FINAL

Sycamore Canyon and Goodan Ranch Preserves
Vegetation Management Plan

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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
AMSL	Above Mean Sea Level
APN	Assessor's Parcel Number
ASMD	Area Specific Management Directives
BMP	Best Management Practice
CAL FIRE	California Department of Forestry and Fire Protection
Cal-IPC	California Invasive Plant Council
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
CSC	California Species of Special Concern
DPR	County of San Diego Department of Parks and Recreation
EFD	Escondido Fire Department
EF/HGFD	Elfin Forest/Harmony Grove Fire Department
FE	Federally Endangered
FRAP	Fire and Resource Assessment Program
FT	Federally Threatened
FP	CDFW Fully Protected
GIS	Geographic Information System
LRA	Local Responsibility Area
MSCP	Multiple Species Conservation Program
MSDS	Material Safety Data Sheets
OMWD	Olivenhain Municipal Water District
RMP	Resource Management Plan
SE	State Endangered
SFP	State Fully Protected
SRA	State Responsibility Area
SSC	Species of Special Concern
SWL	State Watch List
USGS	U.S. Geological Survey
VCM	Vegetation Classification Manual
VMP	Vegetation Management Plan
VMU	Vegetation Management Unit
WL	Watch List
WUI	Wildland–Urban Interface

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1.0 INTRODUCTION

The Sycamore Canyon and Goodan Ranch Preserves (Preserve) is an approximately 2,554.6-acre open space preserve located within an unincorporated area of central San Diego County (County), east of the City of Poway and north of the City of Santee. The Preserve is owned by the County of San Diego Department of Parks and Recreation (DPR) and is the result of a series of acquisitions: the Sycamore Canyon Preserve was acquired by the County in 1964 - 2004; Goodan Ranch was acquired in 1991 by the California Department of Fish and Wildlife (CDFW), DPR, and the Cities of Poway and Santee; and the Hagey and Sycamore South properties were acquired in 2010-2011. The Sycamore Canyon Preserve and Goodan Ranch are currently managed in accordance with the Resource Management Plan for Sycamore Canyon and Goodan Ranch Preserves (RMP) (County of San Diego 2009a), including Area-Specific Management Directives (ASMDs), pursuant to the requirements of the Multiple Species Conservation Program Subarea Plan (MSCP SAP). The RMP will be adapted to include management for the recent acquisitions of Hagey and Sycamore South properties.

This Vegetation Management Plan (VMP) will address the entirety of the Sycamore Canyon and Goodan Ranch Preserves, including the Hagey and Sycamore South properties.

The majority of the Preserve supports high quality native vegetation communities and invasive non-native plant species are generally at low frequencies such that management for them is not necessary. Human activities have marginally impacted the Preserve, including authorized and unauthorized trails, two staging areas, and a ranger station.

However, there are several areas of invasive non-native plant species that are found within Sycamore Canyon Creek and in the lower valley near the ranger station. As such, management for invasive non-native plant species should focus on control of existing populations of invasive non-native plant species in the creek and surrounding habitats to minimize the potential for further invasion. In general, human disturbance is minimal and constrained to trails although there are few unauthorized trails, particularly within the parcel additions. The entirety of the Preserve burned in the 2003 Cedar Fire, and the majority of the site has recovered.

1.1 Purpose and Need

The purpose of this Vegetation Management Plan (VMP) is to describe current conditions within the Preserve and provide recommendations for vegetation management including: 1) invasive non-native plant species management, 2) habitat restoration, and 3) fire management. While this VMP is intended to be a stand-alone document, the information and recommendations presented will be used by DPR to develop additional ASMDs to augment the existing Preserve RMP. In

addition, the VMP provides fire response personnel with critical site information for emergency fire response within and immediately adjacent to the Preserve boundaries and identifies targeted fuel management actions that can be implemented as preventative measures.

The Invasive Species Management section of this VMP lists the invasive non-native plant species mapped within the preserve, identifies and prioritizes target species for removal, and outlines standard removal methods. The Habitat Restoration section of this VMP identifies potential restoration opportunities within the Preserve and outlines standard restoration methods. The Fire Management section of this VMP outlines a framework to address wildfire risk and enables environmental documentation of strategic fuels management that may be needed. The framework includes discussion of fire prevention, suppression, and post-suppression fire-control activities within and adjacent to the Preserve.

The goals and objectives as well as the recommendations in this VMP are consistent with the County's MSCP and the County of San Diego Vegetation Management Report (County of San Diego 2009b), which addresses vegetation management criteria for wildland and urban areas of unincorporated San Diego County. It is anticipated that this VMP will be revised once every 5 years, as needed, in conjunction with anticipated Preserve RMP updates. The VMP may be revised on a shorter timescale if there is a change in circumstance, for example, acquisition of additional Preserve land, or a wildfire event on site.

1.2 Site Location and Description

The Sycamore Canyon and Goodan Ranch Preserves are generally located east of Marine Corps Air Station (MCAS) Miramar, south of Scripps Poway Parkway, and west of State Route 67 in unincorporated San Diego County, approximately two (2) miles north of Santee (Figure 1). The Preserve is mapped within the U.S. Geological Survey (USGS) 7.5-minute San Vicente Reservoir quadrangle, Township 14 South, Range 1 West, Sections 21, 22, 26, 27, 28, 33, 34, and 35, and Township 15 South, Range 1 West, Sections 2, 3 and 4 (Figure 2).

The Preserve is composed of the following Assessor's Parcel Numbers (APNs): 323-111-04, 323-111-15, 324-040-25, 324-040-26, 324-040-27, 324-040-28, 324-040-31, 324-040-32, 324-040-41, 324-040-42, 324-040-46, 324-040-50, 324-041-03, 324-050-33, 325-020-01, 325-020-03, 325-060-01, 325-060-02, 325-060-03, 325-060-04, 325-060-05, 325-060-06, 325-060-07, 325-060-10, 325-060-11, 325-060-12, 325-060-17, 325-060-18, 325-060-19, 325-060-20, 325-060-21, 325-060-22, 325-060-23, 325-060-24, 325-061-01, 326-021-02, 326-050-18, and 326-070-01.

The Preserve is bordered by low density, rural residential development to the north, MCAS Miramar to the west, and open space to the south and east. The Hagey property, located at the northern reach of the Preserve, is separated from the rest of the Preserve by Calle de Rob. The Sycamore South parcels are composed of three (3) non-contiguous study areas in the southern region of the Preserve.



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FIGURE 1

Regional Map

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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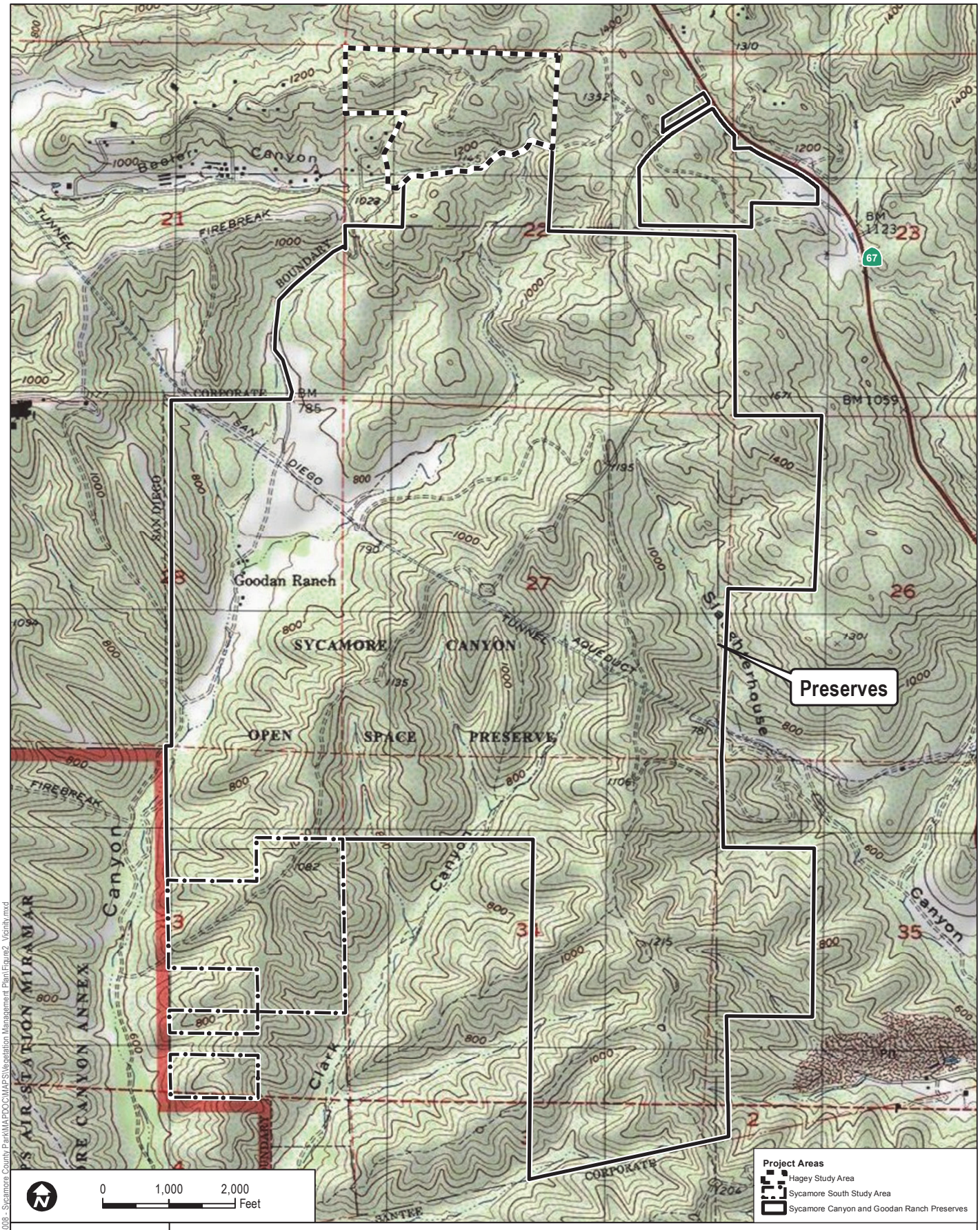

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SOURCE: USGS topo 7.5-Minute Series Quadrangle

FIGURE 2
Vicinity Map

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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The Preserve is located within the Metro-Lakeside-Jamul segment of the MSCP SAP. The Preserve was designated as Pre-Approved Mitigation Areas (PAMA) in the MSCP SAP. The Preserve is located within the management district of one supervising park ranger, one half time park ranger, one park maintenance worker, and park attendants (County of San Diego 2009a).

The Preserve consists primarily of chaparral, particularly chamise chaparral, and non-native grassland habitats. It is classified as a Very High Fire Hazard Severity Zone by the California Department of Forestry and Fire Protection (CAL FIRE) (FRAP 2012). The entirety of the Preserve is designated a state responsibility area (SRA). Therefore, the Preserve lies within the service area of CAL FIRE.

The Preserve is located in the coastal foothills of the Peninsular Ranges of Southern California. The Preserve is dominated by the Sycamore Canyon that runs north – south, and surrounding steep slopes, ridges, drainages, and generally hilly terrain. The Preserve ranges in elevation from 195 meters (640 feet) above mean sea level (AMSL) in the southwestern corner of the Preserve to approximately 466 meters (1,530 feet) AMSL in the northeastern region.

1.3 Vegetation Management Goals and Objectives

This VMP aims to develop management strategies consistent with those of the larger South and North County MSCP subarea plans and the Preserve RMP. To that end, the vegetation management goals for the Preserve are focused on environmental resource preservation and enhancement of existing native habitat. The vegetation management goals for the Preserve include:

- Ensure the long-term viability and sustainability of native ecosystem function and natural processes;
- Protect the existing biological and cultural resources from disturbance-causing, incompatible activities within and adjacent to the Preserve;
- Manage invasive non-native plant species to ensure native vegetation community and resource preservation;
- Restore and/or enhance the quality of degraded vegetation communities in a manner consistent with overall species or habitat preservation goals; and
- Develop fuel-load reduction methods that are consistent with overall Preserve management goals.

To achieve these long-term vegetation management goals for the Preserve, the following objectives have been formulated to achieve desired levels of resource protection and public and firefighter safety:

1. Maximize the extent of appropriate habitat for native target species by the removal or control of invasive non-native plant species:
    - Maximize native vegetation community quality through invasive non-native plant species management;
    - Identify and prioritize removal/control of invasive non-native plant species in the Preserve; and
    - Provide methods for removal/control of invasive non-native plant species.
2. Provide a framework for the restoration of disturbed areas within the Preserve:
    - Avoid or minimize adverse impacts to sensitive and high-value habitats during brush management activities and trail building/maintenance activities;
    - Identify and address current and long-term vegetation community restoration needs; and
    - Monitor restoration success and follow-up to ensure target restoration goals are achieved.
3. Provide a fire management strategy that will include planning for wildland fires:
    - Utilize available fuel and invasive non-native plant reduction techniques, such as mowing, herbicide application, and prescribed fire, consistent with Preserve goals for habitat preservation, enhancement, and restoration, and cultural resource protection;
    - Provide site information about fire behavior to local fire agencies, including Poway Fire and CAL FIRE San Diego Unit, for inclusion in wildland pre-response plans;
    - Establish vegetation management units (VMUs) based on topography or other clearly discernible landscape boundaries to facilitate fire management;
    - Minimize likelihood of Preserve-wide, catastrophic wildfires by limiting ignition potential, reducing fuel loads in key areas, limiting illegal access, and increasing public awareness;
    - Identify wildland-urban interface (WUI) areas and associated fuel management goals with a dual role of preventing wildfire from impacting urban areas, as well as protecting Preserve lands from fire originating in urban areas;
    - Provide local fire agencies maps of sensitive biological and cultural resources to be avoided to the maximum extent possible;

- Prepare Preserve maps depicting relevant fire management data, including property boundaries, topography, vegetation and fuel types, and access;
- Prepare fire restoration management guidelines for each VMU including discussion of prevention, suppression, and post-suppression activities; and
- Provide appropriate contact information to responding fire personnel in the event fire management activities may affect priority resources.

2.0 ENVIRONMENTAL RESOURCES

Baseline biological surveys of the Sycamore Canyon and Goodan Ranch Preserves were conducted by ICFI in 2008 (County of San Diego 2009a). Surveys included vegetation communities mapping, rare plant surveys, invasive non-native plant species mapping, butterfly surveys and habitat assessment for Quino checkerspot (*Euphydryas editha quino*) and Hermes Copper (*Lycaena hermes*) butterflies, herpetological pitfall trap surveys, diurnal and nocturnal avian point count surveys, passive bat surveys, small mammal trapping, and large and medium mammal surveys using remote camera stations. Updates to the vegetation mapping and invasives species mapping within the Sycamore Canyon and Goodan Ranch Preserves were conducted by Dudek in 2012. Baseline biological surveys of the acquisition properties (Hagey and Sycamore South) were first conducted in 2012 (Dudek 2012a). The field surveys listed above were also conducted for the acquisition properties. Brief descriptions of the existing vegetation communities, sensitive plant and wildlife species, and cultural resources documented in the Preserve during the baseline surveys are provided below.

2.1 Biological Resources

2.1.1 Vegetation Communities

Vegetation community classification was based on two separate systems, including the Vegetation Classification Manual (VCM) for Western San Diego County (SANDAG 2011) and the Holland (1986) (as modified by Oberbauer et al. 2008) classification system. The field mapping was conducted according to the VCM and then cross-walked to the Holland/Oberbauer classification system. The predominant vegetation community within the Preserve is chamise chaparral–woolly-leaved ceanothus association; a total of 28 vegetation communities and land cover types have been mapped within the Preserve. These vegetation communities and land cover types include: chamise chaparral alliance, chamise chaparral–woolly-leaved ceanothus association, chamise chaparral-deerweed association, woolly-leaved ceanothus association, chamise chaparral-mission manzanita alliance, chamise chaparral-mission manzanita–woolly-leaved ceanothus association, chamise chaparral-mission manzanita-scrub oak association, California sagebrush-California buckwheat-

laurel sumac association, California sagebrush-black sage scrub alliance, mountain-mahogany provisional association, California buckwheat scrub association, Menzies' golden bush scrub provisional association, deerweed association, laurel sumac-deerweed association, scrub oak chaparral alliance, scrub oak-mountain mahogany association, scrub oak-chamise chaparral association, white sage provisional association, black sage scrub alliance, black sage-California buckwheat scrub association, black sage-laurel sumac association, Mediterranean California naturalized annual and perennial grassland semi-natural stands, wild oats grasslands semi-natural stands, annual brome grasslands semi-natural stands, eucalyptus woodland semi-natural stands, California sycamore-mulefat association, coast live oak woodland alliance, and arroyo willow thickets association (Table 1, Figure 3a). The VCM does not include unvegetated habitat (e.g., disturbed habitat, urban/developed) or agriculture; therefore, these habitats are described using the Oberbauer-modified Holland classification system.

Table 1
Vegetation Communities and Land Covers

VCM Code	VCM Alliance/ Association[1]	VCM Common Name	Holland Code	Holland Classification	Acres on Site
Drought Deciduous Shrublands					
4.1	*Adenostoma fasciculatum* Alliance	Chamise Chaparral Alliance	37200	Chamise Chaparral	526.24
4.1.4	*Adenostoma fasciculatum – Ceanothus tomentosus* Association	Chamise Chaparral-Woolly-leaved Ceanothus Association	37200	Chamise Chaparral	668.54
4.1.5	*Adenostoma fasciculatum – Acmispon glaber* Association	Chamise Chaparral-Deerweed Association	37200	Chamise Chaparral	8.30
4.18.1	*Ceanothus tomentosus* Association	Woolly-leaved Ceanothus Association	37120	Southern Mixed Chaparral	144.53
4.2	*Adenostoma fasciculatum – Cercocarpus betuloides Alliance*	Chamise Chaparral-Mission Manzanita Alliance	37120	Southern Mixed Chaparral	8.96
4.2.3	*Adenostoma fasciculatum – Cercocarpus betuloides – Ceanothus tomentosus* Association	Chamise Chaparral-Mission Manzanita-Woolly-leaved Ceanothus Association	37120	Southern Mixed Chaparral	74.96
4.2.6	*Adenostoma fasciculatum – Xylococcus bicolor – Quercus (berberidifolia, xacutidens*) Association	Chamise Chaparral-Mission Manzanita-Scrub Oak Association	37120	Southern Mixed Chaparral	3.61
4.7.1	*Artemisia californica – Eriogonum fasciculatum – Malosma laurina* Association	California Sagebrush - California Buckwheat - Laurel Sumac Association	32500	Diegan Coastal Sage Scrub	198.67
4.8	*Artemisia californica – Salvia mellifera* Alliance	California Sagebrush - Black Sage Scrub Alliance	32500	Diegan Coastal Sage Scrub	14.30

Table 1
Vegetation Communities and Land Covers

VCM Code	VCM Alliance/ Association[1]	VCM Common Name	Holland Code	Holland Classification	Acres on Site
4.20.1	*Cercocarpus minutiflorus* Provisional Association	Mountain-Mahogany Provisional Association	37120	Southern Mixed Chaparral	0.34
4.23.1	*Eriogonum fasciculatum* Association	California Buckwheat Scrub Association	32500	Diegan Coastal Sage Scrub	12.10
4.29.1	*Isocoma menziesii* Provisional Association	Menzies' Golden Bush Scrub Provisional Association	32000	Coastal Scrub	8.52
4.32.1	*Acmispon glaber* Association	Deerweed Association	42200	Non-Native Grassland	1.13
4.35.1	*Malosma laurina – Acmispon glaber* Association	Laurel sumac – Deerweed Association	32000	Coastal Scrub	170.79
4.37	*Quercus (berberidifolia, xacutidens)* Alliance	Scrub Oak Chaparral Alliance	37900	Scrub Oak Chaparral	92.94
4.37.2	*Quercus* (*berberidifolia, xacutidens*) *–Cercocarpus minutiflorus* Association	Scrub Oak -Mountain-Mahogany Association	37900	Scrub Oak Chaparral	22.49
4.38.1	*Quercus (berberidifolia, xacutidens) – Adenostoma fasciculatum* Association	Scrub Oak - Chamise Chaparral Association	37900	Scrub Oak Chaparral	1.07
4.43.1	*Salvia apiana* Provisional Association	White Sage Provisional Association	32500	Diegan Coastal Sage Scrub	4.28
4.44	*Salvia mellifera* Alliance	Black Sage Scrub Alliance	32500	Diegan Coastal Sage Scrub	154.94
4.44.1	*Salvia mellifera – Eriogonum fasciculatum* Association	Black Sage - California Buckwheat Scrub Association	32500	Diegan Coastal Sage Scrub	37.73
4.44.2	*Salvia mellifera – Malsosma laurina* Association	Black Sage - Laurel Sumac Association	32500	Diegan Coastal Sage Scrub	159.76
				Drought Deciduous Shrublands Total	*2,314.20*
Upland Herbaceous Vegetation					
5.21	Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands	Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands	42200	Non-Native Grassland	5.03
5.5	*Avena (barbata, fatua)* Semi-Natural Stands	Wild Oats Grasslands Semi-Natural Stands	42200	Non-Native Grassland	4.17
5.8	*Bromus* (*diandrus, hordaceus*)- *Brachypodium distachyon* Semi-Natural Stands	Annual Brome Grasslands Semi-Natural Stands	42200	Non-Native Grassland	163.91
				Upland Herbaceous Total	*173.11*

Table 1
Vegetation Communities and Land Covers

VCM Code	VCM Alliance/ Association[1]	VCM Common Name	Holland Code	Holland Classification	Acres on Site
Riparian Vegetation					
3.2	*Eucalyptus (globulus, camaldulensis)* Semi-Natural Stands	Eucalyptus Woodland Semi-Natural Stands	79100	Eucalyptus Woodland	0.05
3.4.1	*Platanus racemosa - Baccharis salicifolia* Association	California Sycamore – Mulefat Association	62500	Southern Riparian Woodland	2.66
3.6	*Quercus agrifolia* Alliance	Coast Live Oak Woodland Alliance	71160	Coast Live Oak Woodland	22.35
3.10.1	*Salix lasiolepis* Association	Arroyo Willow Thickets Association	63320	Southern Willow Scrub	0.86
				Riparian Vegetation Total	*25.92*
Unvegetated					
N/A	N/A	N/A	11300	Disturbed Habitat	38.66
N/A	N/A	N/A	12000	Urban/Developed	1.46
				Unvegetated Total	*40.12*
General Agriculture					
N/A	N/A	N/A	18100	Orchards and Vineyards	1.20
				General Agriculture Total	*1.20*
				Total	2554.55[2]

[1] Vegetation Community descriptions based on the VCM (SANDAG 2011)
[2] Numbers may not sum due to rounding

2.1.2 Sensitive Plant Species

Eleven special-status plant species have been documented within the Sycamore Canyon and Goodan Ranch Preserves (County of San Diego 2009a; Dudek 2012a). Table 2 presents the sensitive plant species identified in the Preserve. Sensitive plant species locations are presented in Figure 4.

Table 2
Sensitive Plant Species Known to Occur in the Sycamore Canyon and Goodan Ranch Preserves

Common Name	Scientific Name	Status (Federal/State/CNPS/County, MSCP)[1]
Ashy spike-moss	*Selaginella cinerascens*	None/ None/ CRPR 4.1/ County List D
California adder's tongue	*Ophioglossum californicum*	None/ None/ CRPR 4.2/ County List D
Delicate clarkia	*Clarkia delicata*	None/ None/ CRPR 1B.2/ County List A

Table 2
Sensitive Plant Species Known to Occur in the Sycamore Canyon and Goodan Ranch Preserves

Common Name	Scientific Name	Status (Federal/State/CNPS/County, MSCP)[1]
Graceful tarplant	*Holocarpha virgata* ssp. *elongata*	None/ None/ CRPR 4.2/ County List D
Palmer's grappling hook	*Harpagonella palmeri*	None/ None/ CRPR 4.2/ County List D
Palmer's sagebrush	*Artemisia palmeri*	None/ None/ CRPR 4.2/ County List D
Rush-like bristleweed	*Xanthisma junceum*	None/ None/ CRPR 4.3/ County List D
San Diego thornmint	*Acanthomintha ilicifolia*	FT/ SE/ CRPR 1B.1/ County List A, MSCP
Small flowered morning glory	*Convolvulus simulans*	None/ None/ CRPR 4.2/ County List D
Variegated dudleya	*Dudleya variegata*	None/ None/ CRPR 1B.2/ County List A, MSCP
Willowy monardella	*Monardella viminea*	FE/ SE/ CRPR 1B.1/ County List A, MSCP

[1] Status
State/Federal Designations:
- FE Federally Endangered
- FT Federally Threatened
- SE State Endangered

CRPR (California Rare Plant Rank):
- 1A Plants Presumed Extinct in California
- 1B Plants Rare, Threatened, or Endangered in California and Elsewhere
- 2 Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
- 3 Plants About Which We Need More Information - A Review List
- 4 Plants of Limited Distribution - A Watch List

Threat Ranks:
- 0.1 Seriously threatened in California
- 0.2 Fairly threatened in California
- 0.3 Not very threatened in California

County Designations:
- County List A Plants rare, threatened or endangered in California and elsewhere
- County List B Plants rare, threatened or endangered in California but common elsewhere
- County List C Plants which may be rare, but need more information to determine their true rarity status
- County List D Plants of limited distribution and are uncommon, but not presently rare or endangered
- MSCP Covered Species under the MSCP

2.1.3 Sensitive Animal Species

A total of 35 special-status wildlife species were observed or detected within the Preserve (County of San Diego 2009a; Dudek 2012a). Table 3 presents the sensitive animal species observed in the Preserve. Sensitive animal species locations are also presented on Figure 5, although not all locations of special-status species were recorded within the Preserve during 2008 surveys and therefore cannot be mapped on the figure.

Table 3
Sensitive Animal Species Known to Occur in the Sycamore Canyon and Goodan Ranch Preserves

Common Name	Scientific Name	Status (Federal/State/County, MSCP)[1]
Herpetofauna		
Coast horned lizard	*Phrynosoma blainvillei* ssp. *coronatum*	None / CSC/ Group 2, MSCP
Coast patch-nosed snake	*Salvadora hexalepis virgultea*	None/ CSC/ Group 2
Coastal rosy boa	*Lichanura trivirgata roseofusca*	None / None/ Group 2
Coastal western whiptail	*Aspidoscelis tigris stejnegeri*	None/ None/ Group 2
Coronado skink	*Plestiodon* [=*Eumeces*] *skiltonianus interparietalis*	None/ CSC/ Group 2
Northern red-diamond rattlesnake	*Crotalus ruber ruber*	None/ CSC/ Group 2
Orange-throated whiptail	*Aspidoscelis hyperythra beldingi*	None/ CSC/ Group 2, MSCP
Two-striped garter snake	*Thamnophis hammondii*	None / CSC/ Group 1
Western spadefoot	*Spea hammondii*	None/ CSC/ Group 2
Birds		
Barn owl	*Tyto alba*	None/ None/ Group 2
Bell's sage sparrow	*Amphispiza belli belli*	None/ WL/ Group 1
Black-chinned sparrow	*Spizella atrogularis*	None / None/ None
Burrowing owl	*Athene cunicularia*	None/ CSC/ Group 1, MSCP
California horned lark	*Eremophila alpestris actia*	None/ WL/ Group 2
Coastal California gnatcatcher	*Polioptila californica californica*	FT / CSC/ Group 1, MSCP
Cooper's hawk	*Accipiter cooperii*	None/ WL/ Group 1, MSCP
Golden eagle	*Aquila chrysaetos*	None / FP, WL/ Group 1, MSCP
Northern harrier	*Circus cyaneus*	None/ CSC/ Group 1, MSCP
Osprey	*Pandion haliaetus*	None/ WL/ Group 1
Red-shouldered hawk	*Buteo lineatus*	None/ None/ Group 1
Southern California rufous-crowned sparrow	*Aimophila ruficeps canescens*	None/ WL/ Group 1, MSCP
Turkey vulture	*Cathartes aura*	None / None/ Group 1
Vaux's swift	*Chaetura vauxi*	None/ CSC/ None
Western bluebird	*Sialia mexicana*	None/ None/ Group 2, MSCP
White-tailed kite	*Elanus leucurus*	None/ FP/ Group 1
Yellow-breasted chat	*Icteria virens*	None/ CSC/ Group 1
Mammals		
Big free-tailed bat	*Nyctinomops macrotis*	None / CSC/ Group 2
California myotis	*Myotis californicus*	None / None/ None
Dulzura pocket mouse	*Chaetodipus californicus femoralis*	None/ CSC/ Group 2
Mountain lion	*Puma concolor*	None/ None/ Group 2, MSCP
Mule deer	*Odocoileus hemionus*	None/ None/ Group 2, MSCP

Table 3
Sensitive Animal Species Known to Occur in the Sycamore Canyon and Goodan Ranch Preserves

Common Name	Scientific Name	Status (Federal/State/County, MSCP)[1]
Northwestern San Diego pocket mouse	*Chaetodipus fallax fallax*	None/ CSC/ Group 2
Pallid bat	*Antrozous pallidus*	None / CSC/ Group 2
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	None / CSC/ Group 2
San Diego black-tailed jackrabbit	*Lepus californicus bennettii*	None/ CSC/ Group 2
San Diego desert woodrat	*Neotoma lepida intermedia*	None/ CSC/ Group 2
Western red bat	*Lasiurus blossevillii*	None / CSC/ Group 2
Western yellow bat	*Lasiurus xanthinus*	None / CSC/ None
Yuma myotis	*Myotis yumanensis*	None / None/ Group 2

[1] Status
Federal Designations:
FT Federally listed as Threatened
State Designations:
CSC California Species of Special Concern
FP California Department of Fish and Wildlife Fully Protected Species
WL California Department of Fish and Wildlife Watch List Species
County Designations:
Group 1 Animals of high sensitivity (listed or specific natural history requirements)
Group 2 Animals declining, but not in immediate threat of extinction or extirpation
MSCP Covered species under the MSCP

2.2 Cultural Resources

Seventy-one sensitive cultural sites have been identified within the Preserve, including 17 prehistoric bedrock milling sites, 12 prehistoric artifact scatters, seven prehistoric major campsites or habitation sites, 18 prehistoric isolates, one prehistoric multi-component resource, and eleven historic structures (Table 4). These resources are discussed further in the RMP (County of San Diego 2009a).

Three additional significant or potentially significant cultural resources have been identified within the Sycamore South and Hagey Study Areas including brick, refuse and can scatter, the Boulder Oaks Spur of the historic Foster Truck Trail, and an isolated metate fragment (ASM 2012). These cultural resources are discussed in greater detail in the *Archaeological Survey Report for the Hagey and Sycamore South Properties, Additions to the Sycamore Canyon and Goodan Ranch Preserves, San Diego County, California* (ASM 2012). Locations of documented cultural resources in the Preserve are presented in the confidential appendices included in these reports. Table 4 presents the sensitive cultural sites identified within the Preserve.

Table 4
Sensitive Cultural Sites in the Sycamore Canyon and Goodan Ranch Preserves

Primary or Trinomial Site Number	Description	Significance Evaluation
CA-SDI-9706/ P-37-009706	Prehistoric bedrock milling site	N/A
CA-SDI-12,842/ P-37-012842	Prehistoric bedrock milling site	N/A
CA-SDI-12,843/ P-37-012843	Prehistoric bedrock milling site	N/A
CA-SDI-13,636/ P-37-013636	Prehistoric bedrock milling site	N/A
CA-SDI-19,170/ P-37-030080	Prehistoric bedrock milling site	N/A
CA-SDI-19,171/ P-37-030081	Prehistoric bedrock milling site	N/A
CA-SDI-19,172/ P-37-030082	Prehistoric bedrock milling site	N/A
CA-SDI-19,173/ P-37-030085	Prehistoric bedrock milling site	N/A
CA-SDI-19,174/ P-37-030086	Prehistoric bedrock milling site	N/A
CA-SDI-19,175/ P-37-030087	Prehistoric bedrock milling site	N/A
CA-SDI-19,177/ P-37-030089	Prehistoric bedrock milling site	N/A
CA-SDI-19,178/ P-37-030090	Prehistoric bedrock milling site	N/A
CA-SDI-19,179/ P-37-030092	Prehistoric bedrock milling site	N/A
CA-SDI-19,180/ P-37-030093	Prehistoric bedrock milling site	N/A
CA-SDI-19,184/ P-37-030100	Prehistoric bedrock milling site	N/A
CA-SDI-19,185/ P-37-030101	Prehistoric bedrock milling site	N/A
CA-SDI-19,187/ P-37-030105	Prehistoric bedrock milling site	N/A
CA-SDI-119/ P-37-0000119	Prehistoric artifact scatters	N/A
CA-SDI-9704/ P-37-009704	Prehistoric artifact scatters	N/A
CA-SDI-13,221/ P-37-013221	Prehistoric artifact scatters	N/A
CA-SDI-13,223/ P-37-013223	Prehistoric artifact scatters	N/A
CA-SDI-13,850/ P-37-013850	Prehistoric artifact scatters	N/A
CA-SDI-16,515/ P-37-016515	Prehistoric artifact scatters	N/A
CA-SDI-16,516/ P-37-016516	Prehistoric artifact scatters	N/A
CA-SDI-16,517/ P-37-016517	Prehistoric artifact scatters	N/A
CA-SDI-19,176/ P-37-030088	Prehistoric artifact scatters	N/A
CA-SDI-19,181/ P-37-030095	Prehistoric artifact scatters	N/A
CA-SDI-19,182/ P-37-030097	Prehistoric artifact scatters	N/A
CA-SDI-19,183/ P-37-090099	Prehistoric artifact scatters	N/A
CA-SDI-9705/ P-37-009705	Prehistoric major campsite/habitation sites	N/A
CA-SDI-9708/ P-37-009708	Prehistoric major campsite/habitation sites	N/A
CA-SDI-16,518/ P-37-016518	Prehistoric major campsite/habitation sites	N/A
CA-SDI-17,151/ P-37-025793	Prehistoric major campsite/habitation sites	N/A
CA-SDI-17,152/ P-37-025794	Prehistoric major campsite/habitation sites	N/A
CA-SDI-17,155/ P-37-025799	Prehistoric major campsite/habitation sites	N/A
CA-SDI-19,186/ P-37-030103	Prehistoric major campsite/habitation sites	N/A
P-37-015294	Prehistoric isolates	N/A
P-37-024271	Prehistoric isolates	N/A
P-37-030079	Prehistoric isolates	N/A

Table 4
Sensitive Cultural Sites in the Sycamore Canyon and Goodan Ranch Preserves

Primary or Trinomial Site Number	Description	Significance Evaluation
P-37-030083	Prehistoric isolates	N/A
P-37-030084	Prehistoric isolates	N/A
P-37-030091	Prehistoric isolates	N/A
P-37-030094	Prehistoric isolates	N/A
P-37-030096	Prehistoric isolates	N/A
P-37-030098	Prehistoric isolates	N/A
P-37-030102	Prehistoric isolates	N/A
P-37-030104	Prehistoric isolates	N/A
P-37-024963	Prehistoric isolates	N/A
P-37-024965	Prehistoric isolates	N/A
P-37-024966	Prehistoric isolates	N/A
P-37-024967	Prehistoric isolates	N/A
P-37-024968	Prehistoric isolates	N/A
P-37-024969	Prehistoric isolates	N/A
P-37-030078	Prehistoric isolates	N/A
CA-SDI-17,154/ H/ P-37-025798	Prehistoric multi-component resources	N/A
CA-SDI-9707H/ P-37-009707	Historic – homestead remains	N/A
CA-SDI-9712H/ P-37-009712	Historic Goodan Ranch complex	N/A
CA-SDI-12,821H/ P-37-012821	Historic Boulder Oaks Spur of Foster Truck Trail	N/A
CA-SDI-12,861H/ P-37-012861	Historic remains of structure	N/A
CA-SDI-17,153H/ P-37-025797	Historic period dam	N/A
CA-SDI-17,156H/ P-37-025800	Historic homestead	N/A
CA-SDI-17,157H/ P-37-025799	Historic trash scatter	N/A
CA-SDI-17,158H/ P-37-025802	Historic shooting range	N/A
P-37-030106	Historic dam and reservoir	N/A
San Diego Aqueduct/ P-37-0300107	Historic San Diego aqueduct	N/A
Stowe Road/ P-37-030197	Historic Stowe Road	N/A
CA-SDI – 20,691	Historic brick, refuse, and can scatter	Not evaluated for CRHR; Significant under County Guidelines
CA-SDI – 12,821	Historic spur of historic Foster Truck Trail	Not evaluated for CRHR; Significant under County Guidelines
P – 37-032647	Prehistoric isolated metate fragment	Not eligible (as an isolate)

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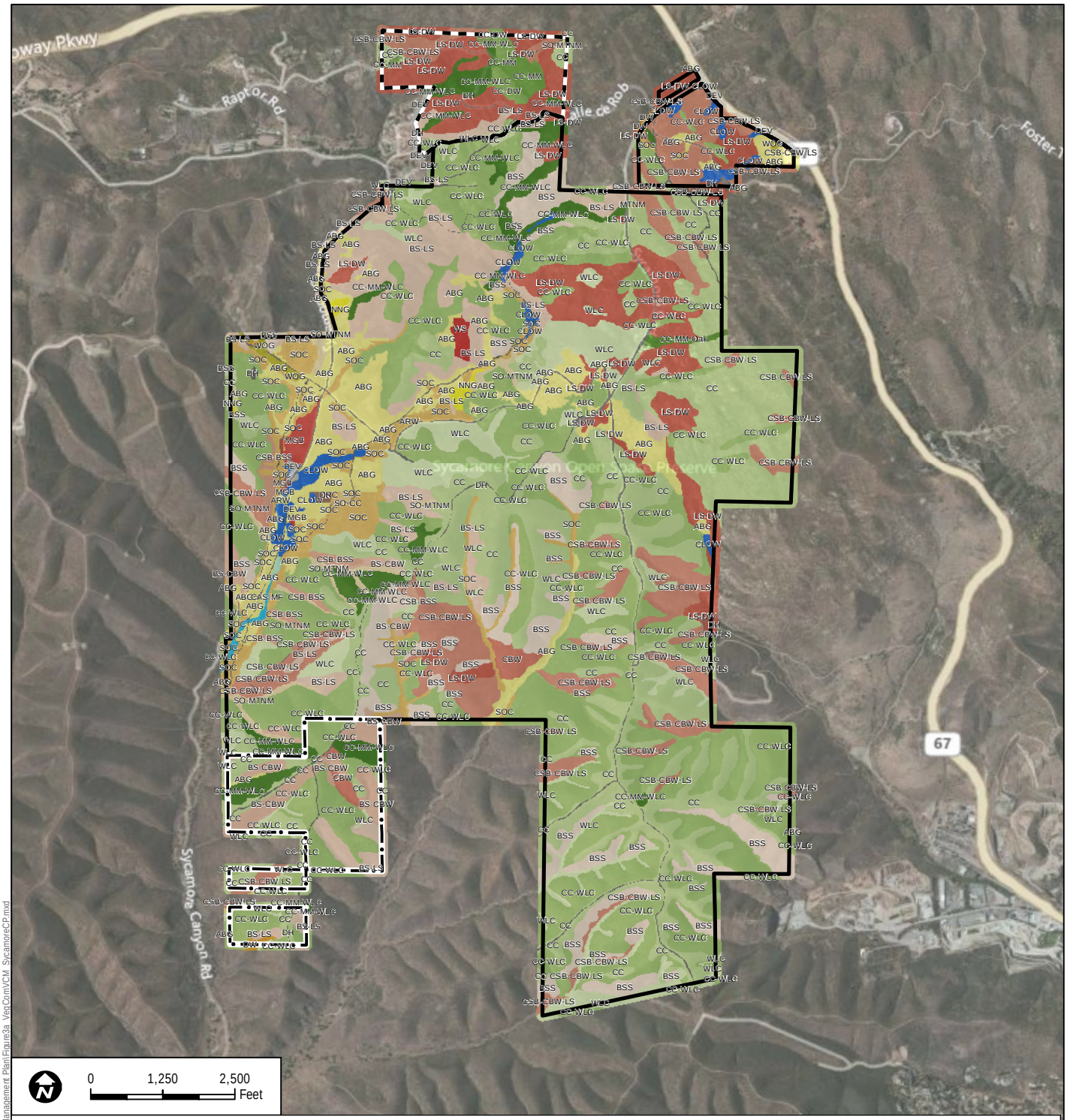

Project Areas
- Hagey Study Area
- Sycamore South Study Area
- Sycamore Canyon and Goodan Ranch Preserves

Drought-Deciduous Shrublands
- 4.44, BSS - Black Sage Scrub Alliance
- 4.44.2, BS-LS - Black Sage - Laurel Sumac Association
- 4.44.1, BS-CBW - Black Sage - California Buckwheat Scrub Association
- 4.8, CSB-BSS - California Sagebrush - Black Sage Scrub Alliance
- 4.7.1, CSB-CBW-LS - California Sagebrush - California Buckwheat - Laurel Sumac Association
- 4.23.1, CBW - California Buckwheat Scrub Association
- 4.35.1, LS-DW - Laurel Sumac - Deerweed Association
- 4.29.1, MGB - Menzies' Golden Bush Scrub Provisional Association
- 4.43.1, WS - White Sage Provisional Association

Evergreen Shrublands
- 4.18.1, WLC - Woolly-leaved Ceanothus Association
- 4.1, CC - Chamise Chaparral Alliance
- 4.1.4, CC-WLC - Chamise Chaparral - Woolly-leaved Ceanothus Association
- 4.1.5, CC-DW - Chamise Chaparral - Deerweed Association
- 4.2, CC-MM - Chamise Chaparral - Mission Manzanita Alliance
- 4.2.6, CC-MM-Oak - Chamise Chaparral - Mission Manzanita - Oak Association
- 4.2.3, CC-MM-WLC - Chamise Chaparral - Mission Manzanita - Woolly-leaved Ceanothus Association
- 4.32.1, DW - Deerweed Association
- 4.20.1, MTNM - Mountain-mahogany Provisional Association
- 4.37, SOC - Scrub Oak Chaparral Alliance
- 4.38.1, SO-CC - Scrub Oak - Chamise Chaparral Association
- 4.37.2, SO-MTNM - Scrub Oak - Mountain-mahogany Association

Upland Herbaceous Vegetation
- 5.8, ABG - Annual Brome Grasslands Semi-Natural Stands
- 5.21, NNG - Non-Native Grassland Semi-Natural Stands
- 5.5, WOG - Wild Oats Grasslands Semi-Natural Stands

Riparian Forests and Woodlands
- 3.10.1, ARW - Arroyo Willow Thickets Association
- 3.4.1, CAS-MF - California Sycamore - Mulefat Association
- 3.6, CLOW - Coast Live Oak Woodland Alliance

Upland Forests and Woodlands
- 3.2, EUC - Eucalyptus Woodland Semi-Natural Stands

Disturbed or Developed Areas (Holland/Oberbauer Classification)
- ORC - Orchards and Vineyards
- DH - Disturbed Habitat
- DEV - Urban/Developed

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SOURCE: Bing

FIGURE 3a

Vegetation Communities and Land Cover Types (VCM)

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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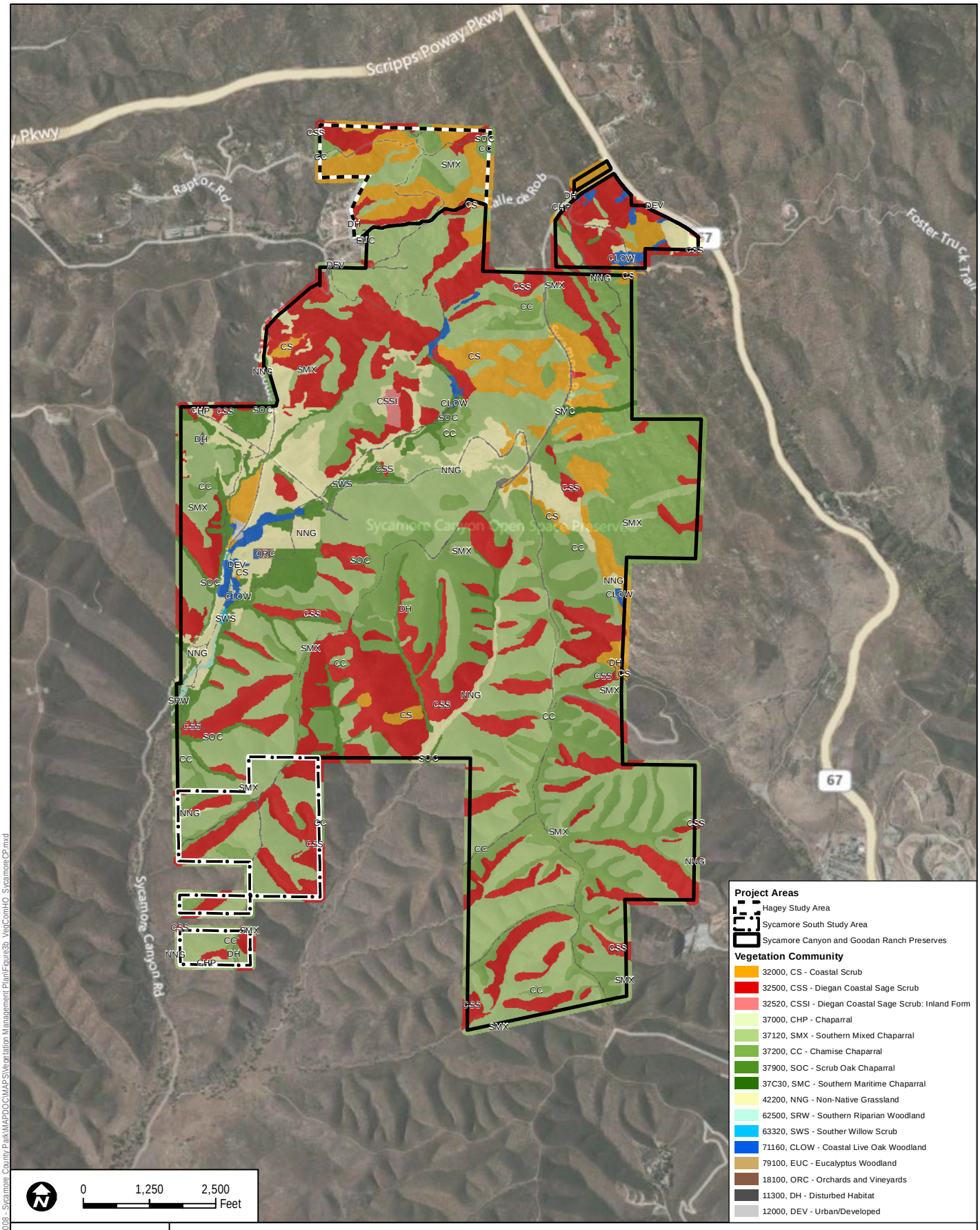

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SOURCE: Bing

FIGURE 3b

Vegetation Communities and Land Cover Types (Holland)

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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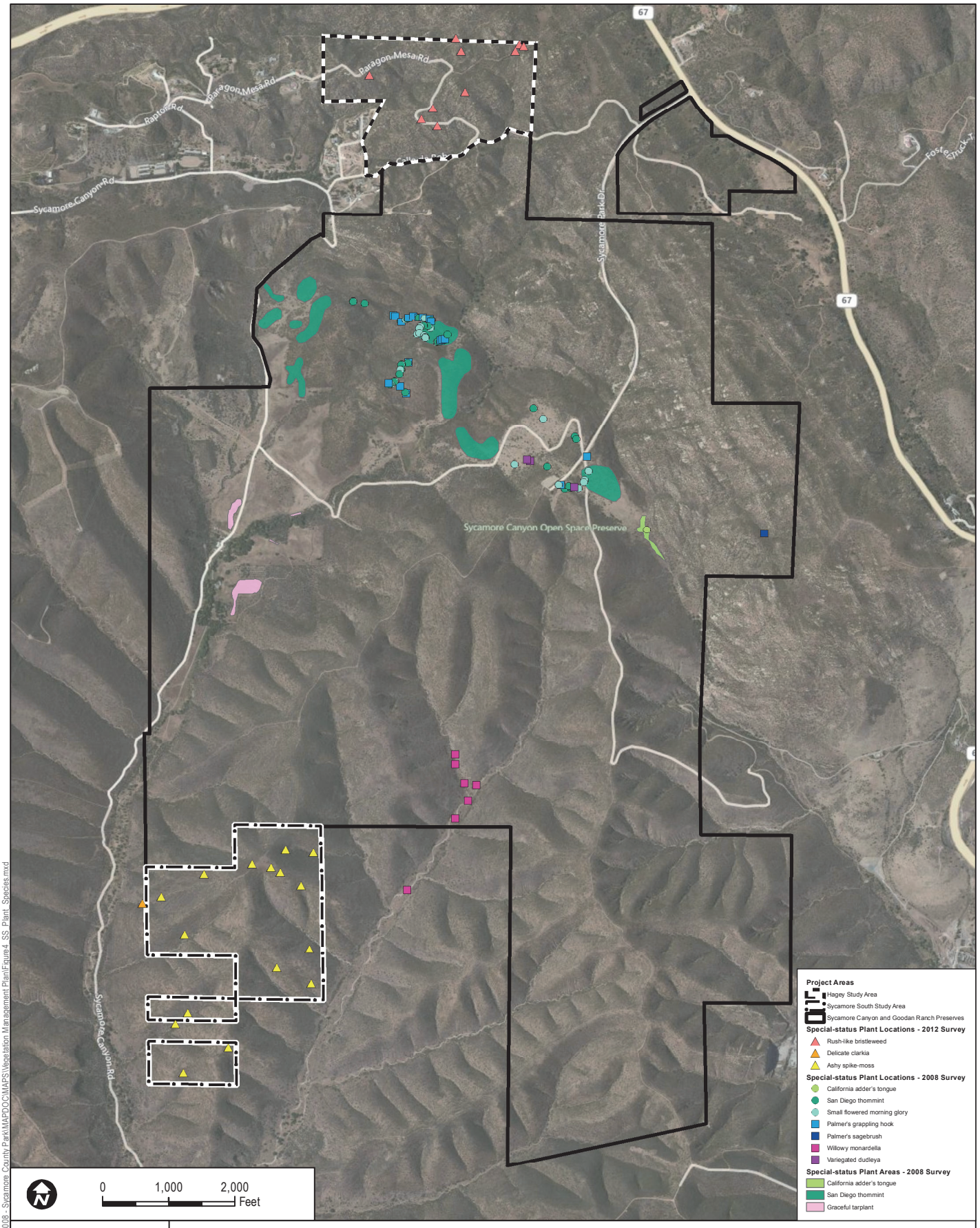

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SOURCE: Bing, County of San Diego 2012

FIGURE 4

Special-status Plant Locations

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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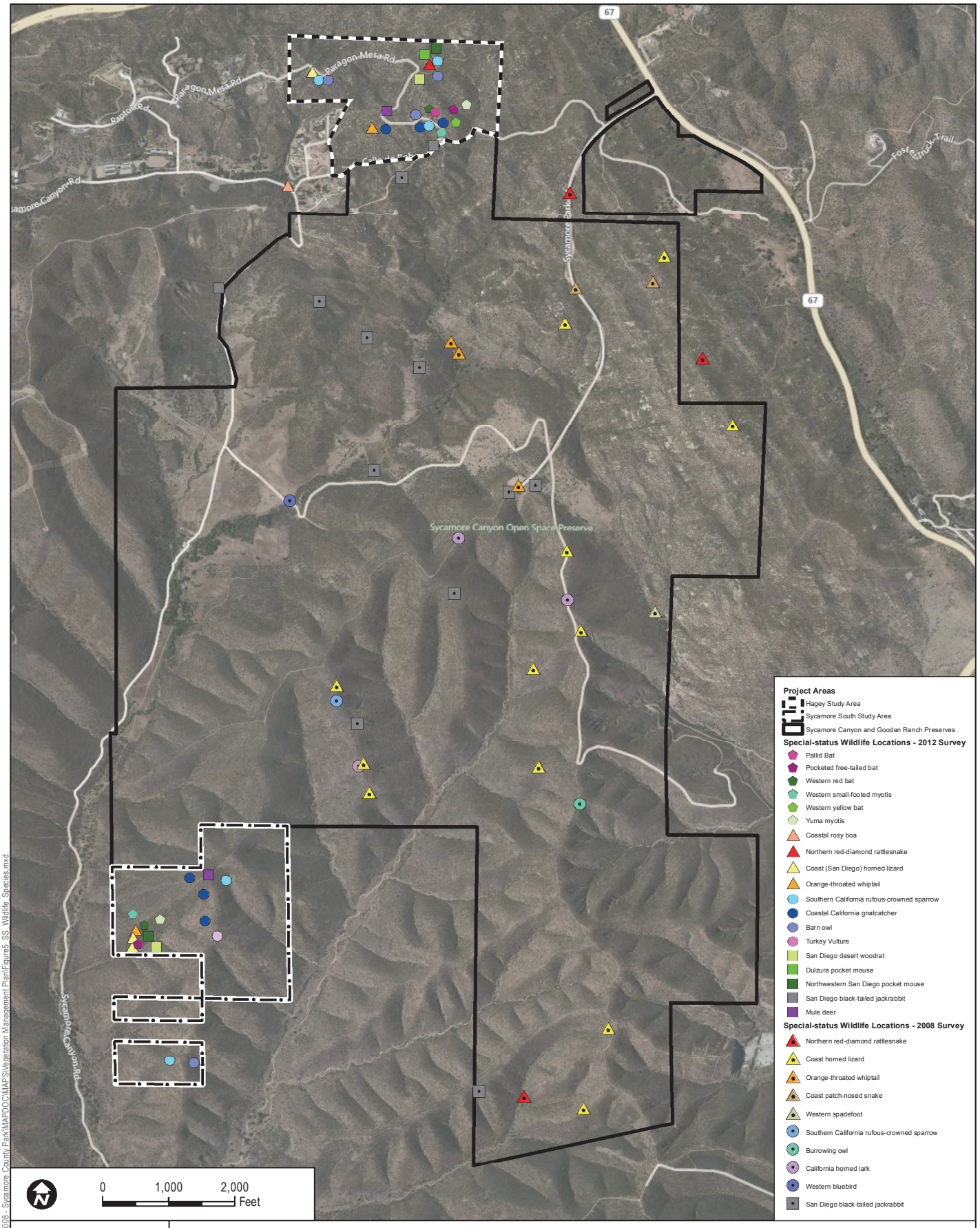

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SOURCE: Bing, County of San Diego 2012

FIGURE 5

Special-status Wildlife Locations

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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3.0 INVASIVE PLANT SPECIES MANAGEMENT

The introduction of foreign invasive species into native habitats is becoming more common and further expansion of human activities into areas away from urban and suburban centers will amplify this effect. Today, it is almost impossible to find any lowland areas in California that do not support a collection of plant species brought from elsewhere. Because invasive non-native plant species can have significant impacts on native plant associations, ecosystem processes, and biodiversity, special management measures are needed for their removal and control. Non-native plants have few ecological controls on their population sizes, and they tend to thrive under conditions created by humans. They often exhibit aggressive growth, out-compete or otherwise harm sensitive species, and can alter natural fire regimes by increasing the frequency and intensity of wildfire (Bell 2009).

In accordance with Implementation Measure B.2.1 of the RMP, non-native invasive plant species were surveyed and mapped within the Preserve in 2012, including the acquisition properties. The focus was on mapping species with the greatest potential to invade native habitats, such as those listed on the California Invasive Plant Council's (Cal-IPC) California Invasive Plant Inventory (2012) with a rating of moderate or high (e.g., Crimson fountaingrass [*Pennisetum setaceum*]), or species that may not be rated as moderate or high, but are considered to have a localized potential for habitat invasion (e.g., olive tree [*Olea europa*]). An attempt was made to count or estimate the quantity of individuals at each location where non-native invasive species were mapped to facilitate land management efforts for invasive species control. However, populations of many of the mapped invasive species, particularly annual species, can fluctuate dramatically from season to season depending on rainfall. Therefore, the mapped quantities of invasive plants should only be considered an indication of the presence and abundance of the species.

Ubiquitous species scattered across the site that pose limited potential for invasion into established habitats and that would be impractical to control on an individual basis (e.g., brome grasses (*Bromus* spp.), wild oat (*Avena* spp.), filaree (*Erodium* spp.), Maltese star thistle (*Centaurea melitensis*), etc.) were not mapped as individual occurrences; however, their presence was noted as components of non-native grasslands mapped on site. Non-native grasslands are considered sensitive under the County's MSCP due to their ability to provide raptor forage habitat, as well as the potential to support special status native plant species (e.g., San Diego thornmint (*Acanthomintha ilicifolia*). However, some of the species often associated with the non-native grasslands on site (e.g., Maltese star thistle), were noted for control in areas where they are invading into native coastal scrub and chaparral communities and are not directly associated with non-native grasslands.

Of the non-native plant species identified during botanical surveys (Dudek 2012b), 17 invasive non-native plant species were mapped and targeted for control, including both perennial and annual species. Table 5 lists the mapped invasive non-native plant species and their associated Cal-IPC Inventory rating. Invasive plant species locations are shown on Figures 6a–6d.

Table 5
Non-native Invasive Plant Species Mapped at the Sycamore Canyon and Gooden Ranch Preserves

Scientific Name	Common Name	Cal-IPC Rating*
Cortaderia selloana	Pampas grass	High
Tamarix ramosissima	saltcedar	High
Brassica nigra	black mustard	Moderate
Carduus pycnocephalus	Italian plumeless thistle	Moderate
Centaurea melitensis	Maltese star-thistle	Moderate
Cirsium vulgare	bull thistle	Moderate
Cynara cardunculus	artichoke thistle	Moderate
Cynodon dactylon	Bermuda grass	Moderate
Dittrichia graveolens	stinkwort	Moderate
Hirschfeldia incana	shortpod mustard	Moderate
Lepidium draba	whitetop	Moderate
Pennisetum setaceum	crimson fountaingrass	Moderate
Olea europaea	olive tree	Limited
Eucalyptus camaldulensis	river red gum	Limited
Rumex crispus	curly dock	Limited
Silybum marianum	milk thistle	Limited
Melinus repens	rose Natal grass	None

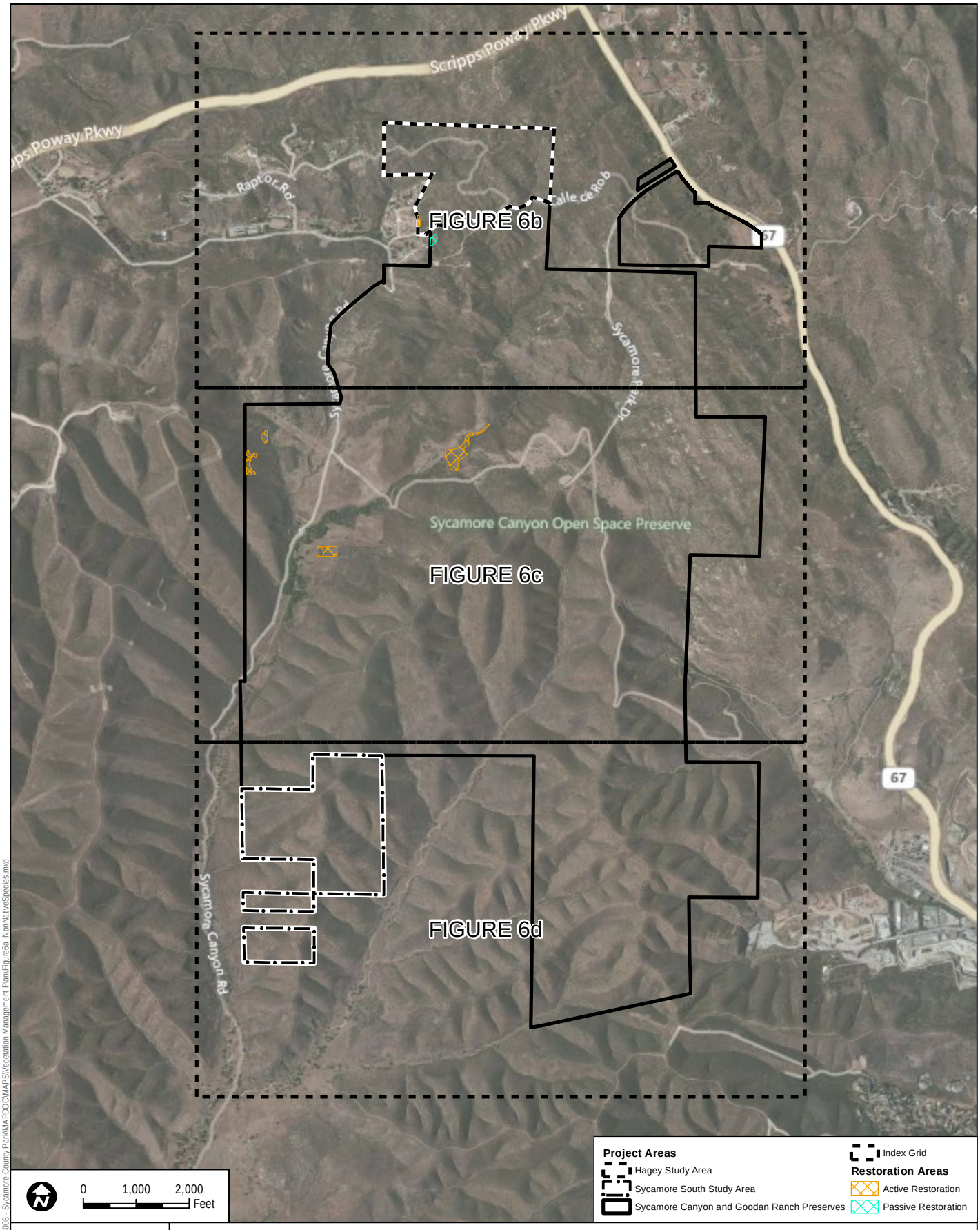
*Source: Cal-IPC (California Invasive Plant Inventory) Database, updated April 2012. Overall rating listed for southwest region, factoring impact, invasiveness, distribution, and documentation level.

Inventory Categories

High: Species have severe ecological impacts, are conducive to moderate to high rates of dispersal/establishment, and most are widely spread.

Moderate: Species have substantial and apparent, but generally not severe, ecological impacts, are conducive to moderate to high rates of dispersal, although establishment is generally dependent on ecological disturbance, and distribution may range from limited to widespread.

Limited: Species are invasive, but their ecological impacts are minor on a statewide level (or there was not enough information to justify a higher score), they have low to moderate rates of invasiveness, and are generally limited but may be locally persistent and problematic.



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SOURCE: Bing

FIGURE 6a

Target Invasive Non-native Plant Species Locations and Potential Habitat Restoration Sites

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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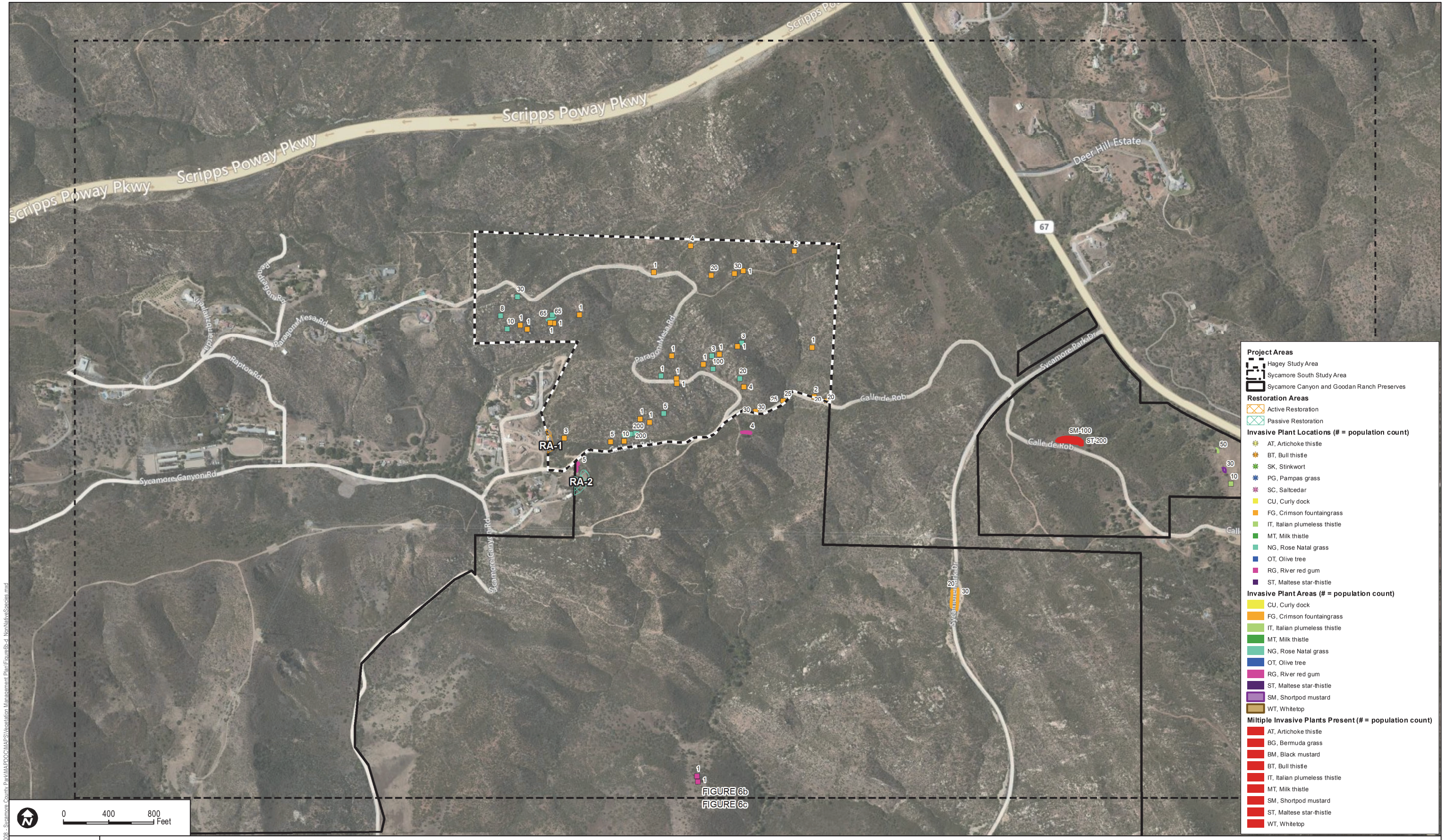

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SOURCE: Bing

FIGURE 6b

Target Invasive Non-native Plant Species Locations and Potential Habitat Restoration Sites

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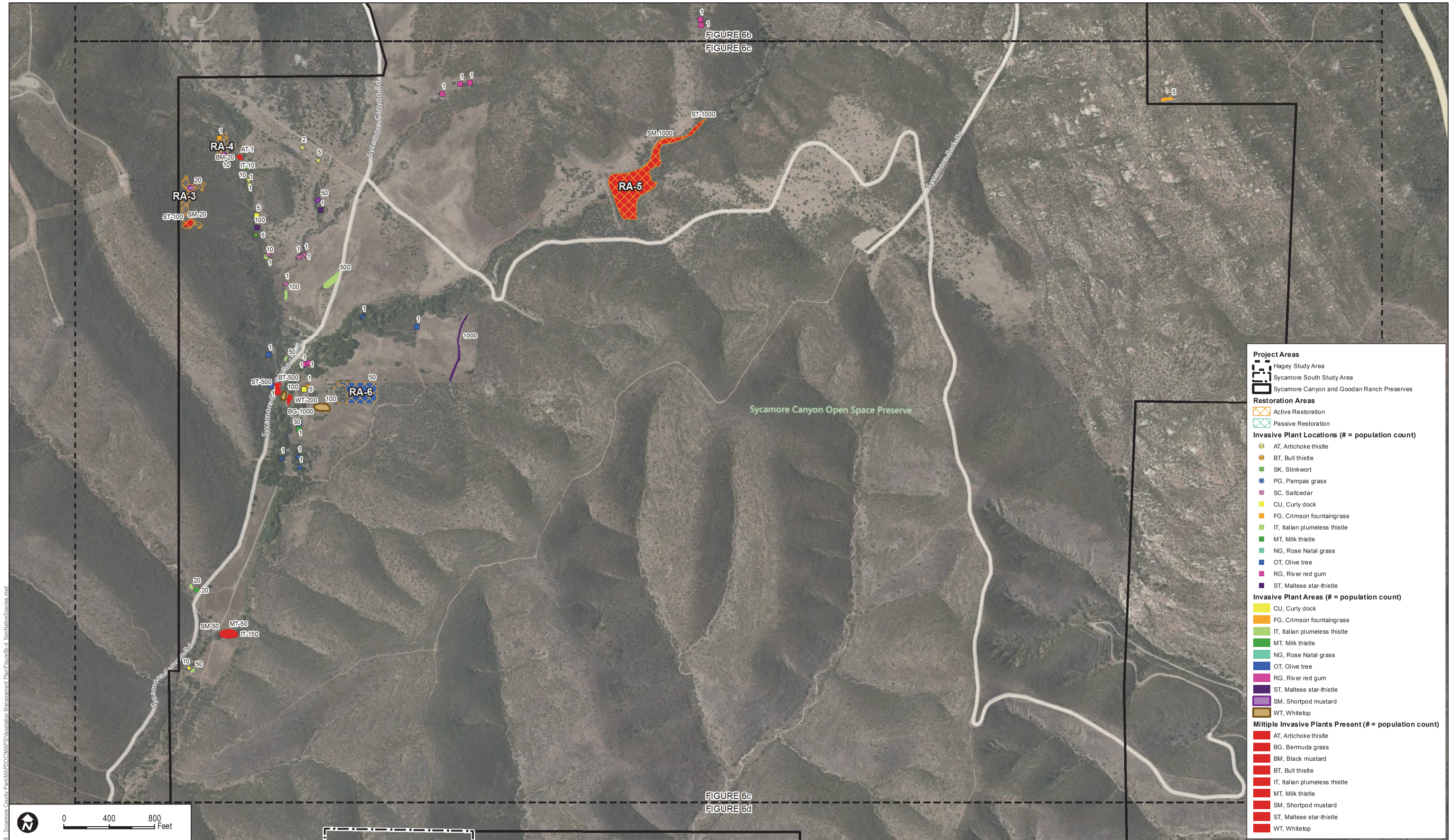

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SOURCE: Bing

FIGURE 6c

Target Invasive Non-native Plant Species Locations and Potential Habitat Restoration Sites

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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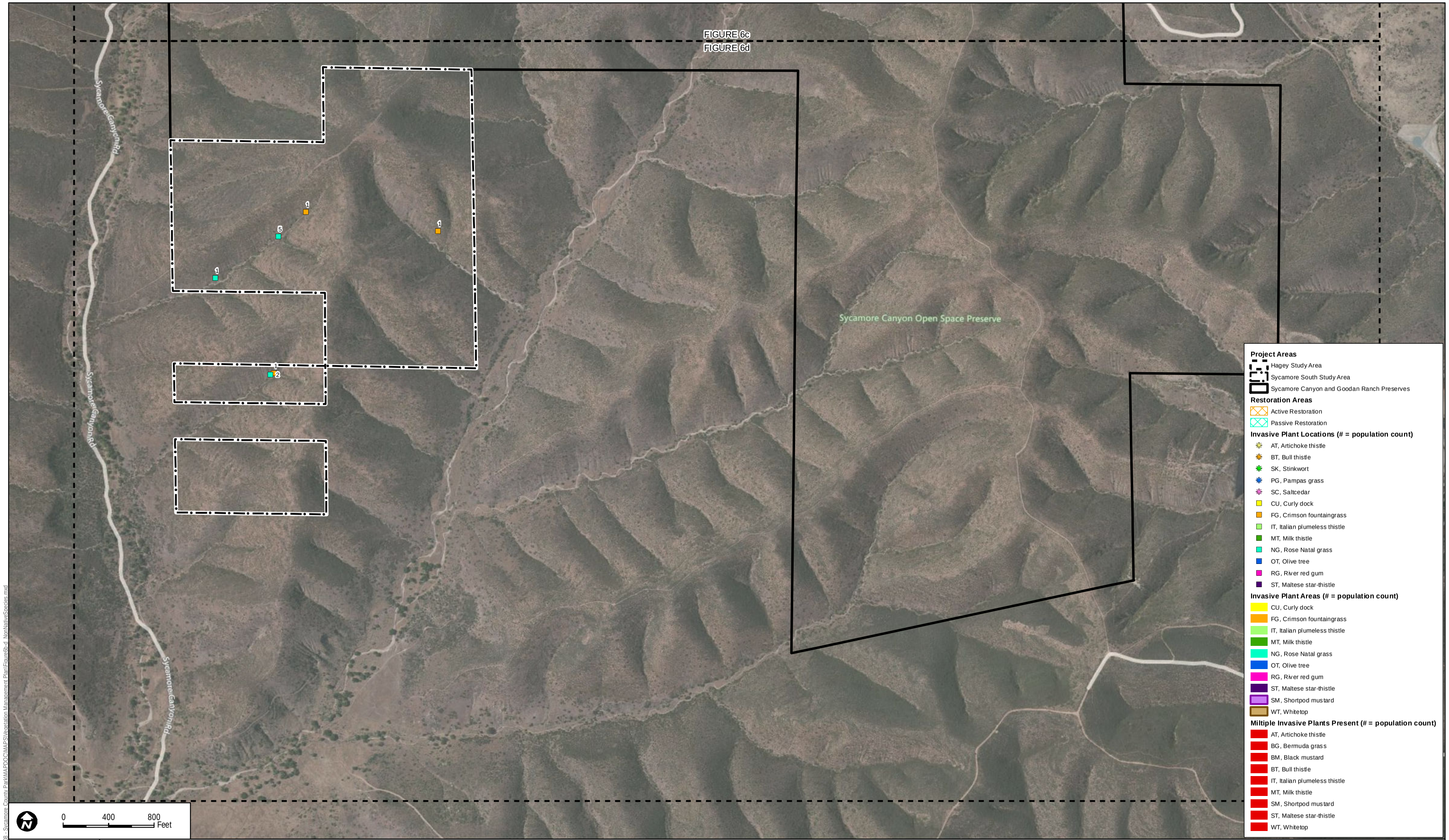

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SOURCE: Bing

FIGURE 6d

Target Invasive Non-native Plant Species Locations and Potential Habitat Restoration Sites

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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3.1 Target Invasive Non-Native Plant Species

Seventeen (17) invasive non-native plant species observed within the Preserve have been identified as target species in need of removal and control. A removal priority ranking system was established for these target species to assist management efforts. The criteria used for assigning removal priority rankings for the invasive non-native plant species included an evaluation of the Cal-IPC rating, the current cover and distribution in the Preserve, the potential for invading sensitive habitat, and the potential for increasing fire intensity. These species and associated management/control recommendations are presented below along with a removal priority ranking. Table 6 summarizes this information. Species ranked as high priority are recommended for control as soon as possible; species ranked as moderate priority are recommended for control as soon as high priority species are under control; and species ranked as low priority are recommended for control after high and moderate priority species are under control.

Table 6
Removal Priority of Target Invasive Non-Native Plant Species

Scientific Name	Common Name	Removal Priority
Cortaderia selloana	Pampas grass	High
Cynara cardunculus	artichoke thistle	High
Dittrichia graveolens	stinkwort	High
Eucalyptus camaldulensis	river red gum	High
Lepidium draba	whitetop	High
Tamarix ramosissima	saltcedar	High
Melinus repens	rose Natal grass	Moderate
Pennisetum setaceum	crimson fountaingrass	Moderate
Brassica nigra	black mustard	Low
Carduus pycnocephalus	Italian plumeless thistle	Low
Centaurea melitensis	Maltese star-thistle	Low
Cirsium vulgare	bull thistle	Low
Cynodon dactylon	Bermuda grass	Low
Hirschfeldia incana	shortpod mustard	Low
Olea europaea	olive tree	Low
Rumex crispus	curly dock	Low
Silybum marianum	milk thistle	Low

General recommendations for control include manual and mechanical removal, application of herbicides, and cut and daub. However, the appropriate removal methodology should ultimately be determined with consideration of many variables, including time of year, severity of infestation, presence of special-status species, the degree of intermixing of invasive non-native

plant species with sensitive native habitats, access, and proximity to surface water. Specific invasive non-native plant control recommendations for high-priority species are included below. Species ranked as moderate and low priority for removal are discussed in Appendix B.

3.1.1 High Priority Species for Removal

Pampas grass (*Cortaderia selloana*)

Pampas grass is a large, clumping grass, about 6–8 feet (1.8–2.4 meters) tall. It is an aggressive spreading, ornamental species that produces significant amounts of biomass, which is extremely flammable, thus increasing the potential for fire ignition and/or spread. This species produces an abundance of seed, which is light, and can be windblown into the surrounding areas (Cal-IPC 2012). The Cal-IPC inventory categorizes pampas grass as having an overall rating of "high", and it is ranked as a high priority for removal/control within the Preserve because of its ability to spread rapidly and contribute to the spread of wildfire. This species was observed scattered in the vicinity of the ranch house in the western portion of the site. Only 5 individual plants (approximately 500 square feet) were observed and mapped within the Preserve, but it is likely that there are more individuals along the riparian corridor of Sycamore Creek (Figures 6a–6d). Removal of pampas grass involves either hand digging or pulling/winching plants out of the ground. If complete removal of the plant is not feasible, it may be treated with an herbicide to control. Herbicide application can occur as a foliar application, or the plants can be cut to near the ground surface and treated with an appropriate systemic herbicide (e.g., glyphosate). Treatment is recommended to occur prior to seed-set (blooms September to March), and if viable seed is present at the time of treatment, plumes should be carefully cut and bagged to prevent seed spread. Fall applications of herbicide for treatment results in better control compared to summer applications (Bossard 2000).

Artichoke thistle (*Cynara cardunculus*)

Artichoke thistle is a large perennial thistle found at lower elevations throughout multiple regions of California. It prefers areas of disturbance, in vegetation communities lacking a dense canopy, such as non-native grasslands, chaparral, sage scrub, and more open canopy riparian areas. Artichoke thistle is an ornamental plant, and is available commercially. It reproduces by seed and sometimes by re-sprouting from root fragments. Artichoke thistle produces a taproot, which can grow to several feet deep. During attempted removal, it is important to ensure removal of the entire root, as it is known to regenerate from fragments (Cal-IPC 2012). The Cal-IPC inventory categorizes artichoke thistle as having an overall rating of "moderate." This species is ranked as a high priority for removal/control in the Preserve because of its tendency to spread and establish rapidly, and for the difficulty in complete control. Within the Preserve, artichoke thistle is located north of the ranch house in the western portion of the site. Approximately 10 individual plants (approximately 100 square feet) were mapped within the Preserve (Figure 6).

Treatment is recommended to occur prior to seed-set, and if viable seed is present at the time of treatment, seed heads should be carefully cut and bagged to prevent seed spread. Herbicide control is recommended as manual removal of plants creates the potential for fragmentation of roots left within the soil which can regenerate into new individuals. Control is most effective when mature plants are bolting (April-May; Bossard 2000). The species can be controlled with a systemic herbicide, such as glyphosate.

Stinkwort (*Dittrichia graveolens*)

Stinkwort is a fall-flowering, sticky, aromatic non-native annual dicot that appears to be rapidly expanding its range in California. It colonizes disturbance areas through seed dispersal (Cal-IPC 2012). The Cal-IPC inventory categorizes this species as having overall ratings of "moderate." Additionally, Cal-IPC categorizes this species as an "alert" species, which indicates that it has significant potential for invading new ecosystems. This species is ranked as a high priority for removal/control in the Preserve because of its tendency to spread rapidly and displace native vegetation communities. Within the preserve, stinkwort is located north of the ranch house in the western portion of the property along a small stream channel. Approximately 15 individual plants (approximately 50 square feet) were documented (Figure 6). Control is recommended to occur prior to seed-set, and if viable seed is present at the time of treatment, seed heads should be carefully bagged to prevent spread. The plant blooms in the summer and fall, producing copious wind-dispersed seed. Stinkwort is an annual species and is easily controlled by manually pulling plants from the ground. Herbicide control is recommended if manual removal is not feasible.

River red gum (*Eucalyptus camaldulensis*)

Documented only in the northern half of the Preserve study area, eucalyptus trees occur as scattered individuals and in small groupings (Figures 6a-6d). The number of individuals is estimated to be 16 (approximately 0.3 acre). The Cal-IPC inventory categorizes river red gum eucalyptus species as having an overall rating of "limited." A closely related eucalyptus species, blue gum (*Eucalyptus globulus*) is ranked by Cal-IPC as moderate. While only river red gum was documented within the preserve, some of the eucalyptus trees were difficult to identify due to the time of year and accessibility. Thus it is possible that some of the eucalyptus within the Preserve may be blue gum. Regardless, eucalyptus is ranked as a high priority for removal/control in the Preserve because of its tendency to displace native vegetation communities and spread into new areas, particularly along riparian corridors. In addition, this species is of concern for fire hazard since its physical characteristics (resin content) can increase fire intensity, transition ground fire to crown fires, and propagate spot fires through the dislodging of canopy material during windy conditions. The best treatment for eucalyptus control is through mechanical removal and herbicidal treatments (Bossard 2000). Treatment can occur any time of year, but best results have been

achieved when cutting occurs in fall (Bossard 2000). Eucalyptus trees may be cut and treated with the appropriate systemic herbicide (e.g., triclopyr, imazapyr, or glyphosate), or trees may be removed with the use of girdling and herbicidal treatment. Herbicides should be applied to the cambium layer within the first 1 to 2 minutes following cutting. Follow-up herbicidal treatment may be necessary since sucker growth may occur. Small saplings or seedlings can be removed by manually removing from the soil by hand pulling.

Whitetop (*Lepidium draba*)

Whitetop is a perennial herb found most commonly in riparian areas and areas of disturbance. It is found in multiple regions in California and in some areas can be very invasive. This plant quickly colonizes in areas of soil disturbance. It reproduces by seed and rhizomatously from its root system. It is possible for new individuals to sprout from root fragments, making manual removal difficult. It produces a large amount of viable seed, which can be dispersed rapidly (Cal-IPC 2012). The Cal-IPC inventory categorizes whitetop as having an overall rating of "moderate"; however, it is ranked as a high priority for removal/control within the Preserve due to its potential to rapidly spread within the Preserve. Within the Preserve, this species is located south of the ranch house area, in the western portion of the site. There were an estimated 400 individuals documented within the Preserve. Treatment is recommended to occur prior to seed-set, and if viable seed is present at the time of treatment, seed heads should be carefully cut and bagged to prevent seed spread. Herbicide control is recommended as manual removal of plants creates the potential for fragmentation of roots left within the soil which can regenerate into new individuals. Herbicide application is most effective during the bolting and flowering stage (generally March to June; Bossard 2000). A systemic herbicide (e.g., glyphosate, 2,4-D) should be used to control the species as the root system can quickly regenerate plants if not killed.

Saltcedar (*Tamarix ramosissima*)

Saltcedar is a shrub or tree typically found along waterways, drainages and riparian areas. It is associated with dramatic changes in geomorphology, groundwater availability, soil chemistry, fire frequency, plant community composition, and native wildlife diversity. Saltcedar presents the greatest risk of reducing habitat quality within riparian areas and vegetated ephemeral drainages, which are limited in presence within the Preserve (Cal-IPC 2012). Saltcedar was observed within drainages in the northwestern portion of the Preserve, just north of the ranch house (Figures 6a-6d). The Cal-IPC inventory categorizes saltcedar as having an overall rating of "high." It is ranked as high priority for control due to its ability to spread rapidly and displace native habitat. Because saltcedar can become a large shrub or tree, it can be difficult to control manually. Therefore, large shrubs or trees may need to be removed mechanically. Within the Preserve, all individuals observed were small shrubs. Application of an appropriate systemic herbicide (e.g., triclopyr or

glyphosate) is recommended to control the species since root fragments can regenerate. Cut and daub treatment is likely the most effective means of control. Foliar applications of herbicide achieve the best results when applied in late spring to early fall (Bossard 2000). Saltcedar is located north of the ranch house in the western portion of the site. Five individuals (approximately 200 square feet) were mapped within the Preserve (Figures 6a–6d).

3.2 Removal Methods

The selection of the appropriate removal methodology should be determined with consideration of many variables, including the time of year, severity of infestation, the presence of sensitive plants and wildlife, the degree of intermixing of invasive species with sensitive native habitats, access, and proximity to surface water. General recommendations for the Preserve are provided below.

3.2.1 Manual Removal

Manual vegetation removal (e.g., hand pulling, grubbing, and hoeing) is a low-impact method of controlling invasive non-native plant species within a focused area. Due to the perennial nature of many of the target invasive plant species, their large size, and/or difficulty of control, manual vegetation control is primarily applicable to the smaller, annual species within the Preserve. Appropriate applications for manual removal are for small occurrences of annual weeds and seedlings of perennial species when complete removal of the root system is possible. More mature perennial plants will limit the ability for manual removal based on their size and root mass. Manual removal should be incorporated where herbicide application alone is inadequate, or where proximity of sensitive plant species prevents safe application (e.g., overspray or drifting of herbicides). In accordance with Implementation Measures B.2.2 and B.2.3 of the RMP, it is anticipated that park rangers will routinely pull weeds or remove non-native plant species in early stages of growth when found along trails and will coordinate with volunteer groups to remove non-native plant species at locations identified during invasive plant surveys and monitoring. With minimal training, and using shovels, hoes, loppers, or just their hands, newly spotted seedlings could be removed before they have the chance to establish themselves and/or set seed. Such a volunteer program would help enfranchise the general public with a vested interest in the Preserve and its protection, as well as serving as an educational experience whose effects could range beyond the boundaries of the Preserve. All removed invasive non-native plant material that is feasible (portions of trees may be too large to remove without significant effort or impact) should be disposed of in a manner that does not promote spread or infestation of the species into new areas of the Preserve. If the plant material cannot be contained on site to decompose without regenerating, it should be disposed of outside of the Preserve at a green waste facility or landfill.

3.2.2 Herbicides

The application of herbicides to control target invasive species may be used on its own or as a secondary treatment following manual or mechanical removal for controlling sprout growth and regeneration. The advantage of using chemical treatments is that they typically result in high kill rates, and can prevent the invasives from setting seed. Thus in the long run, the invasives are eliminated as their "seed bank" is eventually eliminated. Some disadvantages include the necessity of applicators to be trained and then licensed by the State of California, the cost of application and safety equipment, the cost of the herbicide itself, the potential to affect non-target species, and the social stigma associated with the use of chemical controls particularly in wetlands situations. In spite of these drawbacks, herbicides, or herbicides in combination with hand/mechanical removal, are the most widely used and effective techniques for controlling invasive plants, and have been used repeatedly throughout the world.

Herbicides are broadly classified into two basic types: pre-emergent and post-emergent. Pre-emergent herbicides are sprayed directly onto the ground and prevent plants from germinating and/or growing. As such, they have a larger potential to impact any native seeds remaining in the soil, and often have longer persistence times in the environment. Post-emergent herbicides are applied directly onto the plants, often during the early phases of their growth, killing them before they have the chance to mature and set seed. Thus with proper equipment and training, they can be applied relatively selectively, and will have no impact on native seeds residing in the soil. However, should the target species be intermixed with growing native species, the chance of affecting these natives would be greatly increased.

Different plants vary in their response to any particular herbicide, and can also vary in their response depending upon which stage in their life cycle the herbicide is applied. Herbicides applied during the "bolting" phase (when flowing stalks are being produced) may have greater kill rates than the same chemical applied during the rosette stage or the flowering stage. Some herbicides are specific to specific groups of plants (e.g., fusillade affects only grasses), while others can kill virtually all kinds of plants. Still others are permitted for use in California, while others are not. Systemic herbicides (as opposed to contact herbicides) are likely the most effective for control of invasive non-native plant species due to their ability to spread via translocation into root tissue.

Herbicide application is recommended following removal of all target invasive tree species and other perennial species with the ability to regenerate from root fragments when removal of all plant material is not feasible. Herbicide use should be limited to localized applications rather than foliar applications to eliminate the possibility of drift and impacts to neighboring desirable species. A wide range of herbicides are available for such types of treatment.

Herbicide labels and material safety data sheets (MSDS) list susceptible target plant species and provide proper direction in the use and handling of the products. Herbicides should be applied in accordance with state and federal law.

3.2.3 Mechanical Removal

Mechanical removal may be necessary for control of some larger target invasive species, such as eucalyptus, pampas grass, and saltcedar, and is recommended to be combined with herbicide application. The advantage of using mechanized equipment is that it can cover large areas relatively quickly. The disadvantages include the costs of operator training, initial equipment purchase, and equipment maintenance and transportation. Cutting and removal of the aboveground plant material can be conducted with chainsaws and/or hand saws. The resulting material should be chipped and hauled off site. Subsequent application of herbicides should follow product guidelines for safe transport, storage, and application. Stumps remaining on site after cutting and herbicide application are not recommended for removal or grinding, but should be left to decompose in place.

3.2.4 Cut and Daub

Cut and daub treatment is recommended for larger invasive plants, such as large trees and shrubs, to control regrowth and kill the portion of the plant remaining belowground. Cut and daub involves the cutting of invasive plant stalks or trunks and then the direct application of an appropriate systemic herbicide directly to the cambium layer of the freshly cut stump or stem. Other related methods include drill and fill where holes are drilled into the trunk of a tree and herbicide is injected; or the glove method, where an herbicide-soaked glove is used to apply directly to plant foliage or freshly cut stumps. It is critical that the herbicide treatment occur immediately after the plants are severed so that the herbicide is carried into the plant tissue. If enough time elapses to allow the cut surface of the severed plant to dry out, a fresh cut should be made prior to herbicide application.

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4.0 HABITAT RESTORATION

In accordance with Implementation Measure B.1.1 of the RMP, restoration opportunities were evaluated within the Preserve. The goal of habitat restoration is to reestablish or enhance the biological functions and services of vegetation communities that have been degraded by either human or natural causes. Restoration methods range from active revegetation (involving soil preparation and planting), to passive management (involving weed control and allowing time for natural recruitment to occur). Active restoration may assist the recovery of an area that has been disturbed and is showing difficulty in recovering. Any proposed restoration activity should utilize current, accepted techniques, avoid/minimize impacts to sensitive species or native vegetation communities, and should use only local native species. The purpose of restoration within the Preserve is to reclaim native vegetation community acreage lost or compromised due to human or other induced disturbance involving the clearing or grading of native vegetation. Restoring disturbed areas will provide an overall increase of acreage of native vegetation, connectivity of existing native vegetation, and erosion control in areas of disturbance. Restoration of these areas is important to the integrity of the surrounding vegetation communities, as cleared areas can provide opportunity for invasive non-native plant species to colonize (many non-native annuals are flashy fuels that can increase fire danger), provide opportunity for erosion by exposing the soil surface, reduce acreage of native vegetation communities, and sever connectivity among vegetation communities.

4.1 Proposed Habitat Restoration Areas

The Preserve is generally composed of high-quality native vegetation communities, and habitat restoration opportunities are limited within the Preserve. No restoration opportunities were previously identified within the Preserve in the RMP (Section 5.3.1). However, there are a few areas in the Preserve that would benefit from restoration activities. Approximately 6.4 acres of disturbed habitats are proposed for restoration, which primarily include previously cleared and/or disturbed areas. These are located throughout the site, among sagebrush, chaparral and oak communities, as shown in Figures 6a-6d. Within the northeastern portion of the Preserve are several graded areas of disturbance which are associated with the Sunrise Powerlink Project. These are assumed proposed for revegetation by the project, and are therefore not included in this VMP.

4.2 Restoration Methods

Two methods of restoration are proposed for the disturbed areas within the Preserve: (1) passive restoration, and (2) active restoration. For the purposes of discussion in this VMP, restoration areas on Figure 6 are identified as RA-1 through RA-6.

4.2.1 Passive Restoration

Passive restoration involves performing weed and erosion control, as needed, in disturbed areas where natural recruitment of native plant species is actively occurring. RA-2 is proposed for passive restoration, with the rest of the areas proposed for active restoration. Vegetation clearing, potentially associated with brush management activities, has occurred in the past in RA-2, but it is currently recruiting native species found in the adjacent vegetation communities. Since the process of recruitment and establishment of native plant species has already begun, no soil disturbance (e.g., ripping, tilling, grading) or other soil preparation is recommended. Based on site conditions, erosion control measures and weed control should be conducted where necessary. Erosion control features will help to limit further erosion and soil loss and, if installed correctly, will capture sediments that can create areas for native plants to establish. Passive restoration should be maintained weed free to allow native recruitment to continue until the area is reincorporated back into surrounding native vegetation communities. Should natural recruitment slow or stop over time, seed application and/or container plants could be incorporated. If the disturbance at RA-2 is associated with brush management activities conducted by an adjacent property owner, DPR may want to coordinate with the property owner to ensure that future brush management activities are conducted in accordance with County regulations.

4.2.2 Active Restoration

Active restoration involves soil preparation and planting of disturbed or degraded areas where native vegetation recruitment is not actively occurring, and/ or significant soil/ vegetation disturbance is required in preparation for revegetation (such as extensive invasive exotic control or grading). These areas may be ones that were cleared and are not showing significant natural recruitment of native plant species, and/or that are degraded from erosion. These areas may require site preparation prior to planting by recontouring to approximate the natural gradient expected at the site. No fertilizer is recommended for addition to the amendments since this can favor establishment of faster growing, annual non-natives. Appropriate erosion control measures should be installed after site preparation activities to limit further erosion and soil loss.

Upon completion of site preparation activities, native seed and container plants could be installed. Plant materials should be native species from San Diego County. Tables 7 through 11 provide a seed mix and plant palette for areas of potential active restoration. These are native species that are common to the vegetation communities found in the Preserve. Quantities, rates, and composition should be determined on an individual basis, based on the existing plant composition around the restoration sites. Additional native species appropriate to the adjacent vegetation community may be added as appropriate.

Weed control should be performed regularly to allow new seedlings and container plants to establish and transition the area to its intended native vegetation community.

Because the potential restoration areas are not all easily accessible and lack an irrigation system to help in establishing plants, restoration should prioritize seed application over container plant installation. Some sage and chaparral species are challenging to establish from seed due to natural seed dormancy. Therefore, the recommended plant palettes include pioneer species that should help establish vegetative cover until climax species are eventually recruited. Seed application should occur prior to the onset of the winter rainy season to take advantage of the full growing season. An effective seed application technique would be to hand broadcast seed, rake into the soil, and cover with a fine mulch seed topper at approximately 1/4-inch depth. The fine mulch seed topper helps protect the seed from getting eaten by birds and rodents, and also helps keep the soil moist during the rainy season.

If container plants are installed, they should be installed in the fall at the onset of the rainy season. Without supplemental irrigation, installation of container plants will likely have limited success. Standard planting procedures should be employed for installing container plants. All container plants should be checked for viability and general health prior to installation. Holes approximately twice the size of the root ball of the plant should be dug using a shovel, post- hole digger, or power auger. Holes should be filled with water and allowed to drain immediately prior to planting. Container plants should be installed so that the top of the root ball is at grade or slightly above grade. Plants should be monitored for signs of stress or mortality. Many species native to southern California are evergreen, and are adapted to seasonal drought conditions, but require soil moisture for a prolonged period to become established. In the months following planting, and especially if dryer than average conditions exist, periodic hand watering may be necessary to help establish the plants.

4.2.3 Restoration Area Descriptions and Recommendations

RA-1 Black Sage-Laurel Sumac Active Restoration

RA-1 is located along the western edge of the Hagey property, toward the northern end of the Preserve. It is a 0.18 acre area which was mapped as Disturbed Habitat due to previous vegetation clearing likely associated with brush management activities. This area was still bare at the time of evaluation, showing no signs of significant natural native plant recruitment or recovery. Based on the adjacent native vegetation community context, RA-1 is proposed to be revegetated with a Black Sage-Laurel Sumac plant palette (Table 7). DPR may want to coordinate with the adjacent property owner to ensure that future disturbance at this location is conducted in accordance with County regulations for brush management.

Black sage and laurel sumac are codominants in the black sage – laurel sumac association, which is found throughout the central and southern coasts of California, including the Transverse and Peninsular ranges, and into Baja California. Other shrubs found in this association, at lower percent cover, include California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), orange bush monkeyflower (*Mimulus aurantiacus*), and ceanothus (*Ceanothus* sp.), among others (SANDAG 2011). The tree canopy, if present, is sparse, and herbaceous cover is high in openings (SANDAG 2011).

Final plant quantities, percent composition, and application methods shall be determined by field conditions and context at the time of implementation.

Table 7
Black Sage-Laurel Sumac Plant Palette

Container Plants			
Scientific Name	*Common Name*	*Suggested Size*	*Average Spacing (feet on center)*
Artemisia californica	California sagebrush	1 gallon	3
Ceanothus tomentosus	Woolyleaf ceanothus	1 gallon	5
Eriogonum fasciculatum	California buckwheat	1 gallon	3
Malosma laurina	laurel sumac	1 gallon	8
Mimulus aurantiacus	monkeyflower	1 gallon	4
Salvia mellifera	black sage	1 gallon	4
Seed Mix			
Scientific Name	*Common Name*	*Minimum PLS*	*Pounds Per Acre*
Artemisia californica	California sagebrush	10	3
Ceanothus tomentosus	woolyleaf ceanothus	75	2
Eriogonum fasciculatum	California buckwheat	10	4
Eriophyllum confertifolium	golden yarrow	25	0.5
Eschscholzia californica	California poppy	85	0.5
Hazardia squarrosa	sawtooth goldenbush	3	2
Lasthenia californica	California goldfields	50	0.5
Lessingia filaginifolia	sand aster	3	2
Acmispon scoparius	deerweed	85	0.5
Lupinus bicolor	pygmy lupine	90	2
Malacothamnus fasciculata	chaparral mallow	10	4
Malosma laurina	laurel sumac	70	5
Mimulus aurantiacus	monkeyflower	2	1
Stipa lepida	foothill needlegrass	65	2
Plantago erecta	dot seed plantain	85	1
Salvia mellifera	black sage	40	5
		Total	31

RA-2 Passive Restoration of Disturbed Chamise Chaparral-Woolly-leaved Ceanothus Restoration

RA-2 is located along the western edge of the Hagey property, south of Area 1, and is proposed for passive restoration (Figure 6b). It is a 0.41 acre area which was mapped as Disturbed Chamise Chaparral-Woolly-leaved Ceanothus Association. The cause for disturbance in this area was likely previous vegetation clearing for brush management. This area was showing signs of natural native vegetation recruitment and recovery at the time of evaluation; therefore, no additional planting is proposed.

Chamise and woolly-leaved ceanothus (*Ceanothus tomentosus*) are codominants in this association, and form a mostly continuous shrub layer (SANDAG 2011). Other species commonly found in this association include oaks, manzanita, sages, and other species of ceanothus (e.g. *C. leucodermis, C. oliganthus*). This association is commonly found on slopes of cismontane foothills (SANDAG 2011).

For passive restoration of this area, non-native plant species should be regularly controlled, to promote spread and establishment of native species. Erosion potential should be evaluated and monitored, and erosion control best management practices (BMPs) implemented as-needed.

As stated previously, DPR may want to coordinate with the adjacent property owner to ensure that future disturbance at this location is conducted in accordance with County regulations for brush management.

RA-3 Black Sage Active Restoration

RA-3 is located along the western edge of the Preserve, north of the ranch house (Figure 6c). It is a 0.91 acre area which was mapped as Annual Brome Grasslands because non-native grasslands are the predominant vegetative component. However, the location of the site on a hillside surrounded by coastal scrub and chaparral makes this site an ideal candidate for habitat restoration. Based on the adjacent native vegetation community context, RA-3 is proposed to be revegetated with a Black Sage plant palette (Table 8).

Annual brome grasslands are characterized by a dense to sparse cover of annual grasses, particularly bromes (*Bromus diandrus, B. hordeaceus, B. madritensis*), which are dominant or co-dominant in the herbaceous layer. There may be trees or shrubs present, although at very low densities (SANDAG 2011). This vegetation community frequently results from changes in natural ecosystem processes, which can be caused by maintenance (e.g., mowing, scraping, discing, spraying), grazing, repetitive fire, agriculture, or other mechanical disruption that has altered soils and removed native seed sources from areas formerly supporting native vegetation

(SANDAG 2011). Annual brome grasslands typically occur adjacent to roads or other developed areas where there has been some historic disturbance (SANDAG 2011). RA- 3 occurs on an east facing hillside.

RA-3 is proposed for revegetation with black sage vegetation community components (Table 8). In the black sage scrub alliance, black sage can be codominant with other shrubs such as chamise, California sagebrush, California encelia (*Encelia californica*), or white sage (*Salvia apiana*) (SANDAG 2011). Final plant quantities, percent composition, and application methods shall be determined by field conditions and context at the time of implementation.

Table 8
Black Sage Plant Palette

Container Plants			
Scientific Name	*Common Name*	*Suggested Size*	*Average Spacing (feet on center)*
Artemisia californica	California sagebrush	1 gallon	3
Eriogonum fasciculatum	California buckwheat	1 gallon	3
Acmispon scoparius	Deerweed	1 gallon	3
Isocoma menziesii	Menzies' goldenbush	1 gallon	3
Mimulus aurantiacus	monkeyflower	1 gallon	4
Salvia apiana	white sage	1 gallon	4
Salvia mellifera	black sage	1 gallon	4
Seed Mix			
Scientific Name	*Common Name*	*Minimum PLS*	*Pounds Per Acre*
Artemisia californica	California sagebrush	10	3
Eriogonum fasciculatum	California buckwheat	10	4
Eriophyllum confertifolium	golden yarrow	25	0.5
Eschscholzia californica	California poppy	85	0.5
Hazardia squarrosa	sawtooth goldenbush	3	2
Isocoma menziesii	Menzies' goldenbush	15	0.5
Lasthenia californica	California goldfields	50	0.5
Lessingia filaginifolia	sand aster	3	2
Acmispon scoparius	deerweed	85	0.5
Lupinus bicolor	pygmy lupine	90	2
Malosma laurina	laurel sumac	70	3
Mimulus aurantiacus	monkeyflower	2	1
Stipa lepida	foothill needlegrass	65	2
Plantago erecta	dot seed plantain	85	1
Salvia mellifera	black sage	40	3
		Total	25.5

RA-4 Chamise Chaparral-Woolly-leaved Ceanothus Active Restoration

RA-4 is located northeast of RA-3, in the western portion of the Preserve (Figure 6c). It is a 0.46-acre area that was mapped as Disturbed Habitat. Based on the adjacent native vegetation community context, RA-4 is proposed to be revegetated with a Chamise Chaparral-Woolly-leaved Ceanothus Association plant palette (Table 9). This area was mapped as disturbed due to a previous soil disturbance. This area was still mostly unvegetated at the time of evaluation, showing little signs of natural native plant recruitment or recovery. A description of Chamise Chaparral-Woolly-leaved Ceanothus Association can be found in the RA-2 section above.

Table 9
Chamise Chaparral-Woolly-leaved Ceanothus Plant Palette

Container Plants			
Scientific Name	*Common Name*	*Suggested Size*	*Average Spacing (feet on center)*
Adenostoma fasciculatum	chamise	1 gallon	6
Artemisia californica	California sagebrush	1 gallon	3
Ceanothus tomentosus	woolyleaf ceanothus	1 gallon	5
Eriogonum fasciculatum	California buckwheat	1 gallon	3
Malosma laurina	laurel sumac	1 gallon	8
Mimulus aurantiacus	monkeyflower	1 gallon	4
Salvia mellifera	black sage	1 gallon	4
Seed Mix			
Scientific Name	*Common Name*	*Minimum PLS*	*Pounds Per Acre*
Adenostoma fasciculatum	chamise	20	4
Artemisia californica	California sagebrush	10	3
Ceanothus tomentosus	woolyleaf ceanothus	75	4
Eriogonum fasciculatum	California buckwheat	10	2
Eriophyllum confertifolium	golden yarrow	25	0.5
Eschscholzia californica	California poppy	85	0.5
Hazardia squarrosa	sawtooth goldenbush	3	2
Lasthenia californica	California goldfields	50	0.5
Lessingia filaginifolia	sand aster	3	2
Acmispon scoparius	deerweed	85	0.5
Lupinus bicolor	pygmy lupine	90	2
Malacothamnus fasciculata	chaparral mallow	10	2
Malosma laurina	laurel sumac	70	3
Mimulus aurantiacus	monkeyflower	2	1
Stipa lepida	foothill needlegrass	65	2
Plantago erecta	dot seed plantain	85	1
Salvia mellifera	black sage	40	3
		Total	33

RA-5 Scrub Oak -Mountain-Mahogany/Riparian Active Restoration

RA-5 is located in the central portion of the Preserve (Figure 6c). It is a 3.27 acre area which was mapped as Annual Brome Grasslands. This area is located along an existing riparian corridor, and was previously disturbed to construct a seasonal detention pond for ranching purposes. The detention pond is no longer functioning, and the outlet is highly eroded. In addition to the annual brome grassland vegetation characteristics described for RA- 3, RA-5 also has significant cover by shortpod mustard and Maltese star thistle. Based on the adjacent native vegetation community context, RA-5 is proposed to be revegetated with a Scrub Oak - Mountain-Mahogany plant palette (Table 10). Given that the linear context of Area 5 is that of a riparian corridor, coast live oak (*Quercus agrifolia*) has been added to this palette.

Scrub oak (*Quercus berberidifolia*/Q. *xacutidens*) and mountain-mahogany (*Cercocarpus minutiflorus*) are codominant in the shrub canopy of the scrub oak – mountain-mahogany association (SANDAG 2011). Scrub oak is typically at least 50 percent of the relative cover in the shrub canopy. Subdominant species include poison oak (*Toxicodendron diversilobum*), chamise, manzanita, ceanothus, and monkeyflower. Herbaceous diversity and cover is low, and is present primarily in habitat openings. Species diversity increases after fires (SANDAG 2011).

Table 10
Scrub Oak -Mountain-Mahogany/ Riparian Plant Palette

Container Plants			
Scientific Name	*Common Name*	*Suggested Size*	*Average Spacing (feet on center)*
Artemisia californica	California sagebrush	1 gallon	3
Cercocarpus minutiflorus	mountain-mahogany	1 gallon	6
Eriogonum fasciculatum	California buckwheat	1 gallon	3
Mimulus aurantiacus	monkeyflower	1 gallon	4
Quercus agrifolia	coast live oak	1 gallon	15
Quercus berberidifolia	scrub oak	1 gallon	6
Salvia mellifera	black sage	1 gallon	4
Seed Mix			
Scientific Name	*Common Name*	*Minimum PLS*	*Pounds Per Acre*
Artemisia californica	California sagebrush	10	3
Cercocarpus minutiflorus	mountain-mahogany	40	4
Eriogonum fasciculatum	California buckwheat	10	2
Eriophyllum confertifolium	golden yarrow	25	0.5
Eschscholzia californica	California poppy	85	0.5
Hazardia squarrosa	sawtooth goldenbush	3	2
Lasthenia californica	California goldfields	50	0.5
Lessingia filaginifolia	sand aster	3	2

Table 10
Scrub Oak -Mountain-Mahogany/ Riparian Plant Palette

Seed Mix			
Scientific Name	*Common Name*	*Minimum PLS*	*Pounds Per Acre*
Acmispon scoparius	deerweed	85	0.5
Lupinus bicolor	pygmy lupine	90	2
Mimulus aurantiacus	monkeyflower	2	1
Stipa lepida	foothill needlegrass	65	2
Plantago erecta	dot seed plantain	85	1
Quercus agrifolia	coast live oak	NA	(acorn to be placed)
Quercus berberidifolia	scrub oak	NA	(acorn to be placed)
Salvia mellifera	black sage	40	3
		Total	24

RA-6 Scrub Oak-Mountain-Mahogany Active Restoration

RA-6 is located along the western edge of the Preserve, southeast of the ranch house (Figure 6c). It is a 1.20 acre area which consists of an olive orchard. While olive trees are not highly aggressive invaders, this orchard represents an opportunity to provide additional native vegetation cover. Based on the adjacent native vegetation community context, and existing conditions, RA-6 is proposed to be revegetated with a Scrub Oak-Mountain-Mahogany plant palette (Table 11). This community is described above for RA-5.

Table 11
Scrub Oak-Mountain-Mahogany Plant Palette

Container Plants			
Scientific Name	*Common Name*	*Suggested Size*	*Average Spacing (feet on center)*
Artemisia californica	*California sagebrush*	*1 gallon*	*3*
Cercocarpus minutiflorus	mountain-mahogany	1 gallon	6
Eriogonum fasciculatum	California buckwheat	1 gallon	3
Mimulus aurantiacus	monkeyflower	1 gallon	4
Quercus berberidifolia	scrub oak	1 gallon	6
Salvia mellifera	black sage	1 gallon	4
Seed Mix			
Scientific Name	*Common Name*	*Minimum PLS*	*Pounds Per Acre*
Acmispon scoparius	deerweed	85	0.5
Artemisia californica	California sagebrush	10	3
Cercocarpus minutiflorus	mountain-mahogany	40	4
Eriogonum fasciculatum	California buckwheat	10	2
Eriophyllum confertifolium	golden yarrow	25	0.5
Eschscholzia californica	California poppy	85	0.5

Table 11
Scrub Oak-Mountain-Mahogany Plant Palette

Seed Mix			
Scientific Name	*Common Name*	*Minimum PLS*	*Pounds Per Acre*
Hazardia squarrosa	sawtooth goldenbush	3	2
Lasthenia californica	California goldfields	50	0.5
Lessingia filaginifolia	sand aster	3	2
Lupinus bicolor	pygmy lupine	90	2
Mimulus aurantiacus	monkeyflower	2	1
Stipa lepida	foothill needlegrass	65	2
Plantago erecta	dot seed plantain	85	1
Quercus berberidifolia	scrub oak	NA	(acorn to be placed)
Salvia mellifera	black sage	40	3
		Total	24

5.0 FIRE MANAGEMENT

5.1 Current Fire Management Practices

Fire Management consists of fire prevention, fire suppression, and the use of fuel management techniques to achieve vegetation management goals. The two major goals of all vegetation management activities are public and firefighter safety and achievement of biological objectives such as invasive species management or habitat enhancement. However, fire that occurs too frequently can alter vegetation community composition and structure and can promote the invasion of non-native plant species. Fuel management activities can be used to reduce fuel loads and fuel continuity in proximity to residential communities to improve public safety should a wildfire occur.

Currently, fire management practices in the Preserve include maintenance of fuel modification zones and defensible space surrounding the Park Ranger Office.

Additionally, there are other activities associated with fire management that are implemented on the Preserve. These activities are related to emergency response and access. Among them are:

- In the event of a fire, the main entrance road that extends from the northern Gooden Ranch gate off Sycamore Canyon Road through the northwestern portion of the Preserve serves as an access road for Poway Fire Department. Roads and trails have been successfully used for fire containment during small fires, and the Preserve trail provides the opportunity for access and fire operations.
- The existing trail/access road system is maintained, as needed, and provides a means for fire control and firing out operations. Existing perimeter gates have County padlocks. The Sycamore Ranch Road access gate has a Poway Fire Department Knox key switch. No other fire agencies have the means to unlock any other gates.

An analysis of the fire environment has been conducted as part of this VMP. This analysis, presented in the following sections, provides the basis for evaluation of existing fire management practices and their adequacy for meeting Preserve goals and providing for public safety.

5.2 Fire Environment

Several factors comprise the fire environment. Fires can occur in any environment where conditions are conducive to ignition and fire movement. The three major components of fire environment are climate, topography, and vegetation/fuels. The state of each of these components and their interaction with each other determine the potential characteristics and behavior of a fire at any given moment. Understanding these existing conditions is necessary to understanding the potential for fire within and around the Preserve.

Wildfires are a regular and natural occurrence in most of Southern California. However, increasing numbers of fires and acres burned annually has been experienced over the last decade. These wildfires are mostly human-caused, suggesting that the historic fire interval has been artificially affected across large areas. In addition, wildfire suppression efforts over the last several decades may have aided in the accumulation of fuels in some natural communities (Minnich 1983; Minnich and Chou 1997) resulting in larger and more intense wildfires. Large wildfires have had, and will continue to have, a substantial and recurring role in native California landscapes (Keeley and Fotheringham 2003), in part because (1) native landscapes become highly flammable each fall, (2) the climate in the region has been characterized by fire climatologists as the worst fire climate in the United States (Keeley 2004) with Santa Ana winds occurring during autumn after a 6-month drought period each year, and (3) ignitions via anthropogenic sources have increased or are increasing in many wildland or WUI areas.

The Preserve is located within a Very High Fire Hazard Severity Zone (FRAP 2012). This is the most dangerous rating. The Very High Fire Hazard Rating is based on a combination of relevant factors of fuel/vegetation, terrain and climate/weather. The Fire Hazard Severity Zones were created by the Fire and Range Assessment program of CAL FIRE (CAL FIRE 2011) per State of California Public Resources Code, Sections 4201-4204. Based on available information and an understanding of the fire environment of the region, it is expected that large wildfires will occur again and will burn within the Preserve.

5.2.1 Climate

As with most of Southern California, the regional climate in the vicinity of the Preserve is influenced by the Pacific Ocean and is frequently under the influence of a seasonal, migratory, subtropical high-pressure cell known as the Pacific High (Western Regional Climate Center (WRCC) 2012a). Wet winters and dry summers with mild seasonal changes generally characterize the Southern California climate. This climate pattern is occasionally interrupted by extreme periods of hot weather, winter storms, or dry, easterly Santa Ana winds (WRCC 2012a).

Additionally, the local vegetation and the seasonal drying produce climatic conditions that result in fuel-driven wildfires and fire-associated climatic changes. This type of condition is referred to as a plume-dominated wildfire. Plume-dominated wildfires are fires where the energy produced by the fire in conjunction with atmospheric instability creates significant convective forces and increased winds. Such fires are extremely unpredictable, spread in various directions simultaneously, and exhibit extreme fire behavior. These fires are extremely dangerous and are often large in size.

However, there is some local variance in the typical Southern California climate. The inland location of the Preserve affects the degree of influence of the Pacific Ocean, resulting in less-regulated temperatures. The average high temperature calculated from August 1957 to December 2005 for the surrounding Poway Valley area is approximately 75.1º Fahrenheit (F), with higher temperatures in summer and early fall (June through September) reaching up to an average of 83.8°F (WRCC 2012b). The mean annual precipitation for the area is 13.24 inches, with the most rainfall concentrated in the months of January (2.80 inches), February (2.70 inches), and March (2.30 inches) (WRCC 2012b). In Poway Valley, the 2011-2012 wet season (July through June) cataloged 23.18 inches of rain while the 2010-2011 wet season cataloged 22.24 inches of rain (WRCC 2012b).

The prevailing wind pattern is from the west, but the presence of the Pacific Ocean causes a diurnal wind pattern known as the land/sea breeze system. During the day, winds are typically from the west–southwest (sea), and at night, winds are from the northeast (land). During the summer season, the diurnal winds can be slightly stronger than the winds during the winter season due to greater pressure gradient forces. Surface winds can also be influenced locally by topography and slope variations. On the Preserve, the varied topography may affect wind velocity and patterns. The highest wind velocities are typically associated with downslope, canyon, and Santa Ana winds.

The fire season in Southern California typically starts in June, as vegetation begins to dry out after winter and spring rains, and typically ends in October, although fire weather may be present year-round (Schroeder and Buck 1970). The highest fire danger for this area coincides with the Santa Ana winds. Santa Ana wind conditions are a reversal of the prevailing southwesterly winds that usually occur on a region-wide basis during late summer and early fall. They are dry, warm winds that flow from the higher desert elevations in the north through the mountain passes and canyons. As they converge through the canyons, their velocities increase. Consequently, peak velocities are highest at the mouths of canyons and dissipate as they spread across valley floors.

General weather conditions for the region were derived from the Poway Valley weather station[1], as presented above. Additional weather variables were analyzed to determine extreme fire weather conditions, as outlined in the guidelines and standards presented by the County of San Diego, Planning and Development Services. Specifically, Peak and Summer wind and fuel moisture conditions were evaluated and used in the fire behavior modeling efforts conducted for the Preserve. The fire weather variables and an analysis of fire behavior for the Preserve are presented in Section 5.0 and Appendix D.

[1] The Poway Valley station is located in Poway, approximately 7.5 miles north of the Preserve. The following summarizes the location and available data ranges for the Poway Valley weather station: Latitude: 33.017; Longitude: -117.033; Elevation: 650 feet; Data years: 1893 to 2012.

5.2.2 Topography

The topography of the Preserve includes moderate and steep slopes with elevation ranges from approximately 620 to 1,550 feet AMSL. Two primary ridgelines characterize the southern portion of the Preserve and extend roughly north-south until they join in the central portion of the Preserve where they form one primary ridge extending northward. The upper reaches of Sycamore Canyon, Clark Canyon, Slaughterhouse Canyon, and Beeler Canyon extend into the southern and central portions of the Preserve. Elevations rise upward from these canyon bottoms to the peaks of their associated ridgelines. The western portion presents the flattest area of the Preserve, within Sycamore Canyon at the Goodan Ranch site. The canyons and drainages on the Preserve contain slopes with gradients reaching up to 70% (approximately 35°) in some areas. Topographic features that may present a fire spread facilitator are the narrow canyons and sub-drainages which may serve to funnel winds, thus increasing their velocity and potential for influencing extreme fire behavior. Additionally, a "saddle" located at the upper reach of Slaughterhouse Canyon is potentially wind aligned and wind funneling may occur due to local terrain.

5.2.3 Watershed Description

The extreme northern portion of the Preserve is located within the Peñasquitos Watershed, while the remaining Preserve area is within the San Diego Watershed. The upper reaches of Sycamore Canyon and Clark Canyon drain southwesterly into Sycamore Creek, and ultimately into the San Diego River. The upper reach of Slaughterhouse Canyon drains southeasterly from the Preserve into San Vicente Creek, which then flows southward into the San Diego River. The San Diego River then flows southwest, ultimately draining into the Pacific Ocean. The upper reach of Beeler Canyon drains northward, into Beeler Creek and ultimately into Peñasquitos Creek. Peñasquitos Creek then flows west, also draining into the Pacific Ocean.

5.2.4 Fire History

Fire history is an important component in understanding fire frequency, fire type, significant ignition sources, and vulnerable areas. The topography, vegetation, and climatic conditions associated with the Preserve combine to create a unique situation capable of supporting large-scale, high-intensity wildfires, such as the Cedar Fire in 2003. The history of wildfires on the Preserve is graphically portrayed in Figure 7.

Based on historical fire perimeter data (FRAP 2012)[2], all of the Preserve has burned at least once during the recorded data period, with fires occurring in 1913, 1938, 1950, 1955, 1971, 1985, 1986, 1994, and 2003. Some areas of the Preserve have burned as many as four times over the course of the recorded fire history. Table 12 presents the quantity of times the Preserve has burned by land area (acreage).

Table 12
Quantity of Times Burned for the Sycamore Canyon and Goodan Ranch Preserves

Quantity of Times Burned*	Acreage	Percentage
1	1,489.52	58.3%
2	589.97	23.1%
3	441.01	17.3%
4	34.17	1.3%
Total	2,554.67	100.0%

*FRAP 2012

[2] Based on polygon geographic information system (GIS) data from CAL FIRE's Fire and Resource Assessment Program (FRAP), which includes data from CAL FIRE, U.S. Department of Agriculture Forest Service Region 5, Bureau of Land Management, National Park Service, Contract Counties and other agencies. The data set is a comprehensive fire perimeter GIS layer for public and private lands throughout the state and covers fires 10 acres and greater between 1878 and 2011.

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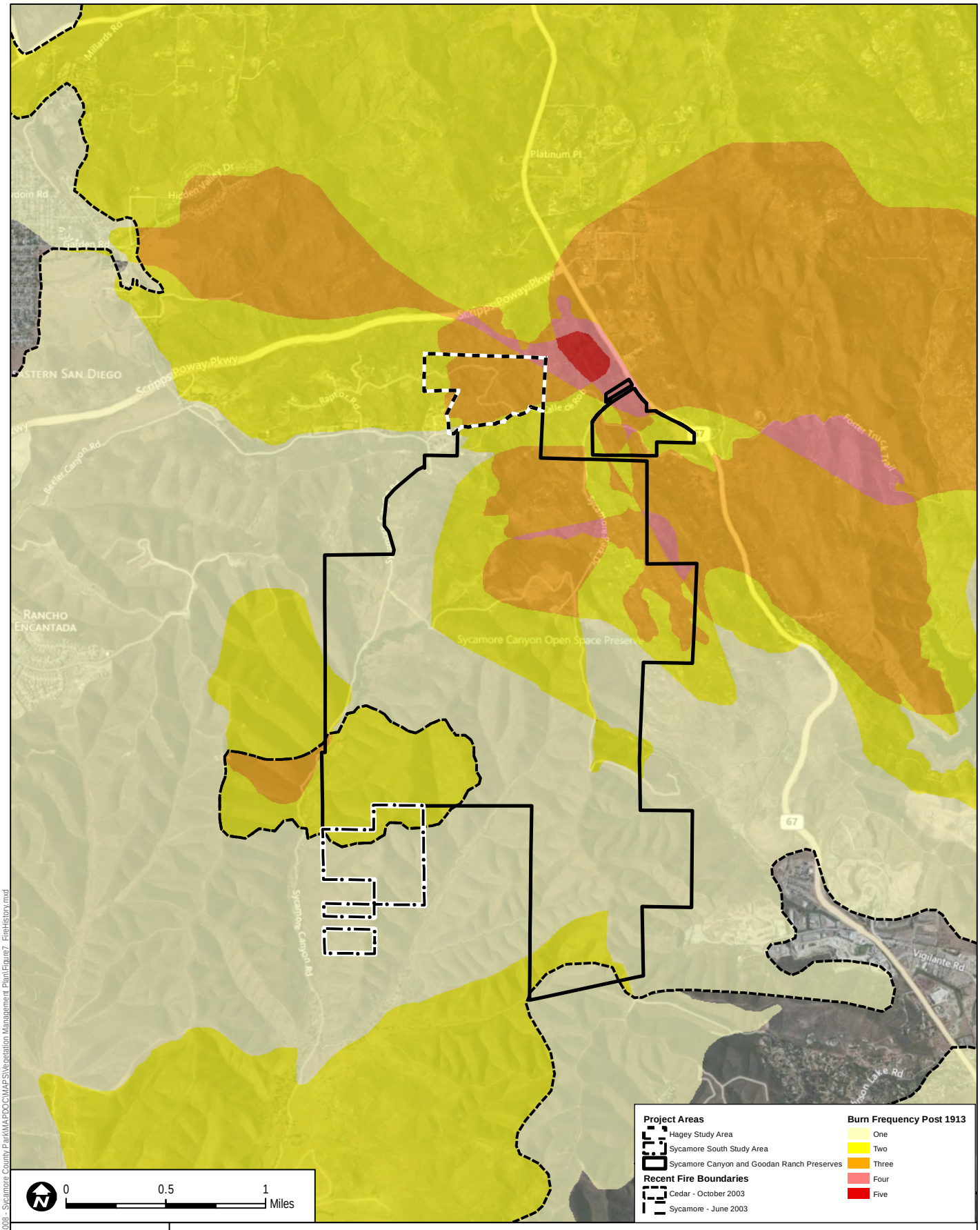

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SOURCE: Bing, SanGIS 2012

FIGURE 7

Fire History

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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Based on an analysis of this fire history data set, specifically the years in which the fires burned, the average interval between wildfires on the Preserve was calculated at 11 years with intervals ranging between 0 (multiple fires occurring in the same year) and 25 years. Based on this analysis, it is expected that the Preserve would be subject to wildfire occurrence every 11 years, with the realistic possibility of shorter interval occurrences. Table 13 presents fire history and fire return interval data for the Preserve.

Table 13
Fire History and Return Intervals for the Sycamore Canyon and Goodan Ranch Preserves

Fire Year*	Fire Name	Interval (years)	Acreage Burned on Preserve	Percent of Preserve Burned**
1913	Unnamed Fire	N/A	14.45	0.6%
1938	Unnamed Fire	25	369.38	14.5%
1950	Elliott Reservation Fire	12	20.17	0.8%
1955	Goat Mtn. Fire	5	414.01	16.2%
1971	Rabbit Fire	16	105.29	4.1%
1985	Sycamore Fire	14	564.99	22.1%
1986	Sycamore #2 Fire	1	29.24	1.1%
1994	Rocoso Fire	8	86.77	3.4%
2003	Sycamore Fire	9	245.93	9.6%
2003	Cedar Fire	0	2,278.94	89.2%

*FRAP 2012
**Based on total Preserve acreage of 2,554.67

Based on an analysis of the fire history, vegetation age classes on the Preserve are fairly consistent across the site due to the extent of burning in 2003. Specifically, over 98% of the vegetation on the Preserve is 9 years old, burning during either the Sycamore or Cedar Fires in 2003. The remaining vegetation (approximately 30 acres), located in the southern-most portion of the Preserve, last burned in the 1994 Rocoso Fire, resulting in 18-year-old vegetation. While younger vegetation is generally considered less susceptible to fire than the older vegetation, all vegetation is capable of igniting and carrying fire, especially during extreme weather (Red Flag Warning Conditions) and over time, the younger age vegetation will become more susceptible to fire ignition and spread due to accumulation and retention of dead plant material over time.

5.2.5 Vegetation Dynamics and Fuel Loads

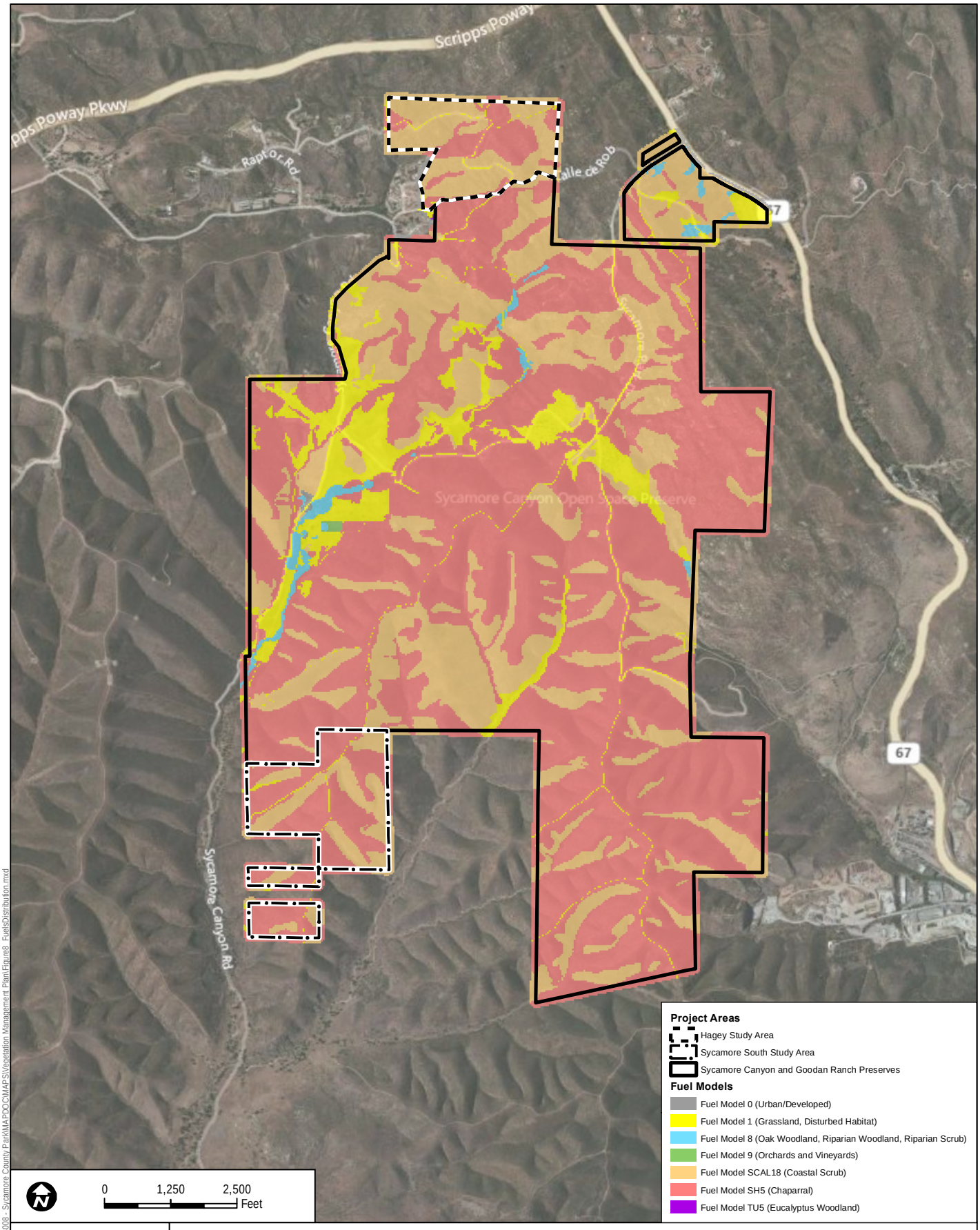
Utilizing site vegetation maps, field evaluations were conducted to evaluate fuel loading and classify vegetation types into fuel models (Anderson 1982; Scott and Burgan 2005; Weise and Regelbrugge 1997). Fuel model assignments are presented in Table 14 by vegetation type and are graphically presented in Figure 8. Certain vegetation types increase fire hazard based on

plant physiology (resin content), biological function (flowering, retention of dead plant material), and/or physical structure (leaf size, branching patterns). Specifically, the following chaparral and sage scrub species found throughout the majority of the Preserve are considered to exhibit higher potential hazard based on such criteria: coastal sagebrush (*Artemisia californica*), chamise, California buckwheat, and black sage.

In addition, non-native invasive plants can increase the frequency of fires by providing more continuous fuels that are more easily ignited (Brooks et al. 2004). The vegetation characteristics, combined with topography, climate, and relatively common weather events (i.e., Santa Ana winds), combine to create a fire environment in which prevention and control is extremely difficult. Invasive plants also present hazards when located adjacent to neighboring structures or within fuel modification zones that are meant to provide defensible space. Non-native invasive species of the greatest concern within the Preserve include saltcedar, Pampas grass, eucalyptus, artichoke thistle, stinkwort and whitetop (Figures 6a–6d).

Table 14
Vegetation Communities and Associated Fuel Models for the Sycamore Canyon and Goodan Ranch Preserves

Vegetation Community/Land Cover	Fuel Model	Acres	Percentage
Chamise Chaparral	SH5	534.54	20.9%
Chaparral	SH5	1.13	0.0%
Coastal Live Oak Woodland	8	22.35	0.9%
Coastal Scrub	SCAL18	179.31	7.0%
Diegan Coastal Sage Scrub: Inland Form	SCAL18	581.79	22.8%
Disturbed Habitat	1	38.66	1.5%
Eucalyptus Woodland	TU5	0.05	0.0%
Non-Native Grassland	1	173.12	6.8%
Orchards and Vineyards	9	1.20	0.0%
Scrub Oak Chaparral	SH5	116.51	4.6%
Southern Willow Scrub	8	0.86	0.0%
Southern Maritime Chaparral	SH5	3.61	0.1%
Southern Mixed Chaparral	SH5	897.33	35.1%
Southern Riparian Woodland	8	2.66	0.1%
Urban/Developed	0	1.46	0.1%
	Total	2,554.57	100.0



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SOURCE: Bing

FIGURE 8

Fuel Distribution

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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Vegetation Dynamics

Vegetation plays a significant role in fire behavior and is an important component of the fire behavior models discussed in this report. A critical factor to consider is the dynamic nature of vegetation communities. Fire presence and absence at varying cycles or regimes affect plant community succession, or the natural sequential replacement of vegetation types over time. Succession of plant communities, most notably the gradual conversion of shrublands to grasslands in areas with high fire frequencies and short intervals between fires, and grasslands to shrublands in areas with fire exclusion or long fire-free periods, is highly dependent on fire characteristics, including intensity, duration, and return interval. Additionally, encroachment of non-native plant species from residential landscaping into wildland areas is already occurring and is expected to continue based on the proximity of ornamental landscaping to open space. Consequently, routine maintenance of the fuel reduction areas/defensible space zones, and establishment of defensible space zones in some areas, is needed to maintain reduced hazard conditions.

Biomass and associated fuel loading will increase over time, assuming that disturbance or fuel reduction efforts are not realized. Depending on factors such as fire exclusion activities, mechanical treatments, and prescribed burning, among others, the current vegetation composition and density will continue to change, either through increased volume and the establishment of invasive non-native plant species or the continued degradation of scrublands and persistence of annual grasses.

The Preserve is dominated by chaparral vegetation communities (approximately 60%) and sage scrub vegetation communities (approximately 30%), with grassland and woodland types present at lower elevations and concentrated primarily within Sycamore, Clark, and Slaughterhouse Canyons, along with scattered patches in the northeast corner of the Preserve. It should be noted that chaparral and sage are not susceptible to annual burning, but grass cover can burn yearly (Minnich and Scott 2005). Lack of disturbance such as fire and grazing will, over time, allow shrub cover to establish in areas currently dominated by grass cover. Shrub cover, although less likely to burn in the first 20 years during typical weather conditions, will burn under extreme fire events (Moritz 2003). Once established, the shrub cover will increase in volume, and following approximately 20 years, the hazard will increase corresponding with fuel age (Keeley 2005; Moritz et al. 2004). Additionally, as previously mentioned, encroachment of non-native plants into open space areas is likely based on the proximity of ornamental landscaping to undeveloped open space land, in many cases increasing the fuel load and likelihood for higher intensity fire.

As with the changes in vegetative cover in grassland habitats over time, changes in the chaparral, scrub, and woodland types will also occur with the lack of disturbance. Chaparral and sage scrub stands will continue to accumulate biomass and volume, often retaining dead plant material within individual component shrubs. Oak woodland cover types tend to limit ground fuel

accumulation with age. Canopy closure serves to "shade-out" understory plants, resulting in mature oak woodland characterized by a dense canopy layer and an understory consisting primarily of leaf and twig litter. Hardwood stands vary in species composition with disturbance, but maintain typically consistent shrub and tree cover with associated ladder fuels allowing the potential for canopy fire spread.

Chaparral Fire Effects

Chaparral communities cover the majority of the Preserve (1,553.1 acres). This vegetation type typically ranges from 1 to 3 meters (3 to 10 feet) in height with little herbaceous understory in mature stands. Chaparral vegetation communities have developed post-fire reproductive strategies intended to survive stand-replacing wildfires. Specifically, component plant species can be classified as obligate sprouters, obligate seeders, or facultative seeders. Obligate sprouters reproduce via root systems that survive after a fire (e.g., toyon), while obligate seeders rely solely on seedling establishment for survival (e.g., ceanothus, Manzanita) (Conrad 1987). Facultative seeders are those chaparral species that stump sprout and regenerate via seed following fire (e.g., chamise) (Conrad 1987).

Current fire frequency in chaparral communities averages between 20 and 30 years (Keeley and Keeley 1988), although historic fire frequency is likely in the range of 50 to100+ years (Conard and Weise 1998). The shortening of fire-free periods in chaparral has been affected by increases in ignition sources due to the proximity of chaparral communities to developed/urban areas. Fires in chaparral typically consume all aboveground vegetation. In the first year following fire, there is typically abundant herbaceous vegetative growth, although by the fifth post-fire year, shrub cover dominates the site (Keeley and Keeley 1988). In general, vegetation/fuel volume in chaparral will increase in the years following fire, with the rate of biomass increase leveling out between 20 and 40 years, depending on numerous site-specific variables (Conard and Weise 1998).

Sage Scrub Fire Effects

Sage scrub occupies 761.1 acres within the Preserve. Following fire, typical sage scrub succession includes a predominance of annual herbs during the first year. Non-native plant species may dominate a landscape after wildfire due to their success in establishing quickly and outcompeting many native species. Non-native plant species tend to decline in subsequent years without fire or other disturbances as shrubs establish and attain greater cover. Perennial herb understory species, which may grow from resprouts, show low recruitment from the soil seed bank. Unlike herbaceous annuals, the overall diversity of perennial understory herbs remains constant the first few years following fire. New species continue to become established in recovering sage scrub, reaching a peak at 5 to 10 years after a fire. After the peak in species

diversity, there is a general decline in perennial understory herb species, possibly attributable to shading effects from dominant shrubs (Wills 2000; Keeley and Keeley 1984).

Lack of fire will allow shrub cover to return to burned areas over time. Recovering shrub cover is less likely to burn in the first 20 years during typical weather conditions, but it will burn under extreme fire events (Moritz 2003). The Preserve's vegetation age is almost entirely consistent, with over 98% of vegetation being 9 years old at the time of this report. Shrub cover will continue to increase in volume, and within approximately 11 years, the fire hazard will increase corresponding with fuel age (Keeley 2005). Changes in land use will also affect the vegetation distribution pattern. For example, the encroachment of non-native plants is likely based on the proximity of residential development and site disturbance during the 2003 Cedar Fire.

Grassland Fire Effects

Annual grassland responses to fire are varied. A review and analysis of the response to burning and grazing of California grasslands indicates that prescribed burning temporarily reduces non-native annual grasses, but also results in increased non-native and native forbs (Rice 2005; Bainbridge and D'Antonio 2003; D'Antonio et al. 2003). These studies indicate that single prescribed burns often decrease non-native annual grasses, but they recover by the third year in the absence of additional disturbance. Grazing or follow-up burns hinder the recovery of non-native annual grasses and maintain forb cover.

One effect that appears to be fairly common among non-native grasses is that lower-intensity grassland fires rarely damage seeds on or near the soil surface (Daubenmire 1968). Since seeds on the soil surface are not generally exposed to high enough temperatures to cause mortality in a grassland environment, burn timing is most effective after desirable species have dispersed their seeds, but when target invasive species have their seed heads directly exposed to flames (DiTomaso et al. 2006). For management purposes, non-native grassland burning must be timed appropriately so that the target seeds are consumed, resulting in decreased reestablishment of non-natives and reduced competition for annual forbs.

Live Oak Woodland and Forest Effects

Coast live oak woodland covers 22.4 acres of the Preserve. Coast live oak trees are very fire resistant, with fire adaptations including evergreen leaves, thick bark, and post-fire sprouting from surviving tissue. Fire intensity affects individual tree survival, with the amount and extent of trunk char and canopy consumption playing a critical role in survival and response (Plumb and Gomez 1983). Following burning, coast live oaks sprout from the main trunk and upper crown even after severe burning (Plumb and McDonald 1981). Post-fire recovery of coast live

oak woodlands is dependent on fire intensity, and fall fire damage is typically more severe than that occurring earlier in the year (Plumb and Gomez 1983). While the thick bark of mature coast live oak trees minimizes the effects of heat exposure from wildfire, seedlings and acorns are much more susceptible to mortality, even following low-intensity fires (Lawson, Zedler and Sieger 1997). Recovery of coast live oaks may take up to 3 years, so post-fire cutting of affected trees should be postponed to verify whether re-sprouting will occur (Plumb and Gomez 1983).

As with coastal sage and chaparral, decreases in fire frequency in coast live oak woodlands and forests favors woodland/forest expansion into neighboring grassland (Callaway and Davis 1993). Fire behavior in oak woodlands and forests is typically much less intense than wildfires burning in chaparral and sage scrub communities. Low, compacted leaf litter understory, canopy shading of ground fuels, and wind velocity reduction resulting from tree canopies significantly reduce the intensity and spread rates of surface fires in oak woodland and forest vegetation types. Transition from ground to canopy fire increases fire intensity, spotting, and tree mortality potential.

Fire Behavior

Fire behavior modeling provides reasonably accurate representations of how wildfire would move through available fuels in high-fire hazard areas. Fire behavior calculations are based on site-specific fuel characteristics supported by fire science research that analyzes heat transfer related to specific fire behavior. Current and accepted fire research data from several programs that specialize in the study of wildland fire were utilized for the completion of this analysis for the Preserve. To objectively predict flame lengths and intensities, the FlamMap fire behavior fuel modeling system was applied using predominant fuel characteristics from representative fuel models observed on the Preserve (Finney et. al. 2012). In addition to fuels data, topographic and weather data were utilized in developing fire behavior models for two separate weather conditions: Summer (onshore flow) and Peak (offshore flow with Santa Ana condition). Results of fire behavior modeling efforts for the Preserve are presented in Appendix D.

5.3 Fuel Management Methods

Successful fire management requires preplanning and utilization of fire prevention techniques and strategies. As the majority of the preserve has been fire-free for 9 years (98%), management of fuels is an important component of overall Preserve management. To that end, VMUs, based on topography or other clearly discernible landscape boundaries, have been delineated on the Preserve to assist with fuel management planning. Figure 9 illustrates the VMU boundaries. VMU specific fuel management recommendations are provided in Section 6.3. A list of general fuel management methods and their suitability for use in the Preserve are discussed as follows.

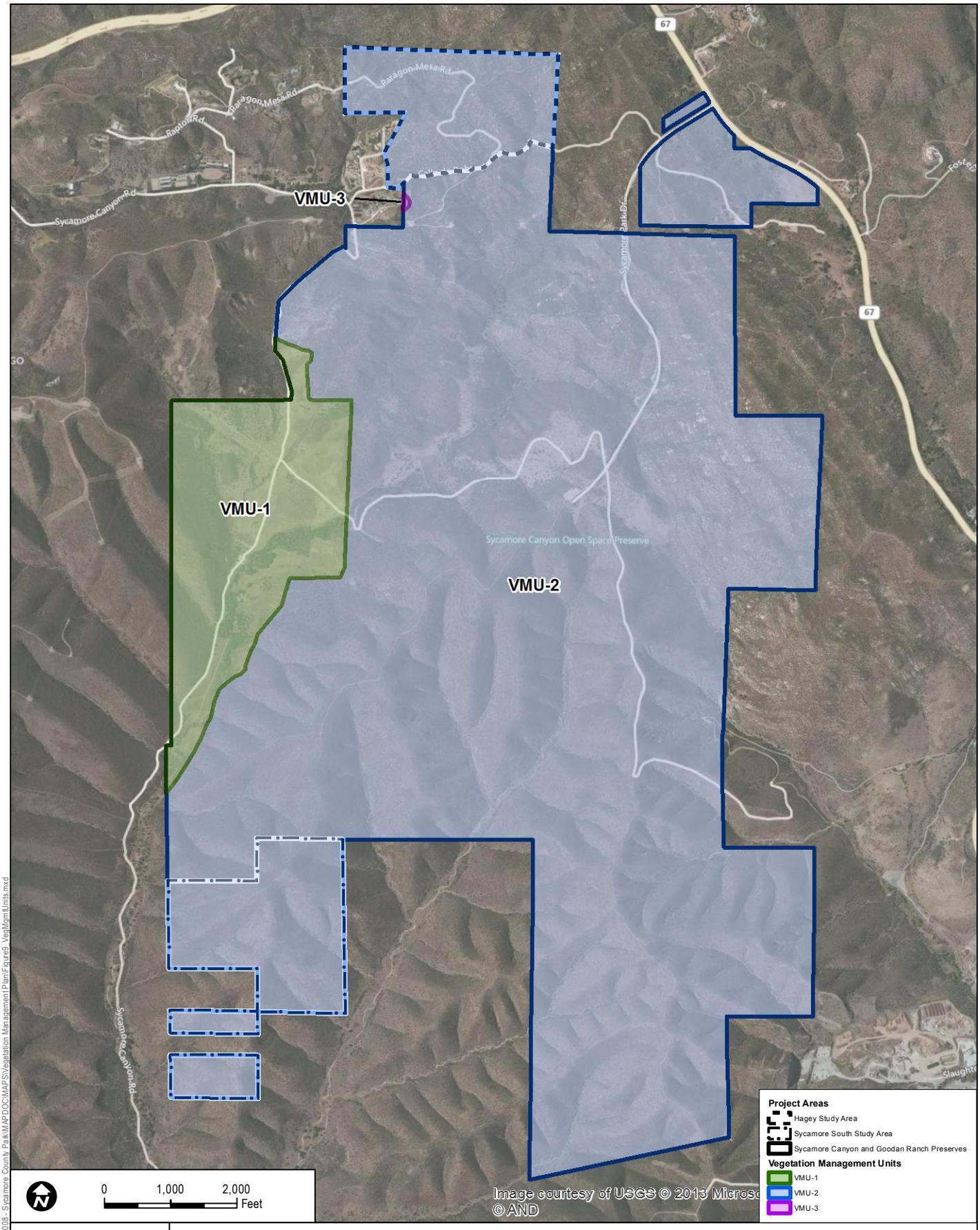

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FIGURE 9

Vegetation Management Units

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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5.3.1 Grazing

Grazing is an effective fuel reduction method and can be compatible with Preserve management goals. Focused grazing is a feasible alternative on this Preserve, but it would need to be highly managed to avoid introducing and spreading non-native plant species, overgrazing, or escape grazing. Currently there is no pressing need to introduce grazing. However, the method should remain in the management toolbox for specific applications adjacent to highly sensitive habitats, adjacent roadways, and potentially in areas that require fuel modification.

5.3.2 Mowing

Mowing is one of the most common and successful methods for reducing fuel loads, and it is compatible with Preserve management goals, but is of limited use in rocky and rugged terrain. Mowing is a feasible option for the Preserve to conduct fuel modification efforts. However, annual mowing may convert shrub dominated areas to grasslands over time. Therefore, mowing should be conducted in late spring after weedy annuals have stopped growing, but have not yet produced viable seed (Bell 2009).

5.3.3 Herbicides

Chemical means to control fuels/non-native plants are an effective method, but one that has a negative connotation, potential toxicity for humans and wildlife, and can affect water quality. Focused chemical selection and application minimizes the detrimental effects and makes the use of chemicals, such as glyphosate and other selective chemicals, a feasible alternative.

5.3.4 Prescribed Fire

Prescribed fire occurs in two forms: (1) natural fire, occurring primarily through lightning strikes that are then allowed to burn, and (2) intentional, managed fires. Natural fires are rare in San Diego County due to a general lack of lightning. However, natural fires may occur, and if allowed to burn as part of a fire plan, would then be considered a prescribed fire. Although considered unlikely, if natural fire occurs on the Preserve and the fire is determined to pose no threat to life or high-value resources, the fire may be allowed to burn if it meets DPR objectives. If unsafe conditions exist (e.g., high winds, low humidity, high temperature) and, without suppression, it has a high likelihood of burning into areas of fire exclusion or is threatening valuable resources on or off site, then assertive suppression would be pursued.

Intentionally managed fires are planned ignitions for purposes of reducing fuels primarily for public safety or habitat improvement, are regulated by all applicable laws, and are managed by CAL FIRE's Vegetation Management Program. Where prescribed burning is feasible, it shall be conducted under permit from CAL FIRE or under contract with CAL FIRE under the statewide Vegetation Management Program.

Prescribed fire on the Preserve is not currently considered a high priority for fuel management in respect to the other treatment options included in this VMP. However, future conditions may warrant the use of prescribed fire as a fire hazard reduction or habitat modification technique. For instance, conducting prescribed burns in the non-native grasslands will aid in the re-establishment of perennial grasses and provide as a natural fuel break, bisecting the northern and southern portions of the Preserve. Prescribed fire can only be implemented by CAL FIRE, or a similar fire authority with experience and certifications to conduct burns, and requires the preparation and approval of a prescribed burn plan prior to implementation. Burning objectives shall adhere to those included in the County of San Diego (2009b) Vegetation Management Report, specifically:

> Prescribed burns will generally be utilized in strategic locations when the surrounding land has few residences or a fire can be easily controlled because of topographic or other features. Again, the use of fire as a management tool will be considered specific to ecosystem management objectives. Strategic fuels treatments would be located to provide the most effective potential for reducing catastrophic fire. The potential for promoting vegetation health could be factored into decisions on locating strategic fuel treatments.

5.3.5 Hand Tool or Mechanical Equipment Thinning

Thinning can reduce fuel continuity and loading by selective removal of dead and dying, overly dense, horizontal and vertical bunches and non-natives. This type of fuel reduction is most useful in urban interface and intermix areas and/or around high-value resources, such as cultural sites. Adjacent semi-rural residential lots along the northern preserve boundary have 100 feet of defensible space around the combustible structures. Thinning is recommended to occur on an annual basis prior to June for fuel modification areas associated with off-site residences or other habitable structures. Thinning is appropriate anywhere in the Preserve where insect or disease outbreaks and frost or drought kill occurs, resulting in dense, dead vegetation.

5.3.6 Fuel Breaks

Fuel breaks provide areas of removed fuels that play an important role in helping contain wildfires. The local fire departments and CAL FIRE attempt to minimize impacts to sensitive resources when fighting fires in wildlands, when possible; and where feasible, fires are allowed to run to natural breaks including trails and roads. These locations then serve as a defensive position for fighting the fire. The existing multi-use trail/access road through the Preserve generally meets the anticipated fuel break requirements for the Preserve.

5.4 Fire Response Plan

The Poway Fire Department and CAL FIRE are the primary responders to the Preserve since the property is in an SRA. It is expected that CAL FIRE and Poway Fire would be the primary agencies involved in wildland fire suppression on the Preserve, with assistance from the other close by agencies, such as Santee Fire and Lakeside Fire Protection District. Given the location of the primary access to the Preserve on Sycamore Canyon Road, initial response to wildland fires will likely be by Poway Fire Department Station #1 since they are capable of reaching the Preserve more quickly. These fire agencies, as well as the other agencies that would respond via automatic or mutual aid, are extremely qualified and experienced in responding to wildfires in this area.

CAL FIRE provides response to wildfires in the SRA, including the Preserve, and the Poway Fire provide response to structure fires, wildfire, and medical and associated emergencies. CAL FIRE has a vast arsenal of firefighting personnel and apparatus throughout the County that can be called upon for responding to wildfires within or in the vicinity of the Preserve, including:

- Air tankers
- Helicopters
- Air tactical aircraft (AA)
- Various fire engine types
- Crew transports
- Bulldozers
- Communications centers.

CAL FIRE utilizes three levels of dispatch and response based upon weather conditions and time of year. The three levels are:

- Low – includes two fire engines with three personnel each
- Medium – includes three fire engines (type III) with three personnel each, one battalion chief, one mid-sized bulldozer, one type III helicopter, and one 16-person hand crew
- High – includes five fire engines with three personnel each, one battalion chief, two medium bulldozers, one AA, two air tankers, and one type III helicopter.

Dispatch levels are based on weather conditions. Low dispatch occurs during the winter months from November through May. Medium and high dispatch occurs during the normally declared fire season, June through October. There is some variation in the timing of the dispatch levels, based entirely on weather.

Poway Fire currently employs the following firefighting apparatus with associated firefighting personnel:

- Structure protection type I pumpers
- Type III brush engines
- 1 water tender
- Command vehicles.

Fire Response

This VMP stresses the need for firefighting response to minimize impacts to natural resources, when possible, by using preplanned fire suppression tactics and actions within the boundary of the Preserve. Fire suppression is considered the top priority across the Preserve due to the shortened fire return interval realized over the last 20 to 25 years.

Fire suppression air support with fire retardant drops may be a component of responses to the entire Preserve for achieving goals and objectives, especially under conditions that would accelerate wildfire spread. Under extreme conditions, or at night, air support may not be available, and in these situations, response categories may become secondary to public safety. Fires occurring within open space areas have demonstrated the potential to move through the preserve into urban areas, consequently overwhelming available fire resources.

Response to a fire within the Preserve could potentially include the use of existing access roads for firefighting personnel, type I fire engines (limited to paved roadways just outside the Preserve), type III fire engines, fire crews, air attack and fire retardant, helicopters, and air tankers. Fire suppression actions may include one or more of the following: direct attack with fire engines, fire crews, helicopters, and firing operations. Line construction activities within the Preserve would be best carried out by hand crews. Dozers/road graders may be activated but should not be put into operation on the Preserve itself unless necessary for improving existing roads for fire engine access or constructing a line or secondary line for preservation of high-value resources, including plant and animal species, habitats, cultural resources, people, or property.

There is an existing access road/trail system that may be utilized for fire containment efforts by fire agency personnel including using the road as a fuel break or as an anchor point from which to conduct operations. However, these roads are not wide enough to provide acceptable fire spread slowing during wind driven wildfires.

5.4.1 Fire Hazard Evaluation

Based on site-specific data analysis, discussions with fire agencies responsible for fire suppression, and fire behavior modeling results, the Preserve includes an ongoing fire hazard that can result in significant fire intensity and spread during extreme weather events. This section presents a discussion of fire hazard situations for the Preserve. This information was collected during initial site analysis and reviews of project data, fire behavior modeling results, and high-resolution aerial imagery and was integrated into the preparation of this document and associated recommendations.

1. Based on topography, vegetation, and fire history of the region, a large conflagration during Santa Ana wind conditions will likely enter the Preserve from the east, traveling through undeveloped wildland areas east of Highway 67, as seen in the 2003 Cedar Fire. Fires during typical onshore wind patterns are likely to enter the site from either the adjacent developed areas or roadways, or from open space areas south or west of the Preserve.
2. A WUI threat exists in the northwestern portion of the Preserve adjacent to low-density residential development.
3. Potential ignitions include a variety of residential related sources including structure fire, hot works, and yard machines, among others. Ignition sources not associated with residential development include vehicular associated ignitions (e.g., car fire, catalytic converter, tossed cigarette) along adjacent roads, including Highway 67 and Scripps Poway Parkway, campfires, training activities on the eastern portion of MCAS Miramar, and other human-caused ignitions resulting from access to the Preserve's trails and other open space areas. Additional nonresidential ignition sources include electrical transmission lines near and on the Preserve and arson.
4. Wildfires fueled by Santa Ana winds may move rapidly across the Preserve. Grassland, sage scrub, and chaparral fuels will be the predominant carriers of fire across the site with flame lengths in the chaparral fuels exceeding 20 feet. Steep slopes with even steeper walled drainages typify the topography of the Preserve. Fires in grassland fuels will be fast-moving ground fires with lower flame lengths (less than 20 feet), while those in chaparral or sage scrub fuels will move more slowly, but produce greater flame lengths (greater than 20 feet) and associated heat output (in excess of 5,000 British thermal units).

5. A fire originating in a structure within approximately a 1-mile radius of the Preserve could result in burning embers landing within the Preserve before they decay to the point of being unable to ignite fuels, potentially resulting in vegetation ignition if there is a receptive fuel bed.

Based on current roadways, firefighting may be difficult on the Preserve due to roads that are not designed to accommodate typical responding fire apparatus. Although there are several ways to access the Preserve, circulation throughout the Preserve under wildfire conditions is precarious and potentially dangerous due to narrow and steep roads with varying levels of traction and numerous waterbars, and vegetation and terrain that can result in significant fire intensity and irregular spread. Air attack will be an important component but may not be available or usable, depending on the extent of the fire event and/or the time of day and weather conditions.

The catastrophic wildfire threat for the Preserve is extreme when severe fire weather occurs, which will coincide with Red Flag Warning periods. Red Flag Warnings are declared by the National Weather Service. The Preserve is located in Fire Weather Zone 250, San Diego County Inland Valleys. Accordingly, Red Flag Warnings are issued when humidity is 15% or lower (for at least 6 hours) and sustained winds are 25 miles per hour (mph) (with gusts greater than or equal to 35 mph) (National Weather Service, San Diego Office 2012).

Beyond these provisions, fire management practices are restricted to response and tactical suppression efforts associated with wildfires originating on or burning onto the Preserve. No active fire or fuels management plans are currently employed on site.

5.4.2 Primary Actions and Contacts for Wildfire Emergency

Public and firefighter safety should be the primary consideration before and during a wildfire. The following measures shall be implemented at the Preserve:

- Close trails;
- Close staging areas;
- Post fire danger signs at staging areas and trail heads;
- Post signs with phone numbers for Preserve users to call and report suspicious activity or fires;
- Post signage at staging areas instructing trail users to report suspicious activity to the 911 dispatch center;

- Post signage at staging areas instructing trail users to immediately report fire activity to the 911 dispatch center or fire agency; and
- In the event of a fire on the Preserve or a fire approaching the Preserve, designate a Department of Parks and Recreation staff member to provide assistance to CAL FIRE, as necessary.

The following persons/agencies should be contacted in the event of a wildfire on the Preserve or for information regarding fire management activities.

CAL FIRE
San Diego Unit
Emergency: 911
Non-Emergency – Unit Chief, El Cajon: 619.590.3100
Website: http://www.fire.ca.gov/

City of Poway Fire Department (PFD)
Emergency: 911
Non-Emergency – Fire Marshal: 858.668.4470
Website: http://www.poway.org/fire department

5.4.3 Roads/Access

Road access in the Preserve is fairly limited due to terrain, although several unpaved roads provide access in the northern and central portions of the Preserve. In addition, several hiking trails are located within the Preserve, situated along ridgelines and along the bottom of Sycamore Canyon and its tributary to the east. The Preserve's eastern ridge is accessible via Sycamore Park Drive at Highway 67. This road is gated at Highway 67 and provides vehicular access to a ridge top staging area. The western edge of the Preserve is accessible via Sycamore Canyon Road from either Beeler Canyon Road or Garden Road off Poway Road. Scripps Poway Parkway does not connect to Sycamore Canyon Road. Sycamore Canyon Road, which is a two-lane, 24 feet wide asphalt road, provides access to several rural residential properties before entering the Preserve's northern boundary. These two access roads are also connected within the Preserve via the Cardiac Hill road which drops westerly from the ridgeline down to Sycamore Canyon. Dirt roads within the preserve are on the average about 10 feet wide. All roads have been recently graded and are in good condition. Most of the interior roads and trails have been given names and are marked on a Preserve map. The trails have been identified with trail signs. Signage has not been erected for the dirt roads. Finally, Calle de Rob connects Sycamore Park Drive and Sycamore Canyon Road through the northern end of the Preserve and Paragon Mesa Road bisects the northern-most portion of the Preserve.

In addition to the aforementioned primary access roads, the southern portion of Sycamore Canyon within the Preserve may be reached via Sycamore Canyon Road at the northern end of Fanita Parkway in the City of Santee. This access point is gated at the water treatment facility in Santee.

Access via roads, trails, and access gates is presented in Appendix C.

From a fire suppression perspective, access is limited to the main entrance at Sycamore Canyon Road where the main gate and Gooden staging area are located. This road is the primary access for Poway Fire to enter the Preserve. An automatic gate with a Knox switch has been installed. The Knox switch can only be operated with a key from Poway Fire Department. Additionally, fire suppression personnel can enter the Preserve through a locked gate off of Highway 67. The Highway 67 gate is kept open during business hours and locked afterwards. There are several interior gates that have County padlocks and are kept open during business hours, only. No fire agencies have keys to these locks after business hours. To improve or maintain the potential for firefighting crews to enter the Preserve during wildfire, the following road maintenance or improvements within the Preserve would be needed:

- Knox padlock on all gates: Install Knox padlocks on access gates that do not currently have Knox padlocks.
- Install an automatic gate at Highway 67 entrance. This gate should have an approved emergency key-operated switch (Knox) to override all command functions and open the gate.
- Both the Gooden and Highway 67 entrance gates should be equipped with an approved emergency traffic control-activating strobe light sensor device. This would allow any fire agency vehicle with a strobe light bar to access the Preserve.
- Increase the width of all dirt roads to be used for emergency fire access to at least 16 feet; continue to maintain the current multi-use trail/access road at a minimum 16-foot width.
- Maintain waterbars/erosion features to be consistent with fire apparatus limitations. Should new waterbars/erosion features be necessary, they should be consistent with fire apparatus limitations.
- Provide a minimum of 20 feet of fuel modification on both sides of Sycamore Park Drive and dirt road from main entrance to Park Ranger Office.
- The firefighting access improvements discussed above will be evaluated by DPR staff for consistency with overall Preserve goals and prioritized appropriately, based on the level of benefit versus potential Preserve impacts and cost. It may be determined during a fire event that even with roadway improvements, firefighters would not enter the Preserve due to the low probability that a wind-driven fire can be controlled and the related high risk to personnel and equipment. If that is the case, then access improvements would be focused on maintaining current accessibility.

5.4.4 Fuel Breaks

Fuel breaks are a fire defense improvement that reduces the volume of flammable vegetation prior to fire season. The existing multi-use trail/access roads through the Preserve currently serve as fuel breaks. Based on the topography of the Preserve and the potential for related impacts, it is not recommended that additional breaks be created at this time. However, the need for fuel breaks is dependent on the specific conditions of a fire. If new fire breaks are required, the location should be coordinated with the Incident Command team where possible. The Incident Command team includes the District Park Manager and fire agency staff with access to location information on sensitive biological and cultural resources that should be avoided, if possible.

5.4.5 Emergency Staging Areas

Emergency staging areas are temporary locations where resources await assignment. The Preserve has three potential staging areas depending on the location of a fire. These areas have been marked on the Preserve map as Highway 67 staging area, Gooden staging area and the Park Ranger's Office parking area. Additional pre-designated staging areas, although important for incident command to organize, plan, and implement firefighting strategies, are not necessary.

5.4.6 Fire Hydrants

The Preserve has a 10,000 gallon water tank adjacent to the Park Ranger Office and is primarily for the fire protection system for the Park Ranger's building. However, the water tank is equipped with a fire department connection at the base. No other fire hydrants are located until the Poway City limits. Wildland fire response to the Preserve will include a water tender as the primary water supply.

5.4.7 Other Water Sources

Other water sources which may be available during a wildfire event within the Preserve include the following:

- San Vicente Reservoir, approximately 3.5 miles from the furthest reaches of the Preserve, provides helicopter dipping access. However, plans for removal of the San Vicente Dam will make this source unavailable in the near future.
- Lake Jennings, approximately 7.0 miles from the furthest reaches of the Preserve, provides helicopter dipping access.

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6.0 MANAGEMENT DIRECTIVES

This section provides recommendations for vegetation management within the Preserve, including management directives specifically related to: invasive species management,habitat restoration, and fire management.

6.1 Invasive Species Removal

The following short-term management directives address high priority invasive species removal while longer-term management directives consider invasive species for their risk of reducing vegetation community quality over time. Management Directives and Implementation Measures for non-native plant species are provided in the RMP (Section 5.3.2). The Management Directives provided herein are consistent with those listed in the RMP, with slight changes relative to the updates from the non-native invasive plant species surveys conducted in 2012 for the Preserve, including the acquisition properties.

Management Directive B.2 (Priority 1) – Reduce, control, or where feasible eradicate invasive, non-native flora known to be detrimental to native species and/or the local ecosystem. . Control aggressive, invasive non-native plant species and those with a high fire hazard within the Preserve, such as saltcedar, Pampas grass, eucalyptus, artichoke thistle, stinkwort and whitetop, as soon as possible.

Implementation Measure B.2.1 – Conduct Invasive Non-native Plant Species Monitoring. Continue to monitor for new locations of non-native invasive species within the Preserve to determine whether additional removal efforts are necessary in order to maintain and/or improve the quality of the existing native vegetation communities on site.

Implementation Measure B.2.2 – Routinely Remove Invasives. Park staff will routinely pull weeds or remove any invasive non-native plant species in early stages of growth found along trails.

Implementation Measure B.2.3 – Identify- and Pursue Funding for Long-term Invasive Non-native Plant Control. Coordinate with other agencies, non-profit organizations, and/or volunteer groups in order to seek funding and implement invasive, non-native plant control projects for moderate and low priority invasive non-native plant species within the Preserve.

Management Directive B.3 – Manage and minimize the expansion of invasive non-native flora within the Preserve (Priority 2)

Implementation Measure B.3.1– Educational Outreach. Prepare and implement a non-native invasive plant species educational outreach program/materials for visitors and adjacent property owners in order to discourage introduction of non-native invasive plants into the Preserve.

Implementation Measure B.3.2 – Equestrian Use Education Program. Prepare and implement an equestrian use education program that discusses the potential negative impacts to native ecosystems from spread of non-native seeds along trails from feed sources containing weed seed. The program could include signage and brochures promoting weed-free feed for at least 72 hours prior to entry into the Preserve to help preserve the natural environment.

6.2 Habitat Restoration

Management Directives for habitat restoration are provided in the RMP (Section 5.3.1). The RMP does not propose any active restoration within the Preserve, but proposes a measure to assess and determine the need for restoration activities. This VMP provides six potential habitat restoration opportunities. Several management recommendations for habitat restoration are discussed in this section that were not included in the RMP. The primary management directives and management recommendations for native habitat restoration include:

Management Directive B.1 (Priority 1) – Restore degraded habitats to protect and enhance populations of rare and sensitive species through stabilization of eroded lands and strategic revegetation. Restore the identified degraded areas to reestablish and/or enhance the biological functions and values of native vegetation communities in these areas.

Management Recommendation B.1.a – Passive Restoration. Perform weed and erosion control as needed in disturbed areas where natural recruitment of native plant species is actively occurring, as described in Section 4.2.1.

Management Recommendation B.1.b – Active Restoration. Conduct soil preparation and native planting of disturbed or degraded areas where native vegetation recruitment is not actively occurring, as described in Section 4.2.2.

Management Recommendation B.1.c – Address Long-term Restoration Needs. Restoration activities should occur following landscape-changing disturbances that remove, damage, degrade, or alter the existing native vegetation communities.

Restoration methods will be customized to the Preserve, based on the type of disturbance, and will require preparation and implementation of a restoration plan. Restoration will incorporate active revegetation, including:

- Native vegetation community establishment/revegetation;
- Native vegetation community enhancement;
- Removal of invasive plants when they are young;
- Application of herbicides, pesticides and fertilizers if needed; and
- Application of supplemental irrigation if needed.

Management Recommendation B.1.d – Monitor Invasive Non-native Plant Removal Sites. Continue to monitor invasive species removal sites to ensure that passive natural recruitment is successfully occurring in these areas.

Management Recommendation B.1.e – Monitor Native Vegetation Community Quality. Continue to monitor the quality of native vegetation communities throughout the Preserve using comparative vegetation mapping over time and evaluation of potential type conversions.

Management Recommendation B.1.f – Monitor Pests and Disease. Monitor the presence of disease or pest levels to determine outbreaks and prescribe an active treatment, as appropriate.

6.3 Fire Management

The long-term strategic fire management plan considers strategic fire prevention activities, fire suppression with regard to fire effects on habitat, and post-fire monitoring and rehabilitation, which are provided in the RMP in Section (5.3.3). The long-term strategic fire plan for the Preserve must prioritize public safety while meeting habitat management goals. Management directives and management recommendations are as follows.

Management Directive B.4 Provide for necessary fire management activities that are sensitive to natural and cultural resources protection (Priority 1)

Implementation Measure B.4.1 – Provide for Suitable Emergency Fire Access. Improve road access for fire emergencies by maintaining and widening (in some stretches) the primary multi-use trail/access road to 16 feet, and providing fuel modification along this trail/access road (20 feet each side where possible). Install an automatic gate at the Highway 67 entrance. Install an approved emergency traffic

control-activating strobe light sensor device at both the Gooden and Highway 67 gates. **Implementation Measure B.4.2 – Create and Maintain Fuel Modification Zones.** Establish and annually maintain fuel modification zones to 100 feet around on-site buildings and facilities (Figure 9; VMU 1). Additionally, establish and annually maintain fuel modification zones along the property boundaries that function as extensions of off-site residential structure fuel modification zones (Figure 10; VMU 3), as identified in Table 10. Figure 10 provides a focused view of proposed fuel modification areas, consistent with the boundary of VMU 3. Fuel modification zones are measured at 100 horizontal feet from the edge of structures.

Management Recommendation B.4.a – Delineate Fuel Modification Areas. Install and maintain inconspicuous fuel modification extent markers for all fuel modification zones (Figure 10; VMU 3) within the Preserve to minimize additional thinning outside intended area.

Management Recommendation B.4.b – Fire Suppression. Fire suppression, in combination with other management methods in targeted Preserve habitat management areas, is the priority for the Preserve. Lengthening the fire return cycle to an optimal frequency will require fuel reduction experiments, research, monitoring, and analysis as part of the overall management approach. The optimal fire frequency in southern mixed chaparral may be from 50 to 100 years or more (Conard and Weise 1998). It may be difficult to achieve the longer fire return intervals given the current and projected ignition sources that may affect the Preserve. However, results of site data analysis will more firmly establish the optimal return intervals to meet habitat goals, or if additional steps need to be implemented, to lengthen the return of fire.

Implementation Measure B.4.3 – Access Data Sharing. Maintain local fire agency gate locks and report any notice of removed or missing locks to the appropriate fire agency. Signs should be installed indicating access limitations and extents (map form) and provide road quality to local fire responders. This information will be included in their wildland pre-response plans, resulting in more efficient responses. Information readily accessible by responders not familiar with the area, such as out of County or out of state responders, will improve firefighter safety.



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FIGURE 10

Focused Fuel Modification Areas (VMU 3)

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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Implementation Measure B.4.4 – Educational Outreach. Private property owners in the interface or intermix (located adjacent to the Preserve) should be encouraged to play an active role in reducing the potential fire hazard. It will also be beneficial if the public understands the management actions occurring on the Preserve, such as grazing, mowing, and herbicides, as applicable. As such, this VMP recommends a concerted effort to reach property owners who are situated in locations that may be affected by wildfire on the Preserve or whose properties and actions may serve as Preserve ignition sources. Educational material can be customized for these homeowners to include discussion of the importance of the Preserve. Standard measures for implementing a 100-foot fuel modification/defensible space zone can be provided from materials available from CAL FIRE and from the County of San Diego Department of Planning and Land Use[3]. As part of the public education program, private property owners should be encouraged to participate as "eyes on the Preserve" to help curb illegal access and report potential problems.

Implementation Measure B.4.5 – Reduce Ignition Sources. Ignition sources are present on and adjacent to the Preserve. The high voltage electrical transmission lines that cross the Preserve present potential ignition sources. Adjacent sources include roadways with vehicular travel, especially Highway 67, adjacent residences, and recreational users, MCAS Miramar training activities and prescribe burns that get out of control, among many others. As such, it is not possible to remove all sources of ignition. Rather, reducing the potential spread of wildfire onto or throughout the Preserve is recommended.

Implementation Measure B.4.6 – Conduct Recommended Fuels Management. Conduct fuels management using the identified VMUs, as feasible, and as presented in Table 14. Table 14 provides a summary of the high-value resource areas acknowledged for the Preserve and the associated fire prevention strategy recommended for achieving long-term management goals.

Implementation Measure B.4.7 –Post-fire Management and Erosion Control. Provide controls following fire events to stabilize soils in the burn area and minimize potential for erosion. Erosion control best management practices (BMPs), such as mechanical rehabilitation treatments, including straw mulch, hay bales, and jute rolls, should be in place as soon as possible after a fire and prior to the onset of the winter rainy season. Care should be taken to select and inspect these materials so they are not a source of invasive non-native plants. The use of certified weed-free hay is good policy (Bell 2009).

[3] Available on-line at http://www.fire.ca.gov/cdfbofdb/pdfs/4291finalguidelines2_23_06.pdf and http://www.sdcounty.ca.gov/dplu/fire_resistant.html

Table 15
Fuel Management Activities by VMU

VMU	Sensitive Resources	Fuel Reduction Practice
1	Sensitive Animal Species: Western Bluebird Sensitive Plant Species: Graceful Tarplant San Diego thorn-mint	VMU 1 is characterized by non-native grassland and coast live oak and riparian woodland along the bottom of Sycamore Canyon. Vegetation age in this VMU is 9 years. Access to the VMU is via Sycamore Canyon Road. Timed prescribed fire could be used on a long-term basis to strategically maintain grassland cover. Fuel treatment in VMU 1 should also focus on invasive species removal. Strategic understory shrub thinning/crown raising may be implemented along the oak woodland interface to minimize the potential for crown fire occurrence in the oak woodland/riparian zone. Reduction of fires through strategic mowing is recommended along the edge of Sycamore Canyon Road. This road should be maintained free of vegetation to effectively maintain a north-south fire break. Thinning/vegetation reduction may be necessary to reduce potential for catastrophic fire near sensitive species locations. Sensitive species locations should be flagged and avoided to the maximum extent possible. Vegetation should be removed via manual methods in these areas. There are no known significant cultural resources within VMU 1.
2	Sensitive Animal Species: Barn Owl Belding's Orange-throated Whiptail Black-tailed Jackrabbit Burrowing Owl California Gnatcatcher Coast Horned Lizard Coastal Pachnose Snake Desert Woodrat Dulzura Pocket Mouse Horned Lark Mule Deer Northwestern San Diego Pocket Mouse Orange Throat Whiptail Pallid Bat Pocketed Free-tailed Bat Red Diamond Rattlesnake Rufous Crowned Sparrow San Diego Black Tailed Jackrabbit San Diego Horned Lizard Spadefoot Toad Turkey Vulture Western Red Bat	VMU 2 consists primarily of chaparral and sage scrub fuels which are predominantly 9 years old. Access to VMU 2 is relatively limited, although Preserve access roads (Sycamore Park Drive) provide good access to ridge tops in the central portion of the VMU. A rough 4WD trail (Paragon Mesa Road) and Calle de Rob provide limited access to the northern portion of the VMU. Steep terrain in this VMU also limits access and the amount of thinning that would be possible. Consequently, fuel treatment in VMU 2 should be limited to invasive species removal. Further, dead fuel removal and invasive species removal should be conducted along publicly-accessed roadways within and adjacent the VMU to minimize the likelihood of ignitions. Reduction of fires through strategic mowing/fuel reduction is recommended along the primary Preserve access roads (Sycamore Park Drive and Calle de Rob). This road should be maintained free of vegetation to effectively maintain north-south and east-west fire breaks. Thinning/vegetation reduction may be necessary to reduce potential for catastrophic fire near sensitive species locations. Sensitive species locations should be flagged and avoided to the maximum extent possible. Vegetation should be removed via manual methods in these areas.

Table 15
Fuel Management Activities by VMU

VMU	Sensitive Resources	Fuel Reduction Practice
	Western Small-footed Myotis Western Yellow Bat White Tailed Kite Yuma Myotis <u>Sensitive Plant Species:</u> Ashy Spike-moss Rush-like Bristleweed California Adder's Tongue San Diego thorn-mint Palmer's Grappling Hook Palmer's Sagebrush Small Flowered Morning Glory Variegated Dudleya Willowy Monardella <u>Cultural Resource Sites:</u> P-37-03264 CA-SDI-20,691 CA-SDI-12,839 CA-SDI-12,821	Limiting potential damage to cultural resource sites is recommended through the use of thinning/vegetation reduction by hand. Thinning/vegetation reduction should be implemented around these sites to minimize fire and heat exposure. Prior to fuel treatment activity, cultural resource locations should be flagged so that they can be avoided during work activity. All vegetation should be removed via manual methods in these areas.
3 (WUI Fuel Modification Zones)	Residences	This zone is characterized by the adjacent residential development in the northwest corner of the Preserve. Fuel reduction by manual thinning, mowing, and non-native removal should be conducted routinely to minimize fire spread and ignition potential from residential development. Thinning/vegetation reduction may be necessary near sensitive species locations. Sensitive species locations should be flagged and avoided to the maximum extent possible. Vegetation should be removed via manual methods in these areas. There are no known significant cultural resources sites or sensitive species within VMU 3.

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APPENDIX A

Glossary of Terms

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Glossary of Terms

Glossary of Terms

BehavePlus: Fire behavior prediction and fuel modeling computer program designed to model fire behavior characteristics based on fuel, weather, and topographic inputs. Model outputs include flame length values, fire spotting potential, and rate of fire spread.

Brush: A collective term that refers to stands of vegetation dominated by shrubby, woody plants or low-growing trees; usually of a vegetation type undesirable for livestock or timber management.

Brush Fire: A fire burning in vegetation that is predominantly shrubs, brush, and scrub growth.

Burning Conditions: The state of the combined factors of the environment that affect fire behavior in a specified fuel type.

Canopy: The stratum containing the crowns of the tallest vegetation present (living or dead), usually above 20 feet.

Closure: Legal restriction, but not necessarily elimination, of specified activities such as smoking, camping, or entry that might cause fires in a given area.

Combustible: Any material that, in the form in which it is used and under the conditions anticipated, will ignite and burn.

Conflagration: A raging, destructive fire. Often used to describe a fire burning under extreme fire weather. The term is also used when a wildland fire burns into a WUI, destroying structures.

Crown Fire: A fire that advances from top-to-top of trees or shrubs more or less independent of a surface fire.

Defensible Space: An area either natural or man-made where material capable of allowing a fire to spread unchecked has been treated, cleared, or modified to slow the rate and intensity of advancing wildfire. This will create an area for housing increased emergency fire equipment, for evacuating or sheltering civilians in place, and a point for fire suppression to occur.

Duff**:** The layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles and leaves and immediately above the mineral soil.

Exposure: (1) Property that may be endangered by a fire burning in another structure or by a wildfire; (2) Direction in which a slope faces, usually with respect to cardinal directions; (3) The general surroundings of a site with special reference to its openness to winds.

Extreme Fire: A level of fire behavior characteristics that ordinarily precludes methods of direct control. One or more of the following is usually involved: high rates of spread, prolific crowning and/or spotting, presence of fire whirls, a strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environments and behave erratically, sometimes dangerously.

Fine Fuels: Fast-drying dead fuels that are less than 0.025-inch in diameter and are generally characterized by a comparatively high surface area to volume ratio. These fuels (grass, leaves, needles, etc.) ignite readily and are consumed rapidly by fire when dry.

Fire Behavior: The manner in which a fire reacts to the influences of fuel, weather, and topography.

Fire Department: Any regularly organized fire department, fire protection district or fire company regularly charged with the responsibility of providing fire protection to the jurisdiction.

Fire Front: That part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified, it is assumed to be the leading edge of the fire perimeter.

Fire Hazard: A fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree of ease of ignition and of resistance to control.

Fire Hydrant: A valved connection on a piped water supply system having one or more outlets that is used to supply hose and fire department pumpers with water.

Fire Prevention: Activities, including education, engineering, enforcement, and administration that are directed at reducing the number of wildfires, the costs of suppression, and fire-caused damage to resources and property.

Fire Protection: The actions taken to limit the adverse environmental, social, political and economic effects of fire. Protection is relative, not absolute.

Fire Regime*:* Periodicity and pattern of naturally occurring fires in a particular area or vegetative type, described in terms of frequency, biological severity, and area of extent.

Fire Retardant: Any substance, except plain water, that by chemical or physical action reduces flammability of fuels or slows their rate of combustion.

Fire Season: (1) Period(s) of the year during which wildland fires are likely to occur, spread, and affect resource values sufficient to warrant organized fire management activities; (2) A legally enacted time during which burning activities are regulated by state or local authority.

Fire Storm: Violent convection caused by a large continuous area of intense fire. Often characterized by destructively violent surface indrafts, near and beyond the perimeter, and sometimes by tornado-like whirls.

Fire Triangle: Instructional aid in which the sides of a triangle are used to represent the three factors (oxygen, heat, fuel) necessary for combustion and flame production; removal of any of the three factors causes flame production to cease.

Fire Weather: Weather conditions which influence fire starts, fire behavior or fire suppression.

Fire Whirl: Spinning vortex column of ascending hot air and gases rising from a fire and carrying aloft smoke, debris, and flame. Fire whirls range in size from less than 1 foot to over 500 feet in diameter. Large fire whirls have the intensity of a small tornado.

Firebrand: Any source of heat, natural or human made, capable of igniting wildland fuels. Flaming or glowing fuel particles that can be carried naturally by wind, convection currents, or gravity into unburned fuels. Examples include leaves, pine cones, glowing charcoal, and sparks.

Firebreak: A natural or constructed barrier used to stop or check fires that may occur, or to provide a control line from which to work.

Firefighter: A person who is trained and proficient in the components of structural or wildland fire.

Flame: A mass of gas undergoing rapid combustion, generally accompanied by evolution of sensible heat and incandescence.

Flammability: The relative ease with which fuels ignite and burn regardless of the quantity of the fuels.

Fuel Break: An area, strategically located for fighting anticipated fires, where the native vegetation has been permanently modified or replaced so that fires burning into it can be more easily controlled. Fuel breaks divide fire-prone areas into smaller areas for easier fire control and to provide access for firefighting.

Fuel Loading: The volume of fuel in a given area generally expressed in tons per acre.

Fuel Model: Simulated fuel complex for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.

Fuel Modification: Any manipulation or removal of fuels to reduce the likelihood of ignition or the resistance to fire control.

Fuel Modification Zone: A strip of land, typically 100 feet wide or more, between an improved property and wildlands, where combustible vegetation has been removed, thinned, or modified and may be partially or totally replaced with approved drought-tolerant, fire-resistant and/or irrigated plants to provide an acceptable level of risk from vegetation fires. Fuel modification reduces radiant and convective heat, thereby reducing the amount of heat exposure on the roadway or structure and providing fire suppression forces a safer area in which to take action.

Fuels: All combustible material within the WUI or intermix, including vegetation and structures.

Hazard: The degree of flammability of the fuels once a fire starts. This includes the fuel (type, arrangement, volume and condition), topography and weather.

High Value Resource: High Value Resources are natural or man-made resources, including plant and animal species, cultural resources, and residences that form the basis for fire management planning on the Preserve.

Ignition Time: Time between application of an ignition source and self-sustained combustion of fuel.

Invasive Plant Species: A plant species that is not native to the region and has demonstrated the ability to aggressively outcompete native plant species that would normally colonize a given area.

Ladder Fuels: Fuels that provide vertical continuity allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease.

Overstory: That portion of the trees in a forest that forms the upper or uppermost layer.

Peak Fire Season: That period of the year during which fires are expected to ignite most readily, to burn with greater than average intensity, and to create damages at an unacceptable level.

Prescribed Burning: Controlled application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions, which allows the fire to be confined to a predetermined area, and to produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

Prescribed Fire: A fire burning within prescription. This fire may result from either planned or unplanned ignitions.

Red Flag Warning Conditions: A **Red Flag Warning** is a forecast warning issued by the United States National Weather Service to inform area firefighting and land management agencies that conditions are ideal for wildland fire ignition and propagation. After drought conditions, and when humidity is very low, and especially when high or erratic winds that may include lightning

are a factor, the Red Flag Warning becomes a critical statement for firefighting agencies, which often alter their staffing and equipment resources dramatically to accommodate the forecast risk.

Responsibility Area: That area for which a particular fire protection organization has the primary responsibility for attacking an uncontrolled fire and for directing the suppression action. Such responsibility may develop through law, contract, or personal interest of the fire protection agent. Several agencies or entities may have some basic responsibilities without being known as the fire organization having direct protection responsibility.

Restoration (*of native vegetation communities*): The act of restoring ecological functions and values of vegetation communities that have been adversely affected by human- or nature-induced impacts, causing decrease in ecological functions and values.

Sensitive Species: A plant or animal species with a special status listing from federal, state or local regulatory agencies.

Slope: The variation of terrain from the horizontal; the number of feet rise or fall per 100 feet measured horizontally, expressed as a percentage.

Smoke: (1) The visible products of combustion rising above a fire; (2) Term used when reporting a fire or probable fire in its initial stages.

Spotting: The ignition of unburned fuels ahead of the fire front as a result of ignition by firebrands. Spotting enhances the spread of wildfires.

Structure Fire: Fire originating in and burning any part of all of any building, shelter, or other structure.

Suppression: The most aggressive fire protection strategy, it leads to the total extinguishment of a fire.

Surface Fuel: Fuels lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants.

Tree Crown: The primary and secondary branches growing out from the main stem, together with twigs and foliage.

Uncontrolled Fire: Any fire that threatens to destroy life, property, or natural resources and that (a) is not burning within the confines of firebreaks or (b) is burning with such intensity that it could not be readily extinguished with ordinary, commonly available tools.

Understory: Low-growing vegetation (herbaceous, brush or reproduction) growing under a stand of trees. Also, that portion of trees in a forest stand below the overstory.

Urban Interface: Any area where wildland fuels threaten to ignite combustible homes and structures.

Vegetation Management Unit: Delineated Preserve unit based on topography, vegetation or other features used for internal invasive species, restoration, and fire management planning.

Waterbar: A combination of a shallow depression and berm of soil running diagonally across a roadway to divert water off of the road. Reducing the volume and velocity of water reduces erosion.

Weed: A plant species that interferes with a desired management objective. This term does not denote the native or non-native status of a plant species. Both native and non-native plants have the ability to interfere, depending on the objective (i.e., native cattails can be considered a weed for flood control management objectives).

Wildfire: An unplanned and uncontrolled fire spreading through vegetative fuels, at times involving structures.

Wildland: An area in which development is essentially nonexistent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.

Wildland Fire: Any fire occurring on the wildlands, regardless of ignition source, damages or benefits.

Wildland-Urban Interface (WUI): The area where structures and other human developments meet or intermingle with undeveloped wildland (as defined in the County Fire Code, County Consolidated Fire Code and County Building Code).

Sources: www.firewise.org and County of San Diego Guidelines for Determining Significance and Report Format and Content Requirements, Wildland Fire and Fire Protection (2010).

APPENDIX B

Moderate and Low Priority
Invasive Non-Native Plant Species for Removal

APPENDIX B
Moderate and Low Priority Invasive Non-Native Plant Species for Removal

Moderate-Priority Species for Removal

Rose Natal Grass (*Melinus repens* ssp. *repens*)

Rose Natal grass is a perennial grass in the Poaceae family that is native to South Africa but has now been introduced to North and South America (Invaders 2012). In the United States, this species now occurs in states along the Gulf of Mexico, and southwestern states including Southern California. This species possesses a low ability to displace well-established native upland vegetation communities and will primarily colonize disturbed areas along roads or trails, or areas of naturally occurring sparse vegetation, such as sandy/rocky outcroppings on south-facing slopes. Rose Natal grass is most extensive in the Hagey Study Area, although it is also found in other parts of the Preserve (Figures 6a-6d). The number of individuals mapped within the Preserve is 718 (approximately 700 square feet).

Rose Natal grass is not rated by the Cal-IPC (Cal-IPC 2012). However, in the Preserve, this species is equally or more abundant than fountain grass, and colonizes the same types of environments. Therefore, it is ranked as a moderate priority for removal/control within the Preserve due to its high abundance within portions of the Preserve, but limited ability to displace established habitats. Recommended control for this species includes treatment with an appropriate systemic herbicide prior to the development of mature seed heads (generally blooms spring through fall, but can bloom year-round). Should control not occur prior to maturation of seed, it is recommended that the seed heads be removed, bagged, and disposed of off-site, with the remaining grass bunch receiving an herbicide treatment. Since the majority of the rose Natal grass stands occurring in the Preserve are located on steep, sparsely vegetated slopes, herbicide treatment would be preferable to hand-pulling due to soil disturbance.

Fountain grass (*Pennisetum setaceum*)

Fountain grass is a smaller clumping grass that has spread in large part due to its popularity as an ornamental plant. This species possesses a low ability to displace well-established native upland vegetation communities and will primarily colonize disturbed areas, or areas of naturally occurring sparse vegetation, such as sandy/rocky outcroppings on slopes. Fountain grass is well-adapted to fire and can increase in density following a burn. Fountain grass is the most widely distributed invasive in the preserve, and has been mapped within the northern, northeastern, central western, and southwestern portions of the Preserve (Figures 6a-6d). The quantity of individuals mapped within the Preserve is 305 (approximately 300 square feet). The Cal-IPC inventory categorizes fountain grass as having an overall rating of “moderate.” It is ranked as a moderate priority for removal/control within the Preserve due to its high abundance within portions of the Preserve, but limited ability to displace established habitats. Small infestations can be removed by uprooting. However, the most effective control for this species is treatment

with an appropriate systemic herbicide (e.g., hexazinone or glyphosate) (Bossard 2000) prior to the development of mature seed heads (species blooms March to December). Should control not occur prior to maturation of seed, it is recommended that the seed heads be removed, bagged, and disposed of off site, with the remaining grass bunch receiving an herbicide treatment. Since the majority of the fountain grass stands occurring in the Preserve are located on steep, sparsely vegetated slopes, herbicide treatment would be preferable to hand-pulling due to soil disturbance.

Low-Priority Species

Black mustard (*Brassica nigra*)

Black mustard is a winter annual herb/forb, which can form monotypic stands. It is known to possess allelopathic chemicals that prevent germination of native plants. Due to the relative flammability of dead/dried stalks, it can spread fire rapidly, and over time can contribute to the transition of native communities to annual grasslands (Cal-IPC 2012). Within the preserve it exists as a component of annual grasslands, but is also observed invading into native non-grassland vegetation communities. Areas noted for control north of the ranch house in the western portion of the Preserve are shown on Figure 6. An estimated 20 individual plants (approximately 20 square feet) were mapped within the Preserve, although more are likely present. The Cal-IPC inventory categorizes black mustard as having an overall rating of "moderate." It is ranked as a low priority species for removal/control within the Preserve due to its limited distribution. Control of this species could include manual removal, mechanical control, or herbicide treatment. The species produces abundant seed, and therefore control should be focused during the winter and early spring months before the species develops seed (species blooms April to September). Young plants can be pulled, cut or treated with an appropriate herbicide (e.g., glyphosate) to control.

Italian plumeless thistle (*Carduus pycnocephalus*)

Italian plumeless thistle is a winter annual forb found in disturbed or open areas throughout California, including road edges, annual grasslands, and pastures (Cal-IPC 2012). This species has a "moderate" Cal-IPC Inventory Ranking. It is rated as a low priority for control within the Preserve due to its isolated occurrences and limited ability to displace native habitat. Within the preserve it is located in the northeastern corner of the site, as well as north and south of the ranch house in the western portion of the site (Figure 6). A total of 930 individuals (approximately 1,000 square feet) were mapped within the Preserve. Control of this species could include manual removal, mechanical control, or herbicide treatment. The species produces abundant, wind-blown seed and therefore control should be focused during the winter and early spring months before the species develops seed. Young plants can be pulled, cut or treated with an appropriate herbicide (e.g., glyphosate) to control.

Maltese star-thistle (*Centaurea melitensis*)

Maltese star thistle is widespread in open or disturbed areas in the western United States. This species will occupy grasslands, open woodlands, roadsides, and agricultural fields (Cal-IPC 2012). This species has more invasive potential in southern California and has been designated with a "moderate" Cal-IPC Inventory Ranking. The species is rated as "low" priority for control within the Preserve due to its difficulty for effective control and limited ability to displace established coastal scrub and chaparral communities. Maltese star-thistle is a common component of non-native annual grasslands, but was occasionally mapped herein for control where its presence was particularly abundant. As shown in Figure 6, areas for control are located in the northeastern corner, central and western portions of the site. A total of 2,900 plants (approximately 1,500 square feet) were mapped within the Preserve. Control of this species could include manual removal, mechanical control, or herbicide treatment. Control should be focused during the winter and early spring months before the species develops seed. Young plants can be pulled, cut or treated with an appropriate herbicide (e.g., glyphosate) to control.

Bull thistle (*Cirsium vulgare*)

Bull thistle is common in coastal grassland, marsh, and forest habitats, although it is of particular management concern in areas that are repeatedly disturbed, including overgrazed pastures or areas of recent burns. Bull thistle outcompetes native species for limited resources, such as water, nutrients, and space (Cal-IPC 2012). This species has a "moderate" Cal-IPC Inventory Ranking. It is rated as a "low" priority for control within the Preserve due to its limited distribution and limited ability to displace established coastal scrub and chaparral communities. As shown in Figure 6, bull thistle is located in the vicinity of the ranch house, in the western portion of the site. A total of approximately 500 individuals (approximately 500 square feet) were mapped within the Preserve. Control of this species could include manual removal, mechanical control, or herbicide treatment. Control should be focused during the winter and early spring months before the species develops seed. Young plants can be pulled, cut or treated with an appropriate herbicide (e.g., glyphosate) to control.

Bermuda grass (*Cynodon dactylon*)

Bermuda grass is a creeping perennial grass commonly used in garden plantings and as a turf species. However, it can escape cultivation and out-compete native species, particularly in riparian areas (Cal-IPC 2012). This species has a "moderate" Cal-IPC Inventory Ranking. It is rated as a "low" priority for control within the Preserve due to its limited distribution. As shown in Figure 6, Bermuda grass is located south of the ranch house in the western portion of the site. The number of individuals mapped is approximately 1,000 (approximately 1,000 square feet),

although the spreading growth habitat of this species makes it difficult to quantify. Recommended control of this species is repeated systemic herbicide treatments, as it will quickly regenerate from stem and root fragments left in the soil. The species goes dormant in the winter. Therefore control measures should occur in spring through fall.

Shortpod Mustard (*Hirschfeldia incana*)

Shortpod mustard is a biennial, or occasionally a short-lived perennial, forb found in coastal scrub and grassland habitats (Cal-IPC 2012). This species has a Moderate Cal-IPC Inventory Ranking (Cal-IPC 2012). Shortpod mustard is primarily found in disturbed areas in grasslands within the Preserve. Approximately 1,280 plants (approximately 1,200 square feet) were mapped within the Preserve, most of which occur within an old detention pond in the central portion of the Preserve (Figure 6c). The species was ranked as low priority for control within the Preserve due to its limited ability to displace coastal scrub and chaparral communities. However, the species has the ability to spread and re-establish quickly in disturbed areas and should be controlled as feasible. Control of this species could include either mechanical or herbicide treatment. The species produces abundant seed. Thus, removal of plant material that has seed present is important. Control should be focused during the winter and early spring months before the species develops seed. Young plants can be pulled, cut or treated with an appropriate herbicide (e.g., glyphosate) to control.

Olive tree (*Olea europa*)

This non-native species of olive tree is commonly grown as a crop in California. This species is a concern due to the potential of spread from orchards, but while it is a major invasive in Australia, it does not appear to be spreading rapidly in California. Within the Preserve, olive tree is noted as occurring near the ranch area in the northwest portion of the study area. Both scattered, individual occurrences, as well as an olive orchard are present. The number of individuals is estimated at approximately 54 (approximately 500 square feet). The Cal-IPC inventory categorizes olive as having an overall rating of “limited.” It is ranked as a low priority for removal/control within the Preserve due to its limited distribution and low potential to colonize the surrounding area. Recommended control of this species includes mechanical removal and treatment of the stump with an appropriate systemic herbicide (e.g., glyphosate). Control of this species can occur year-round.

Curly dock (*Rumex crispus*)

Curly dock is a perennial forb that grows in grassy areas, roadsides, flood plains, and agricultural areas (Cal-IPC 2012). This species has a “limited” Cal-IPC Ranking and is rated as a “low” priority for removal within the Preserve. As shown in Figure 6, curly dock is located north and

south of the ranch house in the western portion of the site. A total of 20 individuals (approximately 20 square feet) were mapped within the Preserve. It is possible to manually remove this species by hand-pulling, although due to its deep taproot it is very difficult to remove entirely. Recommended control for this species includes treatment with an appropriate herbicide (e.g., glyphosate) prior to the development of mature seed heads in the summer. Should control not occur prior to maturation of seed, it is recommended that the seed heads be removed, bagged, and disposed of off-site, with the remaining plant receiving an herbicide treatment.

Milk thistle (*Silybum marianum*)

Milk thistle is an annual forb that grows in grasslands and riparian areas (Cal-IPC 2012). This species is ranked as "limited" in Cal-IPC and is rated as a "low" priority for removal within the Preserve due to its limited distribution and limited ability to displace native habitat. Milk thistle is located in a few isolated patches in the central and southern portion of the Preserve (Figure 6c and 6d). Approximately 100 individuals (approximately 100 square feet) were mapped within the Preserve. Control of this species could include manual removal, mechanical control, or herbicide treatment. The species should be controlled during the winter and early spring months before the species develops seed. Young plants can be pulled, cut or treated with an appropriate herbicide (e.g., glyphosate) to control.

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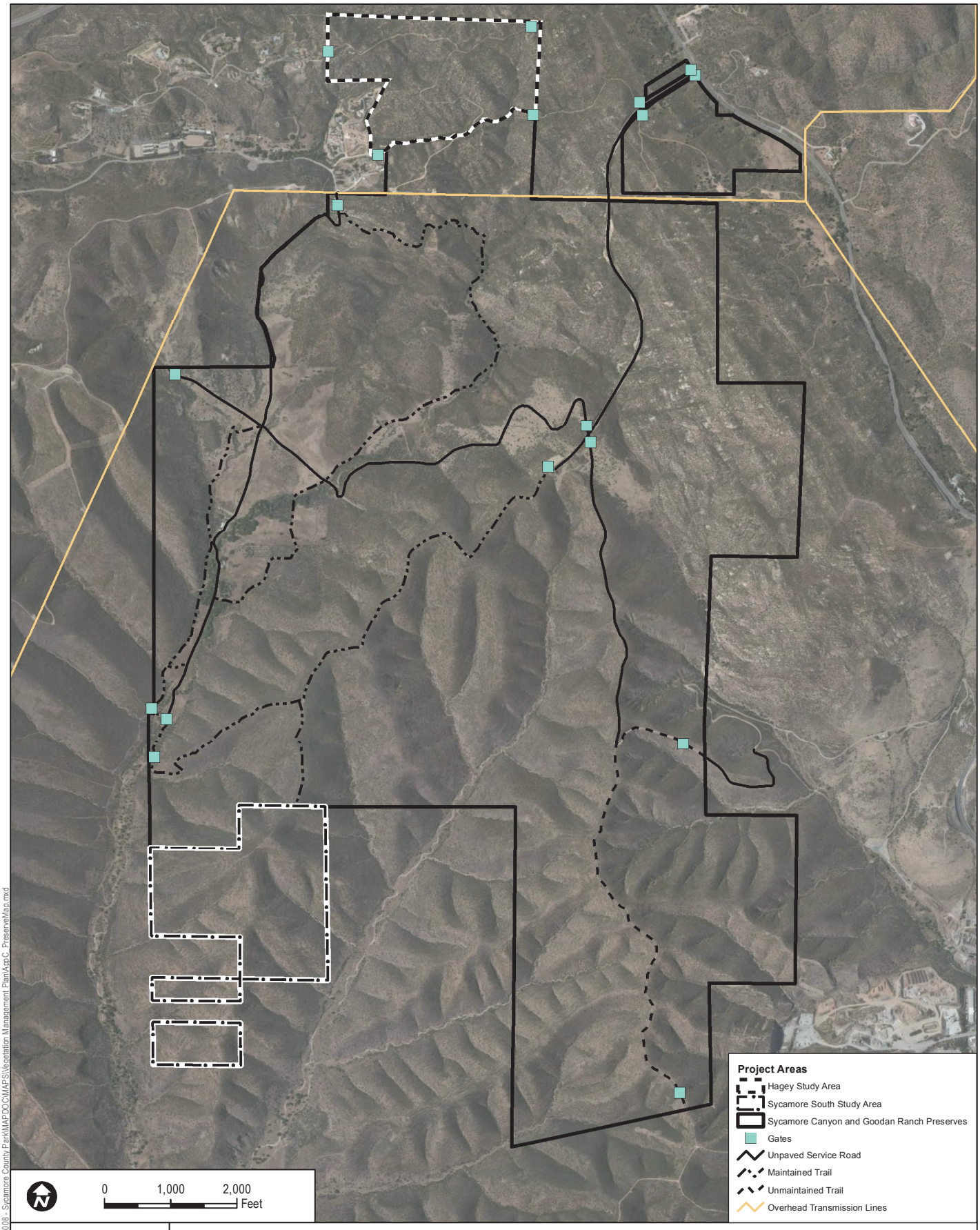
APPENDIX C

Preserve Map with Access Gates and Transmission Line Locations



SOURCE: Bing

DUDEK

6680-08

APPENDIX C

Preserve Map with Gates, Access Roads, and Transmission Lines

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

Path: Z:\Projects\6680\0\6680\08 - Sycamore County Park\MAPDOC\MAPS\Vegetation Management Plan\AppC_PreserveMap.mxd

APPENDIX D

Fire Behavior Modeling Results

APPENDIX D
Fire Behavior Modeling Results

FUELS CLASSIFICATION

Reliable estimates of fire behavior must consider the relationship of fuels to the fire environment and the variations in these fuels. Natural fuels are made up of the various components of vegetation, both live and dead, that occur on a site. The type and quantity will depend upon the soil, climate, geographic features, and the fire history of the site. The major fuel groups of grass, shrub, trees, and slash are defined by their constituent types and quantities of litter and duff layers, dead woody material, grasses and forbs, shrubs, regeneration, and trees. Fire behavior can be predicted largely by analyzing the characteristics of these fuels. Fire behavior is affected by seven principal fuel characteristics: fuel loading, size and shape, compactness, horizontal continuity, vertical arrangement, moisture content and chemical properties.

All vegetation is considered fuel. All vegetation will burn; however, some species require more heat in order to ignite and propagate flame. The moisture content of vegetation is an important component; dry vegetation will ignite more rapidly, whereas green vegetation must lose its moisture before it will ignite. Consequently, shrubland vegetation with high oil content (above 6%) will burn more quickly and hotter than vegetation with high leaf moisture levels and low oil content levels. More than 90% of the flaming front of a wildfire is composed of fuel less than 0.5 inch in diameter and is consumed in minutes. Fuels larger than 1 inch in diameter are termed "residual" fuel and may require several hours to burn out. This larger fuel does not contribute to the forward rate of spread of the fire. The following factors describe the relationship between vegetation characteristics that affect fire behavior:

Fuel loading is defined as the oven dry weight of fuels in a given area, usually expressed in tons per acre. Natural fuel loading varies greatly by vegetative or fuel types in addition to the different size classes of fuel particles. Vegetation types can be rated as light, moderate, or heavy. Each rating is an estimate of the dead or live surface fuels that are less than 3 inches in diameter. Although specific measurements were not taken, based on the vegetation types identified in the cursory survey of the Sycamore Canyon and Goodan Ranch Preserves (Preserve), the different vegetation types can generally be assigned a moderate to high rating.

> Measuring the intensity, force, and destructive potential of wildfire is accomplished by observing flame lengths produced by burning vegetation. A direct relationship exists between the amount of energy released during burning (per second) and the length of flame generated. The standard for measuring energy release in the United States is the British Thermal Unit (BTU). One BTU is defined as the amount of energy required to increase the temperature of 1 pound of water 1°F (a standard kitchen match or candle flame is approximately one BTU).

Size and shape affect the surface area to volume ratio of fuels. Small fuels have a greater surface area to volume ratio than larger fuels. Dead fuels are separated into four size classes: (1) grasses, litter, or duff less than 0.25 inch diameter; (2) twigs and small stems 0.25– to 1-inch diameter; (3) branches 1- to 3-inch diameter; and (4) large stems and branches greater than 3-inch diameter. The fine fuels less than 0.25-inch diameter are most important for fire behavior analysis because their ignition time is less, and their fuel moisture content changes rapidly. This characteristic is typical for the grasses that were identified within and adjacent to the Preserve.

> The arrangement, size, and surface area of vegetative fuels play an important role in fire behavior and spread potential. Dense, concentrated biomass may burn evenly; however, when overall size decreases and surface area increases (as seen in native shrub stands), burning patterns change, resulting in faster ignition and spread. Live shrubland and grassland vegetation generally exhibit high surface to volume ratios. Standing grass, coastal sage scrub, and chaparral have high surface area to volume ratios, whereas forest litter and chipped or cut biomass exhibit very low surface to volume ratios.

Compactness, or spacing between fuel particles, affects the rate of combustion. For example, fuel particles that are closely compacted have less surface area exposed and less air circulation between particles and thus are slower to combust. The thick duff layer found underneath a mixed forest is an example of a tightly compacted fuel, whereas the open, dead branches on sagebrush or chaparral are considered a loosely compacted fuel. With the exception of the on-site oak woodlands, the fuels on the Preserve are loosely spaced with adequate air circulation required to carry a fire.

Horizontal continuity is the extent of horizontal distribution of fuels at various levels or planes. The vegetative types within various portions of the Preserve were analyzed for horizontal continuity and vertical arrangement. Fuels are either rated as uniform or patchy. Uniform fuels are evenly distributed and occur in a continuous, non-interrupted cover across the landscape. Patchy fuels are not continuous.

Vertical arrangement is defined as the relative heights of fuels above the ground, as well as their vertical continuity. Both of these vegetation characteristics influence the ability of fire to reach various fuel levels or strata. Vegetation of various heights that can transport fire from the low-level brush to tree canopies is called a fuel ladder and may create what is called a “crown fire.” When tall grasses and shrubs grow around trees with low hanging branches, the result is a fuel ladder. When a ground fire climbs the fuel ladder into the crowns of trees, it can spread canopy to canopy, creating higher fire intensity and firebrands.

Fuel moisture content is defined as the amount of water in fuels. The moisture content of plant materials plays a major role in the ignition, development, and spread of fires. Fuel moisture controls the current flammability of fuels both living and dead. During the most active growing periods of spring, the moisture content of plant foliage may be quite high. As the season progresses, a plant's moisture content declines until late summer or early fall when the plant becomes dormant or completely dies. Fine fuels, less than 0.25 inch thick, are most responsible for the spread of fire and have highly variable fuel moisture contents depending on the relative humidity of the air. Live fuel moisture content during the peak fire season (October through December) is estimated to be 60% to 80% in the drier open areas. This can potentially drop to less than 60% under extreme, dry wildfire conditions.

> There are two types of fuel moisture values to consider: (1) dead fuel moisture, with measurements of 1-, 10-, 100-, and 1,000-hour time-lag; and (2) live fuel moisture.

Dead fuel moisture percentages are determined by temperature, aspect, time of day, relative humidity, and time of year. One-hour time-lag fuel is less than 0.5 inch thick, 10-hour time-lag fuel is between 0.5 inch and 1 inch thick, 100-hour time-lag fuel is between 1 and 3 inches thick, and 1,000-hour time-lag fuel is greater than 3 inches thick. One-hour time-lag fuel can reach equilibrium with the surrounding atmosphere in 1 hour, or within minutes when air temperature exceeds 80°F and relative humidity is below 25%. One-hour time-lag fuel moisture may be calculated using a set of tables that reference time of day, month, aspect, slope, temperature, and relative humidity. Ten-hour, 100-hour, and 1,000-hour time-lag fuel can take up to 10 hours, 100 hours, or 1,000 hours to reach equilibrium with the surrounding atmosphere, respectively. In Southern California, 1-hour, 10-hour, and 100-hour time-lag fuels are usually given equal value. One thousand hour time-lag fuel, which occurs in more heavily wooded environments (i.e., timber), is generally used in measuring drought effects. Forests are considered "critical" when 1,000-hour fuel measurements are less than 15% (as a frame of references, kiln-dried wood moisture averages 22%).

> Despite variations in the topography and disturbance history of the Preserve, vegetative cover is classified into four main types: grass, chaparral, coastal sage scrub, and woodland. Frequent fires have created low-volume fuel beds throughout much of the Preserve. Although most fuels occur in the 1-hour size class, pockets of 10- and 100-hour fuels can be found, primarily in the woodland vegetation types on site.

Live fuel moisture is described as the moisture in leaves and woody portions of a plant. Field measurements of live fuel moistures are calculated by cutting small branches (less than 3 inches in diameter), weighing the branch, placing it in a low- temperature oven for 12 hours, removing the branch, and weighing it again. The difference in weight is the loss of moisture in the leaves

and woody portion of the branch. Consequently, live fuel moisture may exceed 100% of the dry weight of the plant. Live fuel moisture is the highest in the spring and early summer, and the lowest in late summer, fall, and early winter. This measurement is a valuable tool in predicting wildfire potential for a general area.

> Chaparral and coastal sage scrub are common Southern California vegetation types found in many upland locations and generally have reduced fuel moisture levels. Conversely, riparian vegetation, including willow (*Salix* spp.), coast live oak (*Quercus agrifolia*), and mulefat (*Baccharis salicifolia*), has higher leaf moisture values than vegetation growing in drier, more xeric sites. The importance of fuel moisture in examining fire hazard is that higher moisture levels ultimately require higher BTU output to ignite or sustain ignition. Consequently, fuel arrangement, along with fuel chemical/moisture content, plays an important role in wildfire combustion, spread, and heat output. Fuel moisture is a significant component, as vegetation requires external heat and energy to reduce moisture levels before it will ignite. High winds, low relative humidity, and/or high temperatures begin the process of removing fuel moisture, thus allowing vegetation to ignite and burn more rapidly. Consequently, lower fuel moisture values, including both dead and live fuel moistures, result in increased fire intensity. Moisture-laden fuels inhibit complete combustion while simultaneously producing excessive smoke output.

Fuel chemical properties include the presence of volatile substances such as oils, resins, wax, and pitch. These also affect the rate of combustion. Chaparral and sage scrub vegetation have high amounts of these volatile substances that contribute to rapid rates of spread and high fire intensities.

> Oil and moisture contents vary between fuels and fluctuate depending on the time of year. For example, black sage may have an oil content approaching 20% of its weight in dry summer or autumn months, but, in the spring, when sufficient groundwater is available, moisture content values can exceed 300%. When stressed during extreme dry weather conditions, numerous chaparral and coastal sage scrub species may react explosively when moisture falls below 60%, whereas larger shrubs may require higher energy to sustain ignition.

FUEL MODELS

All nine fuels characteristics are descriptors that help define the 13 standard fuel models (Anderson 1982), the more recently developed 40 fuel models (Scott and Burgan 2005), and five custom fuel models developed for Southern California (Weise and Regelbrugge 1997). Six fuel

models (models 1, 8, 9, SCAL 18, SH5, and TU5) were used in the FlamMap analysis for the Preserve and are required inputs for the mathematical fire spread computations. Additionally, one non-burnable model (model 0) was utilized to represent non-fuel areas (e.g. roads)). Table 1 provides details of the six fuel models used in the analysis conducted for Preserve.

Table 1
Fuel Model Characteristics

Fuel Model	Description	Tons/acre; Btu/lb	Fuel Bed Depth (Feet)
1	Short grass	0.7 tons/acre; 8,000 Btu/lb	1.0
8	Closed timber litter	5.0 tons/acre; 8,000 Btu/lb	0.2
9	Hardwood litter	3.5 tons/acre; 8,000 Btu/lb	0.2
SCAL18	Sage/buckwheat	9.7 tons/acre; 9,200 Btu/lb	3.0
SH5	High load dry scrub	8.6 tons/acre; 8,000 Btu/lb	6.0
TU5	Very high load, dry climate timber-shrub	14.0 tons/acre; 8,000 Btu/lb	1.0

WILDLAND FIRE BEHAVIOR MODELING

Fire behavior was analyzed for the Preserve site using FlamMap fire behavior modeling software and local topographic, fuels, and weather data. The FlamMap output data provide an indication of how vegetative fuels will burn under specific fuel, weather, and topographical conditions. The FlamMap (version 5.0) fire behavior software package (Finney et al. 2012) is a geographic information system (GIS)-driven computer program that incorporates fuels, weather, and topography data in generating static fire behavior outputs, including values associated with flame length, rate of spread, and fireline intensity. It is a flexible system that can be adapted to a variety of specific wildland fire planning and management needs.

The calculations that result from FlamMap are based on the BehavePlus Fire Modeling System algorithms but result in a geographically distinct data set based on GIS inputs. FlamMap model outputs allow wildland resource managers to predict rate of spread, fireline intensity, and flame length, which provide important insights about the characteristics of wildfire spread within and adjacent to high-value areas, whether residential structures or preserved sensitive habitats. Each of the input variables used in FlamMap remain constant at each location, meaning that the input variables are applied consistently to each grid cell and the fire behavior at one grid cell does not impact that at a neighboring grid cell. Essentially, the model presents a “snapshot” in time and does not account for temporal changes in fire behavior or the movement of fire across the landscape. As such, the results of the models contained herein should be utilized as valuable information sources and tools to prioritize fuel treatment options rather than an exact representation of how a fire would behave on the Preserve.

The basic assumptions and limitations of FlamMap are:

- The fire model output describes fire behavior only in the flaming front. The primary driving forces in the predictive calculations are the dead fuels less than 0.25 inch in diameter. These are the fine fuels that carry fire. Fuels greater than 1 inch in diameter have little effect to carry fire, and fuels greater than 3 inches in diameter have no effect.
- The model bases calculations and descriptions on a wildfire spreading through surface fuels that are within 6 feet of the ground and contiguous to the ground. Surface fuels are often classified as grass, brush, litter, or slash.
- The software assumes that fuel moisture conditions are uniform. However, because wildfires almost always burn under non-uniform conditions, length of projection period and choice of fuel must be carefully considered to obtain useful predictions.
- WindNinja software (v. 2.1.0), which is incorporated into FlamMap, allows for the generation and incorporation of gridded wind data in the FlamMap simulation.
- The FlamMap fire behavior computer modeling system provides the average length of the flames, which is a key element for determining defensible space distances for minimizing structure ignition.

Fuel models used in the FlamMap analysis are classified into four groups based upon fuel loading (tons/acre), fuel height, and surface to volume ratio. Fuel model classifications were made during field analysis and in conjunction with available vegetation maps of the Preserve. The following list of fuel types describes the classification of fuel models based on vegetation type:

- Grasses Fuel, Models 1 through 3. These models represent the fast moving, light, flashy fuels found in grassland landscapes.
- Brush Fuel, Models 4 through 7, SCAL 14 through 18. These models are designed to represent the higher-intensity chaparral and sage scrub dominated landscapes.
- Timber Fuel, Models 8 through 10. Timber models are selected to represent the riparian woodland or ornamental forested landscapes.
- Logging Slash, Fuel Models 11 through 13. These models are used to represent slash; none were utilized for the Preserve.

FLAMMAP FUEL MODEL INPUTS

FlamMap software requires a minimum of 5 input files that represent field conditions in the study area, including elevation, slope, aspect, fuel model, and canopy cover. Each of these files was created as a raster geographic information system (GIS) file in ArcGIS 10.0 software,

exported as an ASCII grid file, then utilized in creating a FARSITE Landscape file that served as the base for the FlamMap runs. The resolution of each grid file and associated ASCII file that was used in the models described herein is 10 meters, based on available digital elevation models (DEMs). In addition to the Landscape file, wind and weather data are incorporated into the model inputs. The output files chosen for each of the modeling runs included flame length (feet) and fireline intensity (BTU/ft/sec). Figures D-1 through D-4 depict the results of each of the four modeling runs and exhibit each of these output variables.

The following provides a description of the input and output variables used in processing the FlamMap models. In addition, data sources are cited and any assumptions made during the modeling process are described.

1. ***Elevation.*** Elevation data were derived from a 10 meter resolution Digital Elevation Model (DEM) acquired from the San Diego Association of Governments (SANDAG). This data set was utilized to create an elevation grid file, using units of feet above mean sea level. The elevation data are a necessary input file for FlamMap runs and are necessary for adiabatic (i.e., a process that happens without loss or gain of heat) adjustment of temperature and humidity and for conversion of fire spread between horizontal and slope distances (Finney et al. 2012).
2. ***Slope.*** Using Spatial Analyst tools, a slope grid file was generated from the elevation grid file. Slope measurements are represented in percent of inclination from horizontal. The slope input file is necessary for computing slope effects on fire spread and solar radiance (Finney et al. 2012).
3. ***Aspect.*** Using Spatial Analyst tools, an aspect grid file was generated from the elevation grid. Aspect values are presented in azimuth degrees and are important in determining solar exposure.
4. ***Fuel Model.*** Vegetation coverage data in the form of a GIS shapefile were used in this analysis to create a fuel model file. Derived from Dudek's vegetation mapping data, the vegetation types were classified according to existing National Forest Fire Laboratory (NFFL) and BehavePlus fuel models, and the data file was converted to a grid file for inclusion in FlamMap modeling. Table 2 presents the vegetation and associated fuel type classifications for the Preserve.
5. ***Canopy Cover.*** Canopy cover is a required file for FlamMap operations. It is necessary for computing shading and wind reduction factors for all fuel models. Canopy cover is the horizontal percentage of the ground surface that is covered by tree crowns. Canopy cover is measured as the horizontal fraction of the ground that is covered directly overhead by tree canopy. Crown closure refers to the ecological condition of relative tree crown density. Stands can be said to be "closed" to recruitment of canopy trees but still

only have 40% or 50% canopy cover (Finney et al. 2012). Coverage units can be categories (0–4) or percentage values (0–100). Table 2 presents canopy cover assignments for each vegetation type/fuel model

Table 2
Fuel Models and Associated Canopy Cover Values

Vegetation Community/Land Cover	Fuel Model	Canopy Cover Value
Chamise Chaparral	SH5	0
Chaparral	SH5	0
Coastal Live Oak Woodland	8	3
Coastal Scrub	SCAL18	0
Diegan Coastal Sage Scrub: Inland Form	SCAL18	0
Disturbed Habitat	1	0
Eucalyptus Woodland	TU5	3
Non-Native Grassland	1	0
Orchards and Vineyards	9	2
Scrub Oak Chaparral	SH5	0
Southern Willow Scrub	8	2
Southern Maritime Chaparral	SH5	0
Southern Mixed Chaparral	SH5	0
Southern Riparian Woodland	8	3
Urban/Developed	0	0

Weather

Weather and fuel moisture inputs incorporated into fire behavior modeling for the site were determined by utilizing the guidelines and standards presented by the County of San Diego, Department of Planning and Land Use. These guidelines identify acceptable fire weather inputs for extreme fire conditions during summer months and Santa Ana fire weather patterns. The County analyzed and processed fire weather from Remote Automated Weather Stations (RAWS) between April 15 to December 31 in order to represent the general limits of the fire season. Data provided by the County's analysis included temperature, relative humidity, and sustained wind speed and is categorized by weather zone, including Maritime, Coastal, Transitional, Interior, and Desert.

To determine fuel moisture values for the analysis area, Dudek utilized the Fine Dead Fuel Moisture tool within the BehavePlus (v. 5.0.5) fire behavior modeling software package. The temperature, relative humidity, and wind speed data for the Transitional weather zone were utilized for this analysis based on the Preserve location. Reference fuel moistures were calculated in BehavePlus for two weather scenarios (Summer and Peak) and were based on site-specific topographic data inputs. Table 3 summarizes the fuel moisture calculations utilized for this analysis.

Table 3
Fine Dead Fuel Moisture Calculation

Variable	Summer Weather	Peak Weather
Dry Bulb Temperature	90 -109 deg. F	90 -109 deg. F
Relative Humidity	10 - 14 %	5 - 9 %
Reference Fuel Moisture	2 %	1 %
Month	May June July	Feb Mar Apr Aug Sept Oct
Time of Day	14:00 - 15:59	14:00 - 15:59
Elevation Difference	Level (within 1,000 ft.)	Level (within 1,000 ft.)
Slope	30+ %	31+ %
Aspect	South	South
Fuel Shading	Exposed (< 50% shading)	Exposed (< 50% shading)
Fuel Moisture Correction	1 %	1 %
Fine Dead Fuel Moisture	3 %	2 %

The fine dead fuel moisture values were incorporated into the Initial Fuel Moisture file used as an input in FlamMap. Initial wind direction and wind speed values for the two FlamMap runs were manually entered during the data input phase. WindNinja software (v. 2.1.0), which is incorporated into FlamMap, allows for the generation and incorporation of gridded wind data in the FlamMap simulation. The input wind speed and direction is roughly an average surface wind at 20 feet above the vegetation over the analysis area. The WindNinja-generated wind data was included in the modeling effort and provides a more detailed data set for modeling the effect of wind speed and direction on fire behavior across the modeling area. Table 4 presents the weather and fuel moisture input variables used for fire behavior modeling efforts.

Table 4
FlamMap Weather Input Variables

Model Variable	Summer Weather	Peak Weather
1 h fuel moisture	3%	2%
10 h fuel moisture	4%	3%
100 h fuel moisture	6%	5%
Live herbaceous moisture	60%	30%
Live woody moisture	90%	60%
20 ft wind speed (mph)	19 mph	41 mph
Wind direction	225 degrees	45 degrees
Slope steepness	Variable by location	Variable by location

mph = miles per hour

FlamMap Fuel Model Outputs

Two output grid files were generated for each of the two FlamMap runs, and include representations of flame length (feet) and fireline intensity (BTU/feet/second), as shown in Figures D-1 through D-4. The aforementioned fire behavior variables are an important component in understanding fire risk and fire agency response capabilities. Flame length, the length of the flame of a spreading surface fire within the flaming front, is measured from midway in the active flaming combustion zone to the average tip of the flames (Andrews and Bevins 2009). It is a somewhat subjective and non-scientific measure of fire behavior, but is extremely important to fireline personnel in evaluating fireline intensity and is worth considering as an important fire variable (Rothermel 1991). Fireline intensity is a measure of heat output from the flaming front, and also affects the potential for a surface fire to transition to a crown fire and is another important variable in initial attack and fire suppression efforts. The information in Table 5 presents an interpretation of these fire behavior variables as related to fire suppression efforts.

Table 5
Fire Suppression Interpretation

Flame Length (feet)	Fireline Intensity (Btu/ft/s)	Interpretations
Under 4	Under 100	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4 to 8	100 to 500	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold the fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8 to 11	500 to 1000	Fires may present serious control problems—torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
Over 11	Over 1000	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

Source: BehavePlus 5.0.5 fire behavior modeling program (Andrews and Bevins 2009)

The fire behavior analysis results for the Preserve vary depending on fuel type. As FlamMap utilizes site-specific digital terrain data (including slope, vegetation, aspect, and elevation data) slight variations in predicted flame length and fireline intensity values can be observed based on fluctuations of these attributes across the landscape. As presented, wildfire behavior in each of the fuel types varies depending on weather conditions. Given the climatic, vegetation, and topographic characteristics along with the fire history and fire behavior modeling results discussed in this VMP, the Preserve is determined to be vulnerable to wildfire starting in, burning onto, or spotting onto the site. Based on this information, adjacent residential development, and the fire history of the area, it is expected that wildfires will occur on the Preserve in the future.

Under Peak weather conditions, fire can move rapidly through the site's fuels. Worst-case flame lengths were calculated at approximately 43 feet in chaparral vegetation types and approximately 41 feet in sage scrub vegetation on slopes exceeding 50% throughout the Preserve. Spread rates on site may exceed 8 miles per hour in dry flashy fuels (grasses and scrub) under extreme weather and slope conditions. Finally, under extreme weather and wind conditions, fireline intensity values may exceed 19,000 Btu/feet/second limiting the options for fire response personnel and emphasizing the importance of fuel modification and defensible space for adjacent residences.

It should be noted that the modeling results depict values based on inputs to the FlamMap system. Variations in weather or pockets of different fuel types are not accounted for in this analysis. Additionally, the scale of analysis (10 square meters) limits fine-scale analysis and interpretation. Model results should be used as a basis for planning only, as actual fire behavior for a given location will be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns that could not be obtained for this analysis.

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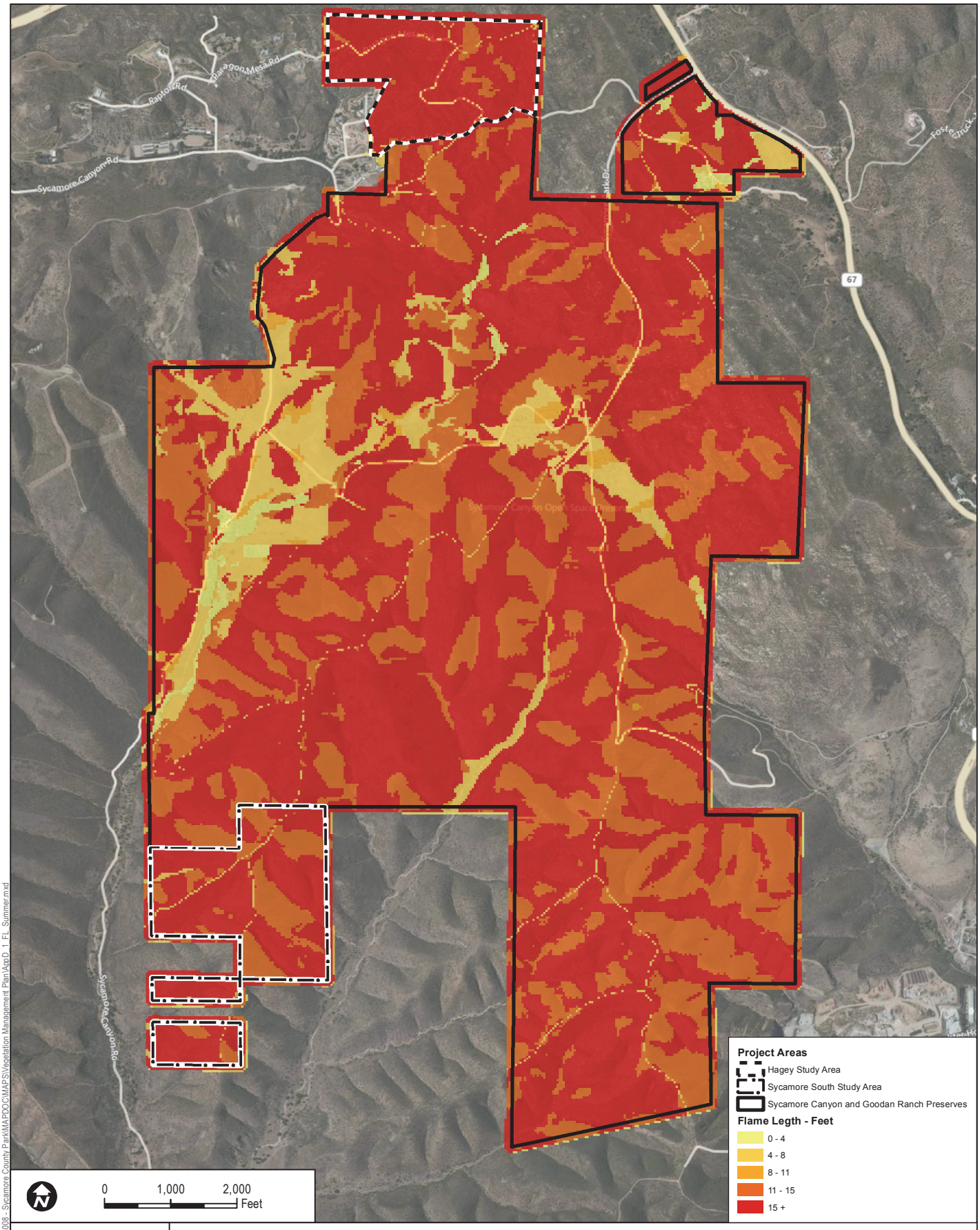

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APPENDIX D-1

Flame Length, Summer Fire

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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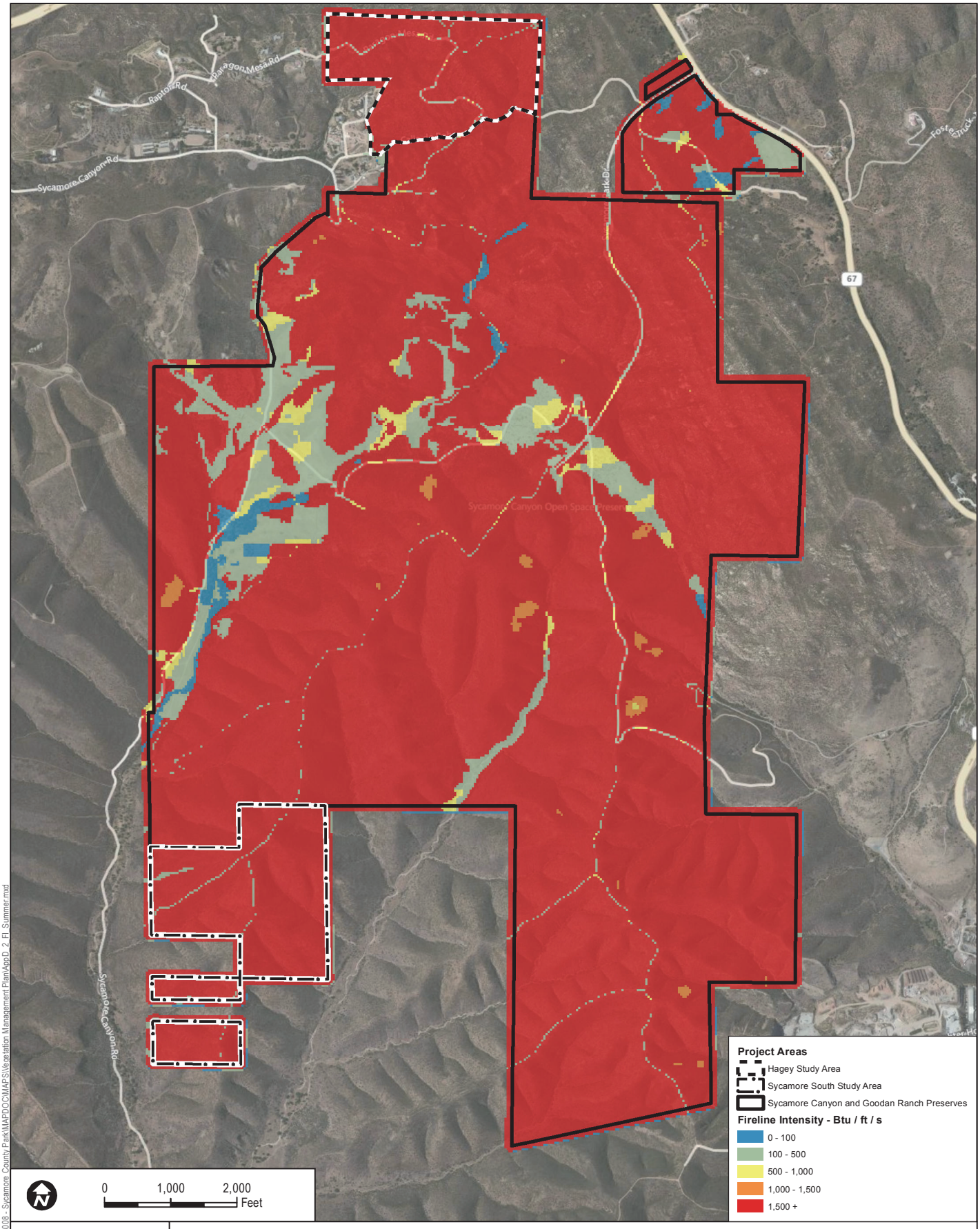

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APPENDIX D-2

Fireline Intensity, Summer Fire

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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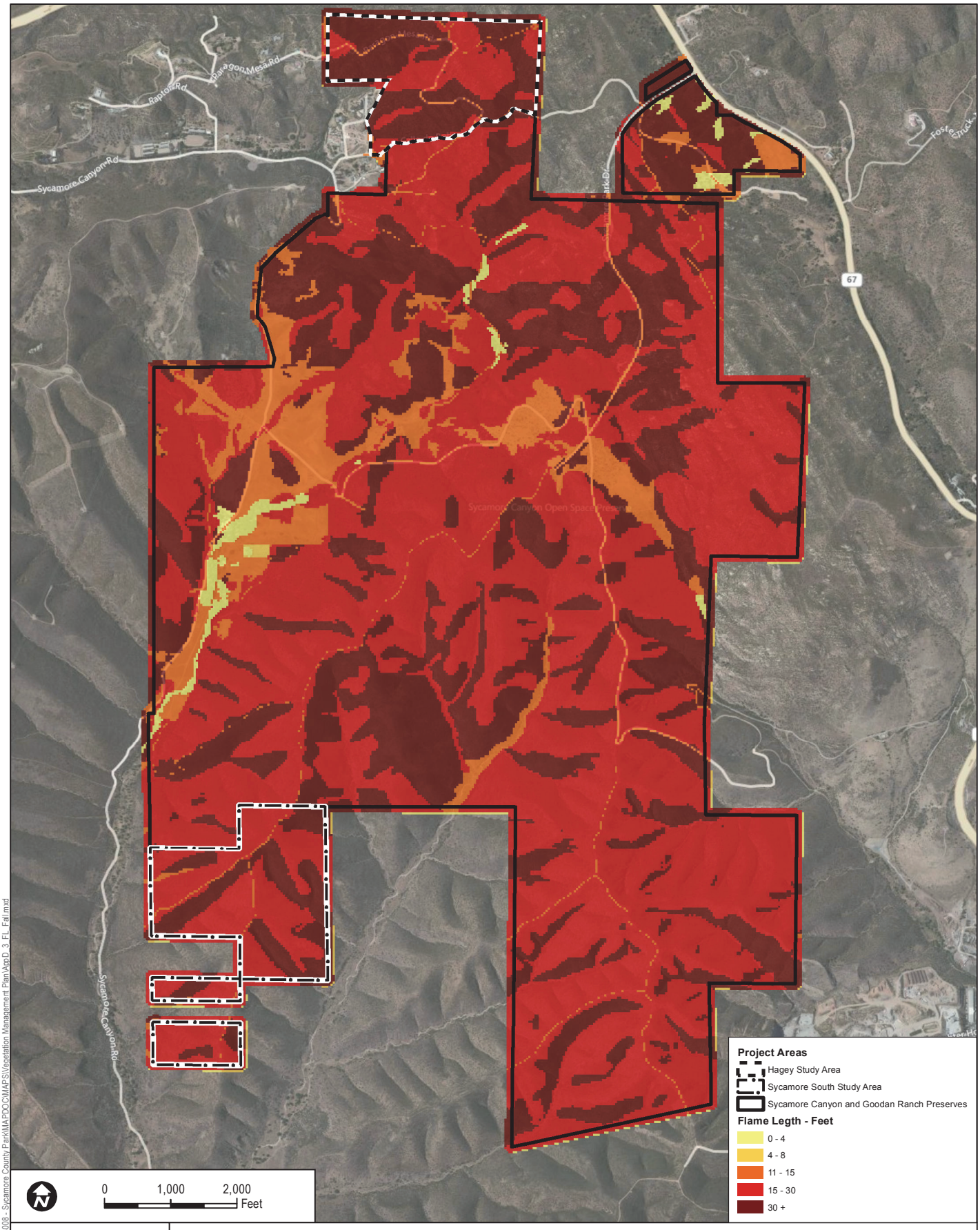

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APPENDIX D-3

Flame Length, Fall Fire

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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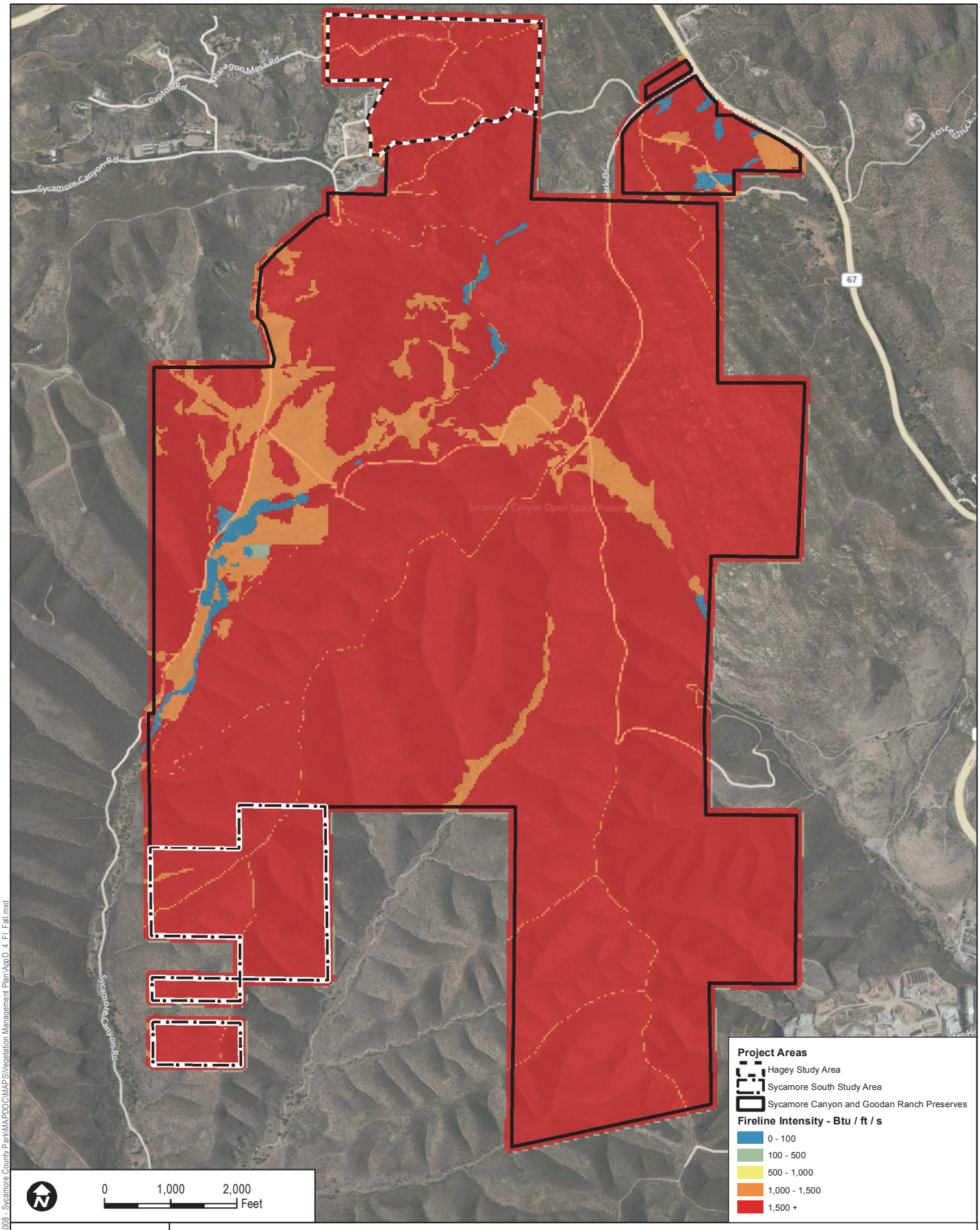

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APPENDIX D-4

Fireline Intensity, Fall Fire

Sycamore Canyon and Goodan Ranch Preserves - Vegetation Management Plan

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