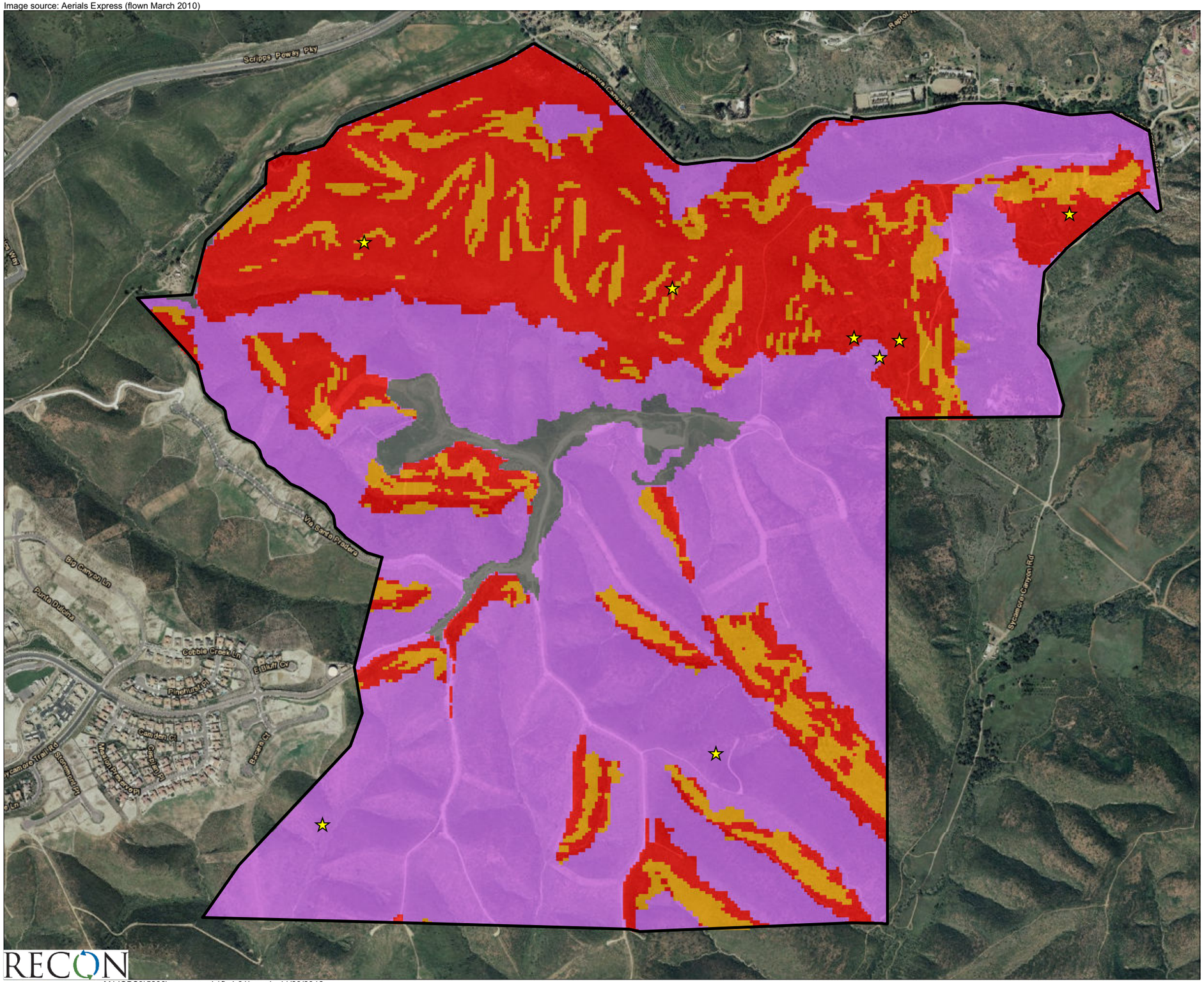
FIGURE 4-31a

California Gnatcatcher Habitat
Evaluation Model Spring 2003 (pre-fire)

Image source: Aerials Express (flown March 2010)



Project Boundary

Coastal California Gnatcatcher (1990-2003)

California Gnatcatcher Habitat Evaluation Model Spring 2003 (pre-fire)

- High
- Very High
- Other
- Developed

0 Feet 1,000

FIGURE 4-31b

California Gnatcatcher Habitat Evaluation Model Spring 2003 (pre-fire)

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Image source: Aerials Express (flown March 2010)

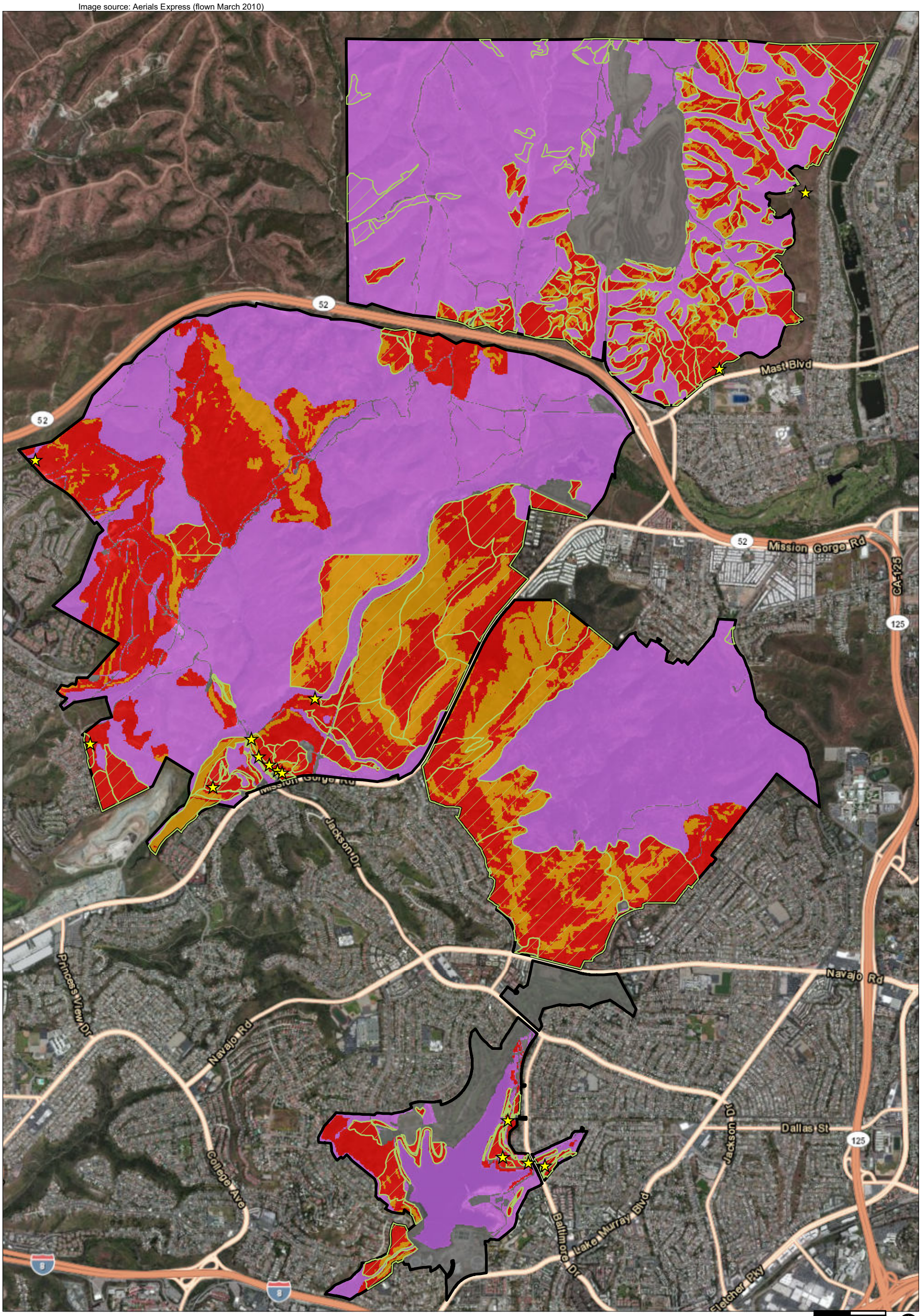

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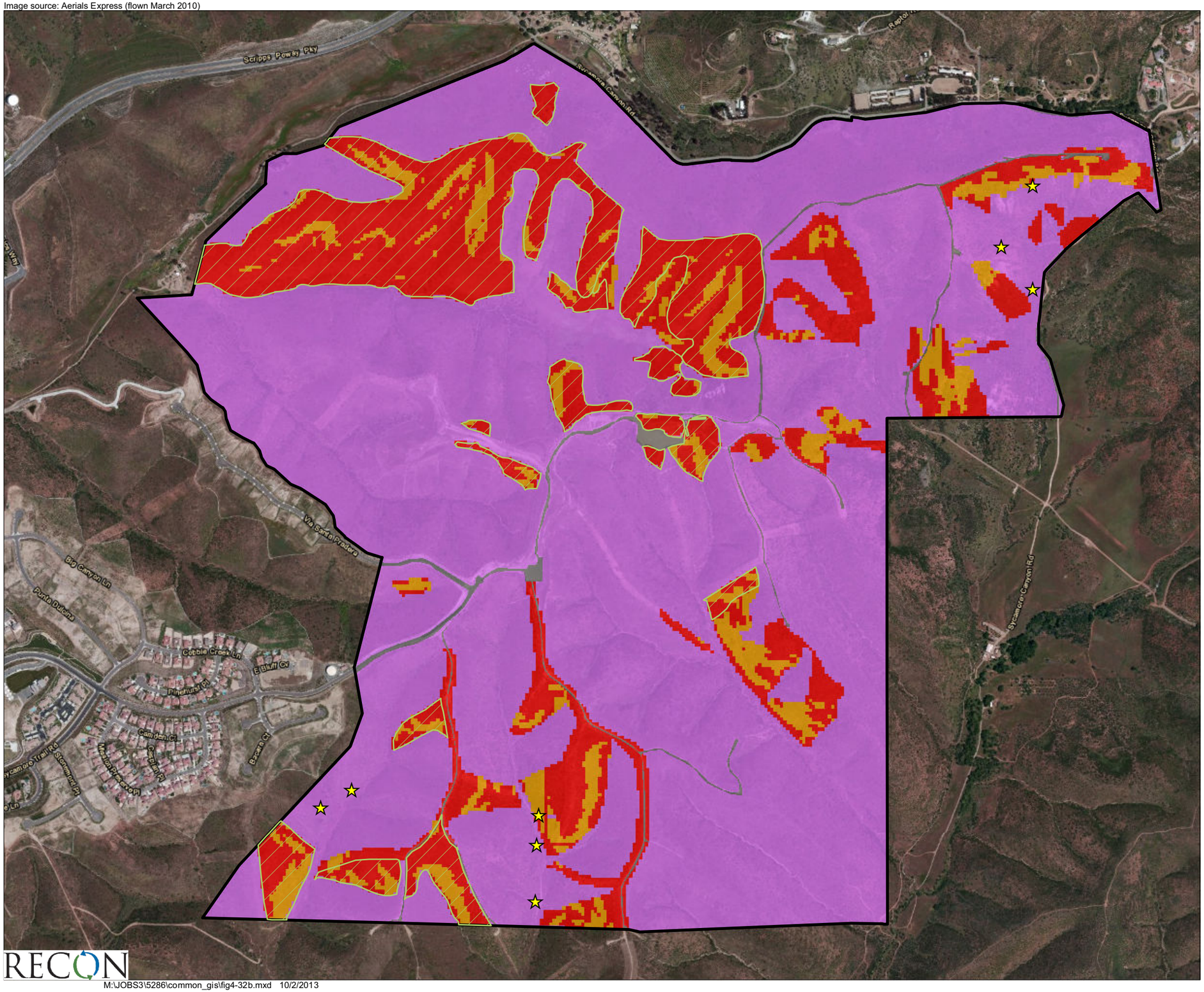
FIGURE 4-32a

California Gnatcatcher Habitat Evaluation Model 2010 (post-fire)

Image source: Aerials Express (flown March 2010)



Project Boundary

Coastal Sage Scrub (Artemisia/Eriogonum) Guild

Coastal California Gnatcatcher (2004-2010)

California Gnatcatcher Habitat Evaluation Model 2010 (post-fire)

High

Very High

Other

Developed

0 Feet 1,000

FIGURE 4-32b

California Gnatcatcher Habitat Evaluation Model 2010 (post-fire)

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Image source: Aerials Express (flown March 2010)

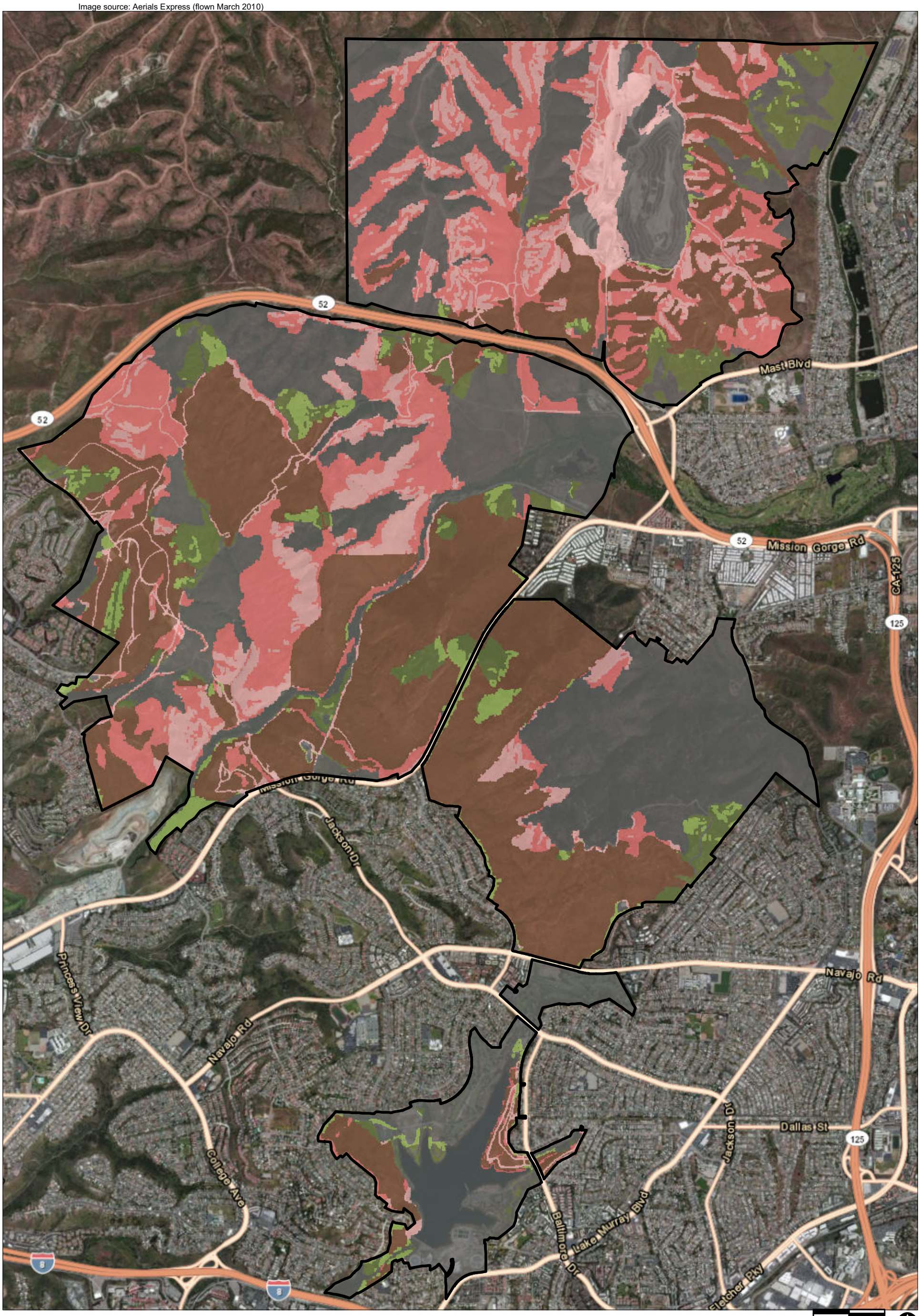

FIGURE 4-33a

Change in California Gnatcatcher
Habitat Evaluation Model 2003-2010

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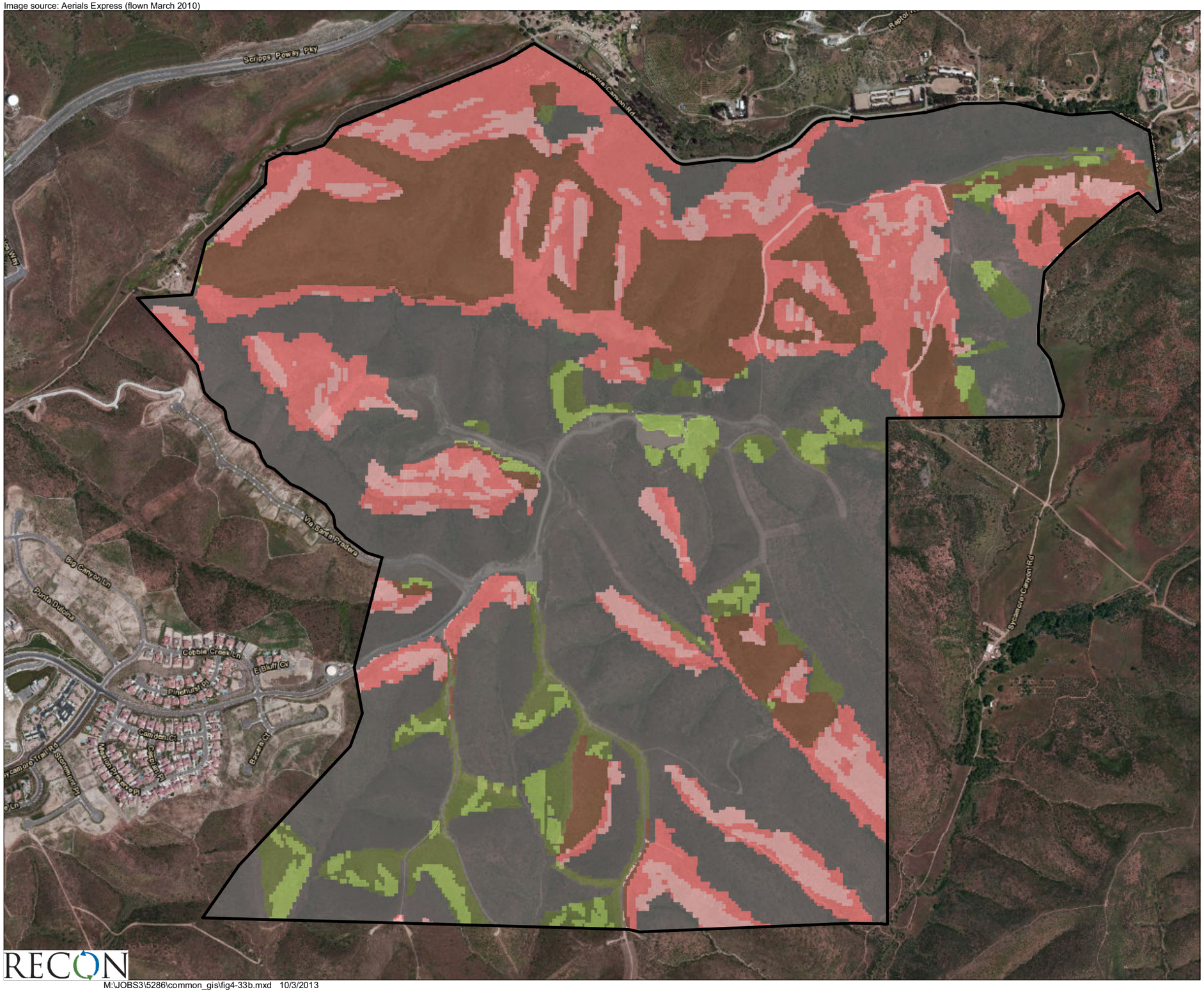
Image source: Aerials Express (flown March 2010)



Project Boundary
Moderate Increase in Habitat Quality
Large Increase in Habitat Quality
Moderate Decrease in Habitat Quality
Large Decrease in Habitat Quality
No Change
Not California Gnatcatcher Habitat

0 Feet 1,000

FIGURE 4-33b

Change in California Gnatcatcher Habitat Evaluation Model 2003-2010

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on USDA 2002 remote sensing data (see Figure 31a). When the area was ground truthed in 2010, large expanses of what appeared as coastal sage scrub in aerial photographs were determined to be sparse, short statured chamise chaparral with developed biological crusts and did not qualify for primary model parameters (see Figure 32b). It is unlikely that scrub in this area would type change into chaparral over 15 years with wildfire (2003). As mature vegetation systems are present in this area and no California gnatcatchers have been recorded before or after 2003, we can cautiously assume that little "high" or "very high" quality habitat for gnatcatcher occurs or has occurred in eastern East Elliott.

Despite precision and accuracy caveats, some trends can be observed when comparing the two iterations of the model. In general, areas burned in the 2003 wildfire (West Sycamore, East Elliott, and Fortuna Mountain) lost suitable habitat for California gnatcatcher while unburned areas (Mission Gorge, Cowles Mountain, and Lake Murray) remained relatively unchanged (Table 4-18).

TABLE 4-18
ACREAGE OF HIGH AND VERY HIGH CALIFORNIA GNATCATCHER AT MTRP

Area	2002	2010	Change
West Sycamore	530	323	- 207
East Elliott	1,443	653	- 709
Fortuna Mountain	1,666	1,025	- 641
Mission Gorge	599	664	+ 65
Cowles Mountain	714	736	+ 22
Lake Murray	127	113	- 14
TOTAL	5,079	3,514	-1,565

The Coastal Sage Scrub – *Artemisia/Eriogonum* Management Guild boundaries closely follow "high" and "very high" suitable gnatcatcher habitat predicted by the model with a few exceptions (see Figure 32a-b).

4.3.5.2 Membership Rules

All mapped SANDAG shrub vegetation alliances and associations at MTRP which contain *Artemisia californica* and/or *Eriogonum fasciculatum*.

4.3.5.3 MSCP Conditions of Coverage for Covered Guild Species

4.3.5.3.1 San Diego Barrel Cactus

Area-specific management directives must include specific measures to protect against detrimental edge effects and unauthorized collection, and include appropriate fire management/control practices to protect against a too-frequent fire cycle (MSCP 1998: Table 3-5).

4.3.5.3.2 San Diego Golden Star

Area-specific management directives must include specific measures to protect against detrimental edge-effects (MSCP 1998: Table 3-5).

4.3.5.3.3 Variegated Dudleya

Area-specific management directives must include species-specific monitoring and specific measures to protect against detrimental edge effects to this species, including effects caused by recreational activities (MSCP 1998: Table 3-5).

4.3.5.3.4 California Gnatcatcher

Area-specific management directives must include measures to reduce edge effects and minimize disturbance during the nesting period, fire protection measures to reduce the potential for habitat degradation due to unplanned fire, and management measures to maintain or improve habitat quality including vegetation structure. No clearing of occupied habitat within the Cities' MHPAs or County's biological core areas may occur between March 1 and August 15 (MSCP 1998: Table 3-5).

4.3.5.4 Threats at MTRP

4.3.5.4.1 Fire and Fire Suppression

MTRP is a matrix of burned and recovering vegetation. Over the last 50 years, seven wildfires have burned through the boundaries of the Coastal Sage Scrub - *Artemisia*/*Eriogonum* Guild at MTRP (Table 4-19).

TABLE 4-19
MAJOR WILDFIRES WITHIN COASTAL SAGE SCRUB - *ARTEMISIA*/*ERIOGONUM* GUILD BOUNDARIES AT MTRP

Area	1963	1981	1983	1986	1988	1995	2003
West Sycamore	X					X	X
East Elliott		X					X
Fortuna Mountain		X					X
Cowles Mountain			X	X	X		
Lake Murray							

Although wildfires are a natural part of the vegetation ecosytems at MTRP, an elevated frequency of fires has the potential of locally extirpating species with weak abilities to resprout, such as *Artemisia californica,* from recovering coastal sage scrub vegetation (Malanson and O'Leary 1982). Type conversion from coastal sage scrub to non-native grassland via successive burning may also reduce the spatial area of Coastal Sage Scrub – *Artemisia*/*Eriogonum* (Zedler et al. 1983).

4.3.5.4.2 Invasive Weeds

- Exotic annual grasses have colonized many areas within the Guild boundary following the fires of 1981, 1995, and 2003. Over time, if initial fire damage is not too severe and disturbance frequencies are kept low, successional processes at a landscape scale should favor the reformation of coastal sage scrub vegetation on invaded sites (Zedler et al. 1983). Over the long term, climate change may potentially affect seral processes to the point where a more permanent type change in vegetation occurs (Bachelet et al. 2001).

- Exotic perennial weed species pose a major threat to the CSS-*Artemisia*/*Eriogonum* Guild at MTRP. A large population (5 acres of coverage) of artichoke thistle (*Cynara cardunculus*) was observed in the West Sycamore area during vegetation surveys (RECON 2011; Figure 4-34 and Photograph 4-14). Artichoke thistle, also called cardoon, is a perennial herb that may grow up to six feet high and six feet wide with a cluster of large, purple flower heads. The plant reproduces from seed and may colonize riparian woodlands, natural openings in chaparral and sage scrub, or native grasslands (Pepper and Kelly 1994). Artichoke thistle is native to the Mediterranean and has become widespread over California. Artichoke thistle is found in disturbed areas and has also been observed colonizing coastal sage scrub habitat, riparian areas, and native grasslands (Pepper and Kelly 1994).

- According to a brief review of past aerial photography, the spatial area of the population appears to have grown significantly since the first observable image in 2002.

Photograph 4-14: Artichoke thistle infestation within the West Sycamore area.

4.3.5.5 Monitoring and Management Goals

Goal: Monitor and control emerging threats to size and health of Coastal Sage Scrub – *Artemisia*/*Eriogonum* at MTRP

Objective: **Control Artichoke Thistle at the West Sycamore Area**

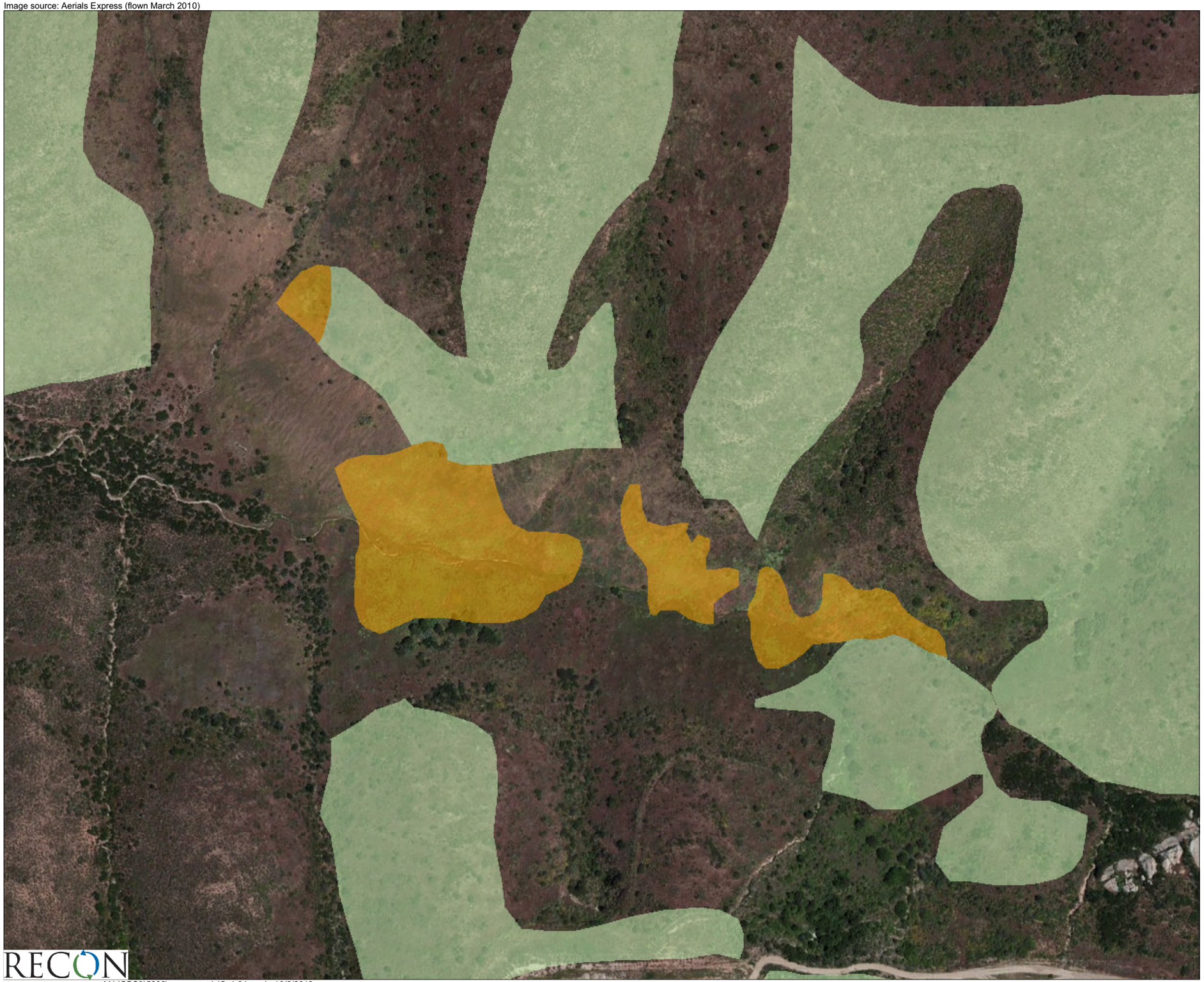
- Develop a restoration plan to control artichoke thistle at the West Sycamore area. Care should be taken to control emergent weed threats within the treatment area as artichoke thistle cover is reduced. A restoration plan can incorporate the following:

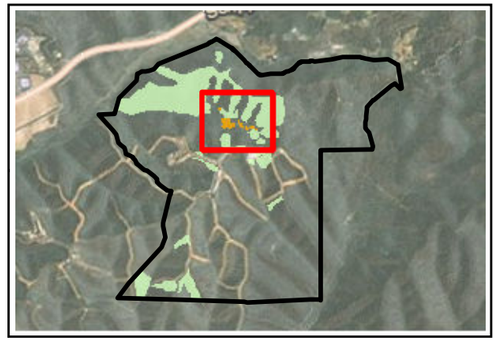
  Herbicide treatment: Glyphosate has been shown as effective to use in cut stumps applications and as foliar spray in controlling artichoke thistle. Cut stump applications involve cutting and bagging the basal rosette of plants and applying glyphosate to the exposed root. Cut stump applications are recommended in pre-bolting plants. In cases where artichoke thistle has bolted, a glyphosate (2 percent) foliar spray has been shown effective as a control (Kelly 2000).

  Treatment Schedule:
  Spring: remove basal rosettes and apply herbicide to cut stumps.
  Summer: bag seed heads and apply foliar spray to bolted individuals.

  Success Criteria:
  Reduce cover of artichoke thistle 5 percent per year of treatment

Image source: Aerials Express (flown March 2010)





Project Boundary

Coastal Sage Scrub (*Artemisia/Eriogonum*) Guild

Artichoke Thistle (*Cynara cardunculus*)

0 Feet 200

RECON

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FIGURE 4-34

Coastal Sage Scrub (*Artemisia/Eriogonum*) Guild Management Actions

5.0 Budget and Schedule

The following is a projected budget and schedule for recommended tasks in Sections 4.2 and 4.3 (Table 5-1).

TABLE 5-1
BUDGET AND SCHEDULE

Management Area	Task	Cost (per year)	Cost (5-year)	Schedule
San Diego Thornmint	Remove exotic weeds within existing populations: hand weeding	$20,000	$100,000	Early winter–late summer (4x/year)
	Remove exotic weeds within occupied clay lenses: dethatch and herbicide	$9,500	$47,500	Early winter–late summer (4x/year)
	Continue MSCP monitoring	$0		
San Diego Ambrosia	Continue adaptive management weeding program	$0		
	Transplantation	$5,100-first year $3,000-additional years	$17,100	Early winter
	Continue MSCP monitoring	$0		
Variegated Dudleya	Update baseline population surveys	$25,000	$50,000	Winter: two seasons
	Threats assessment and prioritization	$5,000	$10,000	Concurrent with update
	Monitoring: Continue MSCP Monitoring	0		
Willowy Monardella	Hydrological evaluation	$6,500	$6,500	
	Erosion control (installation)	$2,000	$2,000	Install before winter rains
	Remove exotic weeds from occupied habitat	$7,000	$35,000	Fall: annual
	Continue CNPS and MSCP monitoring	$0		
	Monitoring: Recruitment study	$12,000	$60,000	Early spring: annual
	Monitoring: Entrenchment study	$5,500	$27,500	Summer: annual
Coastal Cactus Wren	Reduce combustible fuels around cacti	$20,000-first year $10,000-additional years	$60,000	8/15-3/15
	Cacti transplantation	$13,000	$13,000	
	Cactus wren presence absence surveys	$3,500	$14,000	2x/year: winter and breeding season
	Monitoring: photo points	$0		Concurrent with relevé
	Monitoring: relevé	$2,500	$12,500	Spring: annual
East Elliott Clay Ridgelines Management Guild	Survey: biological crusts	$25,000	$25,000	Spring: 5-year interval
	Survey: sensitive plant update	$0		Concurrent with biological crust surveys
Tierrasanta Clay Ridge Management Guild	Survey: biological crusts	$10,000	$10,000	Spring: 5-year interval

TABLE 5-1
BUDGET AND SCHEDULE
(continued)

Management Area	Task	Cost (per year)	Cost (5-year)	Schedule
Riparian Woodlands Management Guild	Continue MSCP monitoring	$0		
	Continue cowbird trapping and regional coordination	$0		
	"Search and Destroy" giant reed surveys	$4,000/3 years	$4,000	3-year interval and/or 6 months after major flood
Coastal Sage Scrub – *Artemisia/ Eriogonum* Management Guild	West Sycamore restoration plan	$4,000	$4,000	
	Artichoke thistle control	$85,000	$425,000	4x/year
	Continue MSCP monitoring	$0		

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