

FINAL

**Lusardi Creek Preserve
Vegetation Management Plan**

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Glossary of Terms and Acronyms

Arson Fire: A wildfire willfully ignited by anyone to burn, or spread to vegetation or property without consent of the owner or his/her agent.

BEHAVE: 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.

Class A Foam: Foam intended for use on Class A or woody fuels; made from hydrocarbon-based surfactant, therefore lacking the strong filming properties of Class B foam, but possessing excellent wetting properties.

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.

Condition of Vegetation: Stage of growth or degree of flammability of vegetation that forms part of a fuel complex.

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 wildland/urban interface, destroying structures.

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

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Defensible Space: An area, typically 100 feet wide or more, between an improved property and a potential wildfire, where the combustibles have been removed, thinned, or treated.

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.

Escape Route: Route away from dangerous areas on a fire; should be pre-planned.

Evacuation: The temporary movement of people and their possessions from locations threatened by wildfire.

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 which 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 Danger Index: A relative number indicating the severity of wildland fire danger as determined from burning conditions and other variable factors of fire danger.

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.

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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 Proofing: Removing or treating fuel with fire retardant to reduce the danger of fires igniting or spreading.

Fire Protection: The actions taken to limit the adverse environmental, social, political and economical 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 Resistant Roofing: The classification of roofing assemblies A, B or C as defined in the Uniform Building Code (UBC) Standard 32.7.

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 Suppressant: Any agent used to extinguish the flaming and glowing phases of combustion by direct application to the burning fuel.

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.

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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.

Fire-Resistive Rating: The time that the material or construction will withstand fire exposure as determined by a fire test made in conformity with the standard methods of fire tests of building, construction and materials.

Firewise Landscaping: Vegetative management that removes flammable fuels from around a structure to reduce radiant heat exposure. The flammable fuels may be replaced with green lawn, gardens, certain individually spaced green, ornamental shrubs, individually spaced and pruned trees, decorative stone or other non-flammable or flame-resistant materials.

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.

Foam: The aerated solution created by forcing air into, or entraining air in water containing a foam concentrate by means of suitably designed equipment or by cascading it through the air at a high velocity. Foam reduces combustion by cooling, moistening and excluding oxygen.

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 Condition: Relative flammability of fuel as determined by fuel type and environmental conditions.

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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.

Fuels: All combustible material within the wildland/urban interface or intermix, including vegetation and structures.

Ground Fuels: All combustible materials such as grass, duff, loose surface litter, tree or shrub roots, rotting wood, leaves, peat or sawdust that typically support combustion.

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

Hazard Reduction: Any treatment of living and dead fuels that reduces the threat of ignition and spread of fire.

Hazardous Areas: Those wildland areas where the combination of vegetation, topography, weather and the threat of fire to life and property create difficult and dangerous problems.

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

Ignition Probability: Chance that a firebrand will cause an ignition when it lands on receptive fuels.

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

Initial Attack: The actions taken by the first resources to arrive at a wildfire to protect lives and property, and prevent further extension of the fire.

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

Mitigation: Action that moderates the severity of a fire hazard or risk.

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National Fire Danger: A uniform fire danger rating system that focuses on the environmental factors that control fire behavior the moisture content of fuels.

Natural Barrier: Any area where lack of flammable material obstructs the spread of wildfires.

Noncombustible: A material that, in the form in which it is used and under the conditions anticipated, will not aid combustion or add appreciable heat to an ambient fire.

Overstory: That portion of the trees in a forest which 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.

Post Fire Charite: Non-combustible material, such as ash, that is unburned and remains on site following fire.

Preparedness: (1) Condition or degree of being ready to cope with a potential fire situation; (2) Mental readiness to recognize changes in fire danger and act promptly when action is appropriate.

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.

Property Protection: To protect structures from damage by fire, whether the fire is inside the structure, or is threatening the structure from an exterior source. The municipal firefighter is trained and equipped for this mission and not usually trained and equipped to suppress wildland fires. Wildland fire protection agencies are not normally trained nor charged with the responsibility to provide structural fire protection but will act within their training and capabilities to safety prevent a wildland fire from igniting structures.

Protection 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.

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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 which 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.

Response: Movement of an individual firefighting resource from its assigned standby location to another location or to an incident in reaction to dispatch orders or to a reported alarm.

Retardant: A substance or chemical agent which reduces the flammability of combustibles.

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.

Structural Fire Protection: The protection of a structure from interior and exterior fire ignition sources. This fire protection service is normally provided by municipal fire departments, with trained and equipped personnel. After life safety, the agency's priority is to keep the fire from leaving the structure of origin and to protect the structure from an advancing wildland fire. (The equipment and training required to conduct structural fire protection is not normally provided to the wildland firefighter.).

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.

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Uncontrolled Fire: Any fire which threatens to destroy life, property, or natural resources, and (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.

Water Supply: A source of water for firefighting activities.

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

Wildland: An area in which development is essentially non-existent, 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 Fire Protection: The protection of natural resources and watersheds from damage by wildland fires. State protection and Federal forestry or land management agencies normally provide wildland fire protection with trained and equipped personnel (the equipment and training required to conduct wildland fire protection is not normally provided to the structural fire protection firefighter).

Wildland/Urban Interface (WUI): Any area where wildland fuels threaten to ignite combustible homes and structures.

Source: www.firewise.org

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1.0 INTRODUCTION

This Vegetation Management Plan (VMP) provides a discussion of current site conditions and provides recommendations for invasive non-native plant species control, habitat restoration, and fire management specific to the Lusardi Creek Preserve (Preserve). All three are connected components of Preserve management as each individual component affects and is affected by the others.

The Lusardi Preserve consists of approximately 194.5 acres and is located along the northern boundary of the City of San Diego slightly southeast of the community of Rancho Santa Fe and west of the community of 4S Ranch. It is located in an area that includes rural development along the San Dieguito River Valley in all directions except to the southwest where the Preserve borders new, higher density development associated with the community of 4S Ranch. The Preserve consists of very high value native habitats, as well as areas that have been marginally impacted by human activities including utility access roads that also serve as trails. The Preserve is within a Very High Fire Hazard area as mapped by Cal Fire (FRAP 2010). The Preserve was recently burned by the Witch Fire (2007) and large acreages that were once high quality coastal sage scrub are now vegetated with non-native annual grasslands.

1.1 Purpose and Need

This VMP has been prepared to provide information on non-native plants, restoration opportunities, and fire management. The resulting vegetation management directives will be included in the Resource Management Plan for Lusardi Creek.

The Invasive Species section of this VMP outlines an inventory of non-native, invasive plants that have been observed on the Preserve. Invasive species represent a potentially significant impediment to achieving Preserve habitat goals, especially following a site-wide disturbance as experienced in 2007 when the Witch Creek Fire burned most of the site. To that end, the invasive species have been prioritized for removal urgency and an on-going program for recognizing and controlling invasive species populations is formulated.

The Habitat Restoration section of this VMP outlines the current need for restoration and the longer term procedures for passive and active restoration following disturbances such as pests, fires, floods, invasive species, or other disturbances.

The Fire Management section of this Plan outlines a framework to address wildfire. The framework includes discussion of fire prevention, suppression, and post-suppression fire control activities within and adjacent to the Preserve. The intent of this section is to provide Department of Parks and Recreation (DPR) staff and fire response personnel with critical site information for

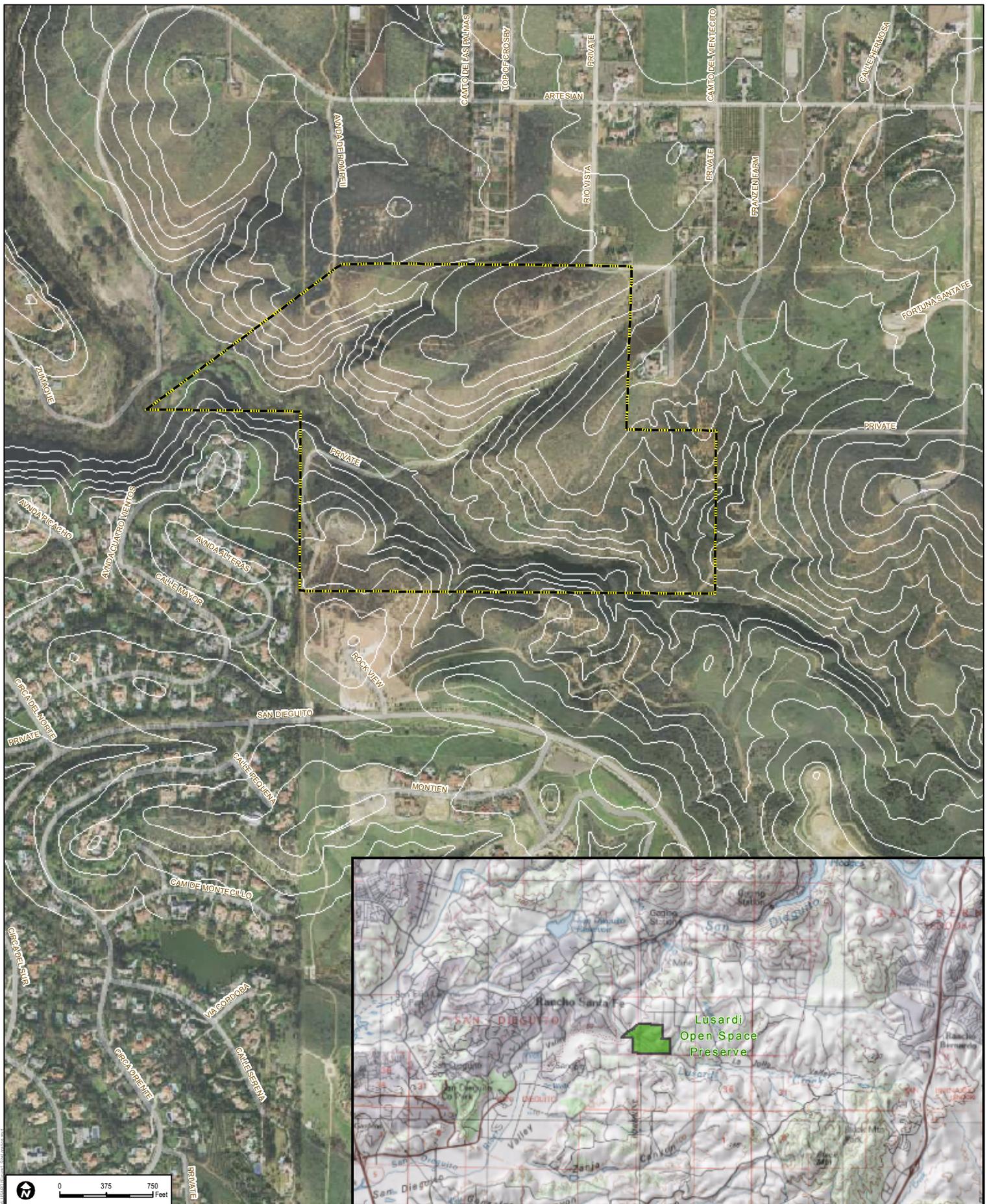
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emergency fire response within and immediately adjacent to the Preserve boundaries and identify targeted fuel management actions that can be implemented as preventative measures.

The VMP is consistent with the County of San Diego Vegetation Management Report (County of San Diego 2009a) which addresses vegetation management criteria for wildland and urban areas of unincorporated San Diego County. The goals and objectives as well as the recommendations included in this VMP are consistent with the South County Multiple Species Conservation Program (MSCP).

1.2 Site Location and Description

The roughly 195-acre Lusardi Creek Preserve is located in San Diego County east of the community of Rancho Santa Fe, and north of the community of Fairbanks Ranch, specifically, just north of San Dieguito Road, west of Del Sur, and south of Artesian Road (Figure 1). The Preserve lies within the Lake Hodges segment of the South County MSCP Subarea Plan (County of San Diego 1997). The Preserve is classified as a High Fire Hazard Severity Zone by Cal Fire and is designated a state responsibility area (SRA) within the Rancho Santa Fe Fire Protection District (RSFFPD). The Preserve is bounded on the south, east, and west by rural/undeveloped land. Low density rural-residential development is located adjacent to the northwestern Preserve boundaries. There is currently no full time on-site manager; the Preserve has no “staging” areas; and the Preserve is patrolled once per week (County of San Diego 2009b).



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SOURCE: DigitalGlobe, 2008; SanGIS, 2007; USGS Digital Raster Graphic - Ramona Quadrangle

FIGURE 1

Site Location - Lusardi Creek Vegetation Management Plan

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The Preserve includes native habitats along with areas that are maintained in a disturbed state, such as utility access roads and trails (Appendix A). Specifically, the Preserve includes several vegetation communities including: southern willow scrub, riparian scrub, southern mixed chaparral, southern maritime chaparral, chamise chaparral, Diegan coastal sage scrub, valley needlegrass grassland, and non-native grassland.

The Preserve ranges in elevation from 120 meters (m) (390 feet (ft)) above mean sea level (AMSL) in the north-central portion to approximately 24 m (80 ft) AMSL in the west-central portion where Lusardi Creek confluence with the San Dieguito River is located. The Preserve includes the Lusardi Creek Valley located in its southern portion with the San Dieguito River Valley adjacent to the west. The Preserve includes upland habitats which are dissected by small tributary drainages to Lusardi Creek, resulting in several narrow, steep canyons or ravines. The site is located within a large geographic area that is subject to dry summer months, seasonal drying winds, and wetter winters.

1.3 Vegetation Management Goals and Objectives

Vegetation management goals for the Preserve are focused on resource preservation. This VMP aims to create and adopt management strategies consistent with those of the larger South County MSCP Subarea Plan and the Resource Management Plan for the Preserve (County of San Diego 2009b). The vegetation management goals for the Preserve include:

- Restoring or enhancing the quality of degraded vegetation communities and habitat types in a manner consistent with overall species or habitat preservation goals.
- Developing fuel-load reduction methods that are consistent with overall Preserve management goals.
- Manage non-natives to ensure native habitat and resource preservation.

To achieve 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:

- Maximize native habitat quality
- Identify and prioritize invasive species on the Preserve
- Provide methods for removal/control of invasive species
- Address current and longer term restoration needs
- Minimize the loss of mature coastal scrub communities.

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- Utilize available fuel and exotic/invasive reduction techniques, such as grazing, mowing, herbicide application, and prescribed fire, consistent with DPR goals for habitat preservation, enhancement, and restoration.
- Provide site information on fire behavior to RSFFPD for inclusion in wildland preresponse plans. Transfer critical Preserve information to the Cal Fire San Diego Unit.
- Establish vegetation management units (VMUs) based on topography or other clearly discernable landscape boundaries to facilitate invasives treatment and management.
- Minimize likelihood of Preserve-wide, catastrophic wildfires.
- 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 the Preserve lands from fire originating in urban areas.
- Provide education for local firefighting personnel regarding sensitive resources and overall management considerations associated with the Preserve.
- Provide 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, access, and other major features, including roads and structures.
- Prepare fire restoration management guidelines for each VMU including discussion of prevention, suppression, and post-suppression activities.
- Provide appropriate contact information to responding fire personnel in the event fire management activities may affect priority resources.

2.0 ENVIRONMENTAL RESOURCES

The Baseline Biological Resources Evaluation for the Preserve, prepared by ICF Jones & Stokes (ICF Jones & Stokes 2008a) presents results from baseline biodiversity surveys conducted during the 2008 survey period (February through October). Field studies included vegetation mapping (including mapping invasive plants), rare plant surveys, pitfall trap arrays to sample amphibians, reptiles, and small mammals, avian point counts, nocturnal bird surveys, acoustic sampling and roost surveys for bats, small mammal trapping, a track and sign survey for medium-to-large mammals, and a camera station survey for medium-to-large mammals.

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2.1 Biological Resources

2.1.1 Vegetation Communities

Nine vegetation communities and land covers were mapped on the Preserve (ICF Jones and Stokes 2008a) based on general physiognomy and species composition (Table 1). Native or naturalized vegetation communities on site include: southern mixed chaparral, chamise chaparral, southern maritime chaparral, Diegan coastal sage scrub, valley needlegrass grassland, non-native grassland, southern willow scrub, and riparian scrub. Disturbed habitat includes all existing dirt roads on the Preserve. Vegetation community distributions are also presented in Figure 2.

**Table 1
Vegetation Communities**

Vegetation Community/Land Cover	Acres	Percentage
Chamise Chaparral	12.05	6.19
Diegan Coastal Sage Scrub	27.97	14.38
Disturbed Habitat	5.13	2.64
Non-native Grassland	98.03	50.39
Riparian Scrub	0.82	0.42
Southern Maritime Chaparral	4.94	2.54
Southern Mixed Chaparral	30.21	15.53
Southern Willow Scrub	8.33	4.28
Valley Needlegrass Grassland	7.07	3.63
Total	194.55	100.00

2.1.2 Sensitive Plant Species

Thirteen special-status plant species were identified on the Preserve (ICF Jones & Stokes 2008a). Additionally, one species, thread-leaved brodiaea (*Brodiaea filifolia*) was not observed on the Preserve, but has a high potential to occur on site. Table 2 presents the sensitive plant species identified on the Preserve. Sensitive plant species locations are also presented in Figure 3.

**Table 2
Sensitive Plant Species**

Common Name	Scientific Name	Status
California Adolphia	<i>Adolphia californica</i>	CNPS List 2, San Diego County Group B
Del Mar Manzanita	<i>Arctostaphylos glandulosa</i> ssp. <i>glandulosa</i>	Federally Endangered, CNPS List 1B, MSCP Covered Species, San Diego County Group A

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Table 2 (Continued)

Common Name	Scientific Name	Status
Graceful Tarplant	<i>Holocarpha virgata</i> ssp. <i>elongata</i>	CNPS List 4, San Diego County Group D
Nuttall's Scrub Oak	<i>Quercus dumosa</i>	CNPS List 1B, San Diego County Group A
Palmer's Grappling Hook	<i>Harpagonella palmeri</i>	CNPS List 2, San Diego County Group B
Robinson's Pepper Grass	<i>Lepidium virginicum</i> spp. <i>robinsonii</i>	CNPS List 1B, San Diego County Group A
San Diego Barrel Cactus	<i>Ferocactus viridescens</i>	CNPS List 2, MSCP Covered Species, San Diego County Group B
San Diego Marsh Elder	<i>Iva hayesiana</i>	CNPS List 2, San Diego County Group B
Small Flowered Morning Glory	<i>Convolvulus simulans</i>	CNPS List 4, San Diego County Group D
Southwestern Spiny Rush	<i>Juncus acutus</i> ssp. <i>leopoldii</i>	CNPS List 4, San Diego County Group 4
Summer Holly	<i>Comarostaphylos diversifolia</i>	CNPS List 1B, San Diego County Group A
Variiegated Dudleya	<i>Dudleya variegata</i>	CNPS List 1B, MSCP Covered Species, San Diego County Group A
Western Dichondra	<i>Dichondra occidentalis</i>	CNPS List 4, San Diego County Group D

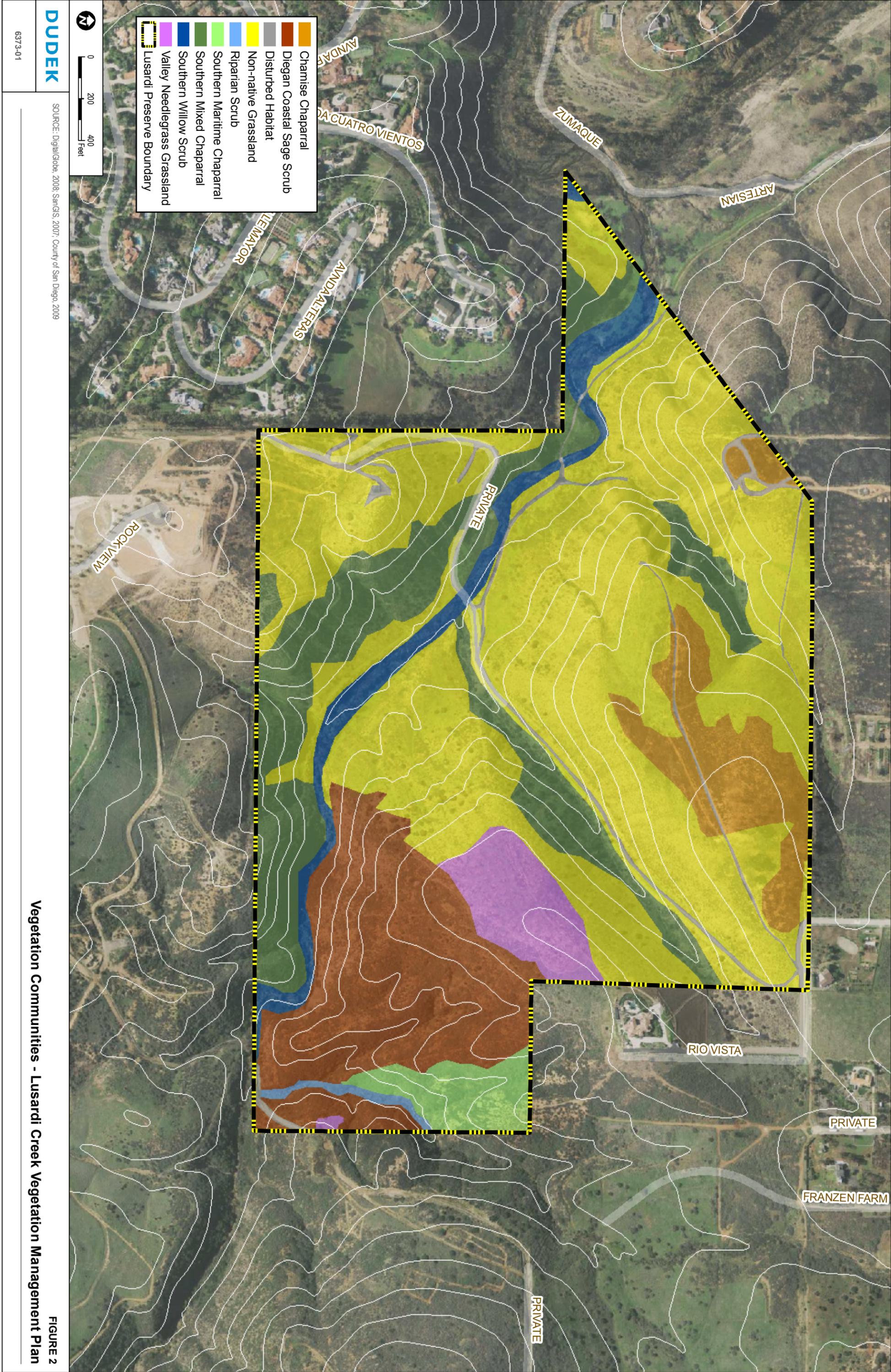
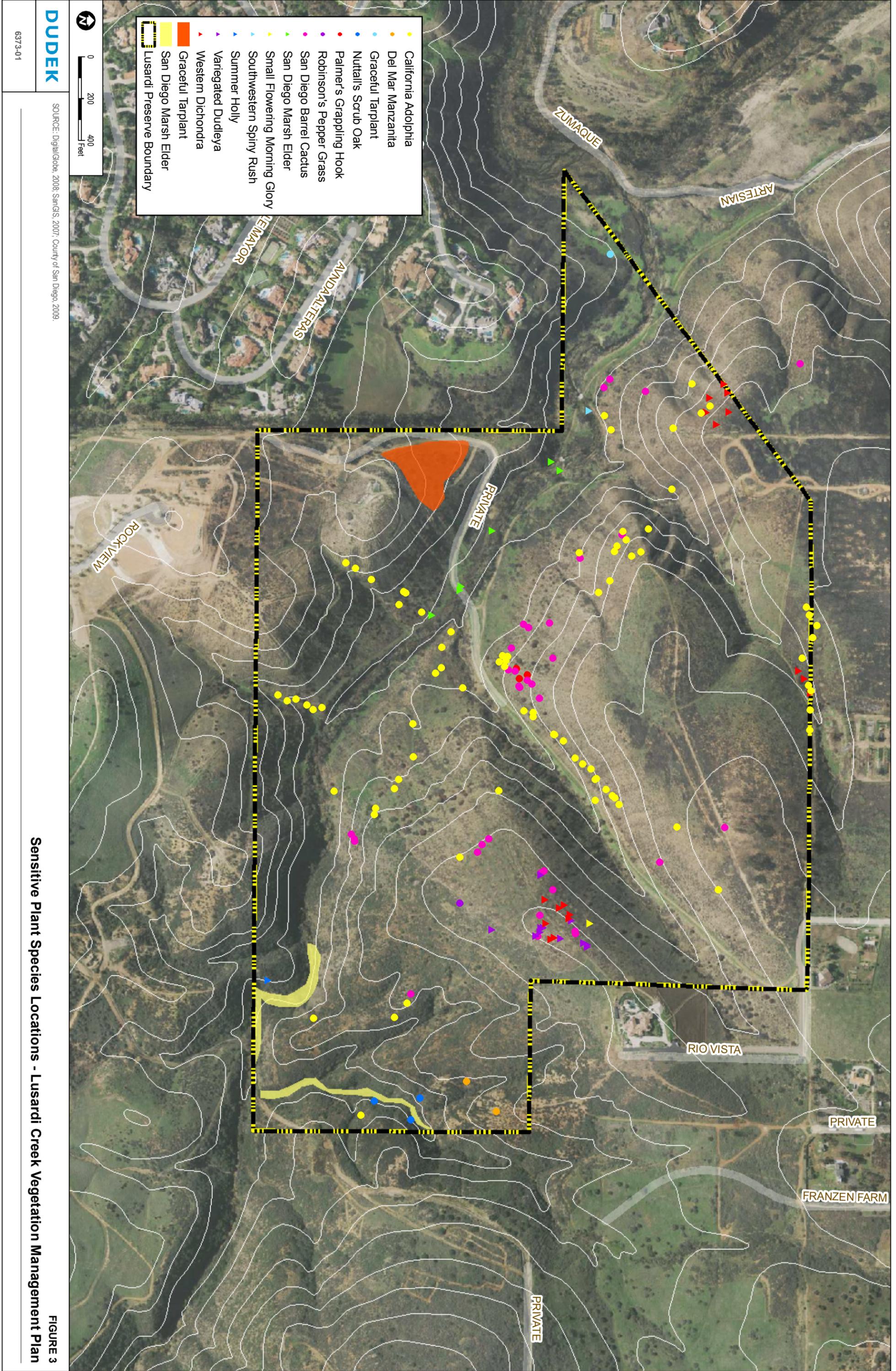


FIGURE 2
Vegetation Communities - Lusardi Creek Vegetation Management Plan

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2.1.3 Sensitive Animal Species

Overall, nineteen special-status wildlife were observed or detected on site during surveys (ICF Jones & Stokes 2008a). Included are five reptile species, six bird species, and eight mammal species. Table 3 presents the sensitive animal species observed on the Preserve. Sensitive animal species locations are also presented in Figure 4.

Table 3
Sensitive Animal Species

Common Name	Scientific Name	Type	Status
Barn Owl	<i>Tyto alba</i>	Bird	2
Coastal California Gnatcatcher	<i>Polioptila californica californica</i>	Bird	1, 3, 5, 6
Cooper's Hawk	<i>Accipiter cooperii</i>	Bird	3, 5
Northern Harrier	<i>Circus cyaneus</i>	Bird	1, 3, 5
Southern California Rufous-crowned Sparrow	<i>Aimophila ruficeps canescens</i>	Bird	3, 5
White-tailed Kite	<i>Elanus leucurus</i>	Bird	4, 5
Dulzura Pocket Mouse	<i>Chaetodipus californicus femoralis</i>	Mammal	1, 2
Long-eared Myotis	<i>Myotis evotis</i>	Mammal	2
Pocketed Free-tailed Bat	<i>Nyctinomops femorosaccus</i>	Mammal	1, 2
San Diego Desert Woodrat	<i>Neotoma lepida intermedia</i>	Mammal	1, 2
Small-footed Myotis	<i>Myotis ciliolabrum</i>	Mammal	2
Southern Mule Deer	<i>Odocoileus hemionus fuliginata</i>	Mammal	2, 3
Western Red Bat	<i>Lasiurus blossevillii</i>	Mammal	1, 2
Yuma Myotis	<i>Myotis yumanensis</i>	Mammal	2
Coastal Western Whiptail	<i>Aspidoscelis tigris stejnegeri</i>	Reptile	2
Coronado Skink	<i>Eumeces skiltonianus interparietalis</i>	Reptile	1, 2
Orange-throated Whiptail	<i>Aspidoscelis hyperythra</i>	Reptile	1, 2, 3
Red Diamond Rattlesnake	<i>Crotalus ruber ruber</i>	Reptile	1, 2
Coast Horned Lizard	<i>Phrynosoma coronatum (blainvillii population)</i>	Reptile	1, 2, 3

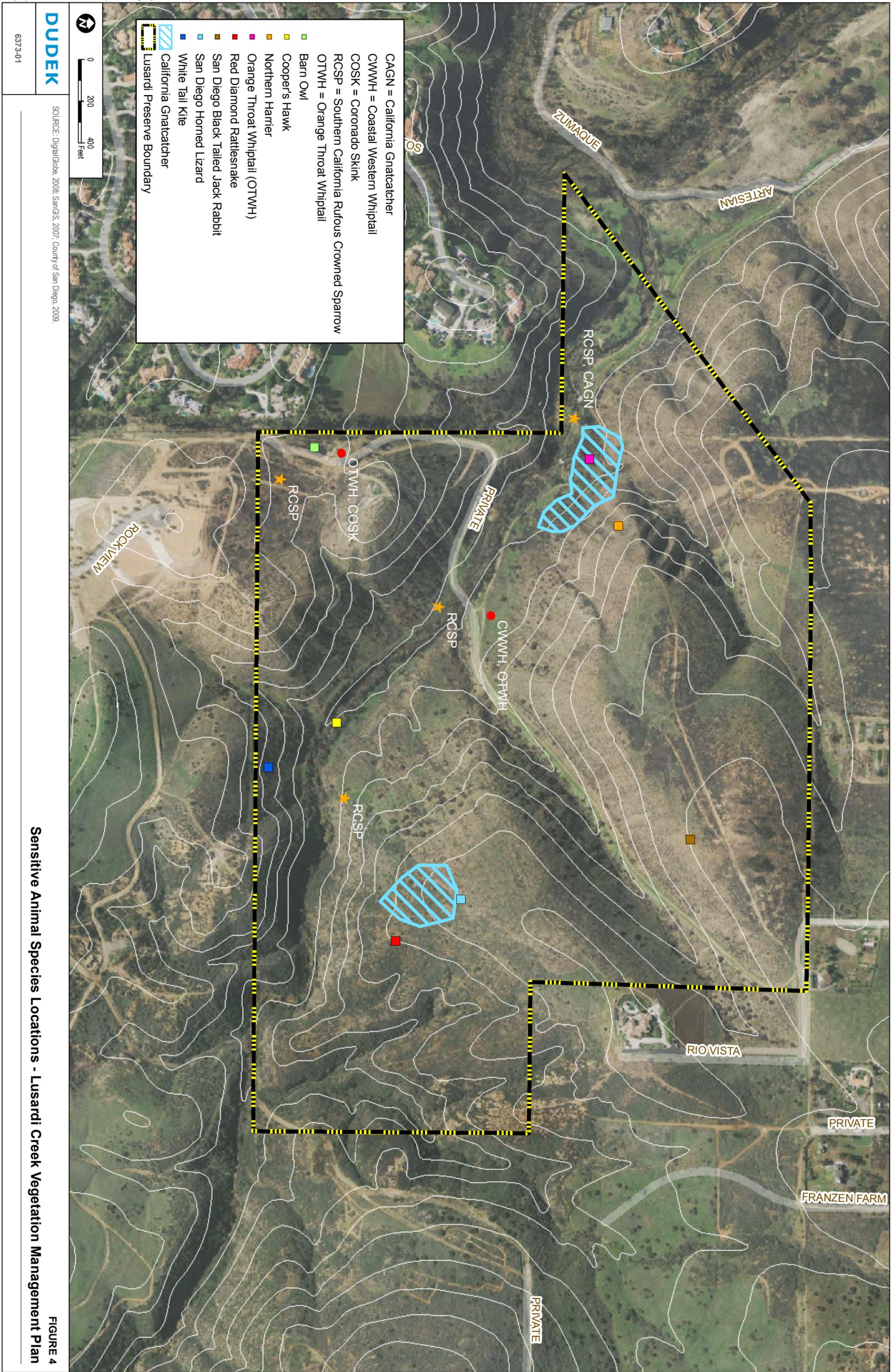
1. State Species of Special Concern
2. San Diego County Group 2
3. MSCP Covered Species
4. State Fully Protected Species
5. San Diego County Group 1
6. Federally Threatened

A number of special status reptile species were observed at the Preserve during herpetological surveys: coastal western whiptail (*Aspidoscelis tigris stejnegeri*), orange-throated whiptail (*Aspidoscelis hyperythra*), Coronado skink (*Eumeces skiltonianus interparietalis*), red diamond rattlesnake (*Crotalus ruber ruber*), and coast horned lizard (*Phrynosoma coronatum (blainvillii population)*)).

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A number of special status bird species have been recorded on the Preserve: Southern California rufous-crowned sparrow (*Aimophila ruficeps canescens*), northern harrier (*Circus cyaneus*), barn owl (*Tyto alba*), white-tailed kite (*Elanus leucurus*), and Cooper's hawk (*Accipiter cooperii*). Many of these are grassland species that will take advantage of the recovering habitat for foraging.

Special status mammal species that have been documented on the site and that may be affected by fires include the Dulzura pocket mouse (*Chaetodipus californicus femoralis*), San Diego desert woodrat (*Neotoma lepida intermedia*), and mule deer (*Odocoileus hemionus*). Of these species, the pocket mouse and woodrat are most at risk of both direct and indirect impact of fire.



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2.2 Cultural Resources

Nineteen cultural resources have been recorded within the Preserve according to the Preserve’s Cultural Resources Phase I Survey and Inventory (ICF Jones & Stokes 2008b). Results of the Phase I inventory indicate that nine cultural resource sites, one historic and eight prehistoric, have been previously recorded within or are contiguous to the Preserve (Table 4). Three other prehistoric sites have been previously recorded proximate to the Preserve, and seven previously recorded prehistoric isolates were observed within the Preserve. The resource types on the Preserve range from prehistoric milling stations, quarries, lithic scatters, rock alignments, historic trash scatters, and a former residential building location with associated vegetation and trash scatter (ICF Jones and Stokes 2008b). Site locations are depicted in the confidential appendix.

**Table 4
Lusardi Creek Preserve Sensitive Cultural Sites**

Trinomial or Primary or Temp Site#	Description
CA-SDI-9817	Prehistoric site – lithic scatter/quarry/campsite
CA-SDI-13,040	Prehistoric milling site – one milling feature
CA-SDI-13,041	Prehistoric milling site – one milling feature
CA-SDI-13,042H	Former residence location – trash scatter/trees
CA-SDI-13,043	Prehistoric site – lithic scatter (adjacent property)
CA-SDI-13,045	Prehistoric site – quarried boulder (adjacent property)
CA-SDI-13,046	Prehistoric site – Milling feature (adjacent property)
CA-SDI-13,047	Prehistoric site – quarried boulder
CA-SDI-13,048	Prehistoric site – Milling feature/stacked rocks
CA-SDI-13,049	Prehistoric site – “cottonwood point”, a “quartz lithic” and single “donax shell”
CA-SDI-13,058	Prehistoric site – lithic scatter/fragments of two metates
CA-SDI-13,059	Prehistoric site – lithic scatter
CA-SDI-19,239	Prehistoric milling site – one milling feature
CA-SDI-19,238	Historic Trash Scatter

3.0 **INVASIVE SPECIES MANAGEMENT**

Protecting native plant species and the habitats in which they occur is one objective of the Preserve. Many non-native plants have been introduced to the Preserve through either escape from adjacent landscapes or opportunistically from bird-dropped seed or other natural seed dispersal methods. Some non-native plants exhibit an aggressive growth habit and can out-compete and displace native species. Specifically, giant reed, pampas grass, sweet fennel, tamarisk, Mexican fan palm, Peruvian pepper tree, eucalyptus, and artichoke thistle are found

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within the northeastern and central areas of the Preserve. Artichoke thistle is currently prevalent throughout the Preserve and may hinder Diegan coastal sage scrub recovery from past wildfires if not properly controlled. Additionally, giant reed is prevalent in riparian areas of the Preserve. These invasive non-native plants can have significant impacts on insect-native plant associations, ecosystem processes and biodiversity, as discussed in the next section.

3.1 Target Invasive Species

Based on the baseline inventory conducted in 2008 (ICF Jones & Stokes 2008a), ten invasive plant species were observed within the Preserve, as identified in the California Invasive Plant Council (Cal-IPC) Inventory (Cal-IPC 2006) (Figure 5). These species and associated management/control recommendations are presented below along with a removal priority rating. High priority recommends removal/control as soon as possible; Moderate priority recommends removal/control as soon as high priority species are under control; and Low priority recommends removal/control when high and moderate priority species are under control.

- **Artichoke thistle (*Cynara cardunculus*):** An infestation of artichoke thistle is present throughout the site. Artichoke thistle is considered a moderate priority for removal. The reproductive biology and other attributes of artichoke thistle are conducive to moderate to high rates of dispersal, although establishment is generally dependent upon ecological disturbance. This species is ranked as a ‘moderate’ alert species with the Cal-IPC (2007). Treatment and control of artichoke thistle involves cutting and removing the aboveground material and treating the stump with herbicides. This method works well where foliar applications may damage surrounding vegetation or where remote populations limit equipment access.
- **Castor bean (*Ricinus communis*):** Located within the chamise chaparral habitat on site. Castor bean is ranked as a ‘limited’ alert species with the Cal-IPC (2007). This species is ranked as a moderate for removal on the Preserve due to its aggressive growth that can form dense monocultures, displacing native vegetation in the process. Treatment and control involves either manual pulling of the plants by hand, foliar spray with herbicide, or cutting and removing the aboveground material and treating the stump with herbicides.



FIGURE 5 Target Invasive Non-native Plant Species Locations - Lusardi Creek Vegetation Management Plan

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- **Canary Island date palm (*Phoenix canariensis*):** Located in the southern willow scrub habitat within the Preserve and ranked as a ‘limited’ alert species with the Cal-IPC (2007). Removal of date palms is rated as a low priority on the Preserve. This species is also of concern for fire hazard as its physical characteristics (frond size) can propagate spot fires during windy conditions. Control of date palms will include a combination of both mechanical and herbicidal means. A large wedge may be cut from the trunk of the trees and the appropriate systemic herbicide may be applied. Caution should be taken when this treatment occurs, as trees may fall and cause damage if they are left standing.
- **Eucalyptus trees (*Eucalyptus* spp.):** Located in an upland location in the northeastern portion of the Preserve, this burned stand of eucalyptus covers approximately 1.7 acres. Eucalyptus is ranked as a ‘limited’ alert species with the Cal-IPC (2007) and is ranked as a low priority for removal on the Preserve. This species is also of concern for fire hazard as 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. Eucalyptus trees on site present a lower risk of reducing habitat quality than tamarisk, but should still be considered a removal priority. As such the best treatment for eucalyptus removal is through mechanical and herbicidal treatments. Eucalyptus trees may be cut and sprayed with the appropriate herbicide, or trees may be removed with the use of girdling and herbicidal treatment. Trees can be girdled past the xylem/phloem and treated with an appropriate herbicide. Follow up herbicidal treatment may be necessary as sucker growth may occur.
- **California fan palm (*Washingtonia filifera*):** Located along Lusardi Creek in the southwest portion of the Preserve and occurs as two individuals. Fan palm is considered to have a low potential to be invasive and therefore, is rated as a low priority for removal on the Preserve. This species is also of concern for fire hazard as its physical characteristics (frond size) can propagate spot fires during windy conditions. Control of fan palm will include a combination of both mechanical and herbicidal means. A large wedge may be cut from the trunk of the trees and the appropriate systemic herbicide may be applied. Caution should be taken when this treatment occurs, as trees may fall and cause damage if they are killed and left standing.
- **Fountain grass (*Pennisetum setaceum*):** Fountain grass was observed in a limited extent within the southern willow scrub habitat within the Preserve and ranked as a ‘Moderate’ alert species with the Cal-IPC (2007). It is ranked as a high priority for removal on the Preserve due to its reputation as a highly aggressive, fire adapted colonizer that will outcompete native plants. It can increase the fuel load and result in faster, hotter wildfire spread. The plant spreads via wind-dispersed seeds that may also be spread via water, vehicles, and animals. Treatment and removal involves either hand digging or

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pulling/wincing plants out of the ground. Inflorescences should also be treated carefully to prevent seed spread. Additional treatment with herbicide is likely necessary to adequately control this species.

- **Giant reed (*Arundo donax*):** Located in the southern willow scrub habitat within the Preserve. Giant reed is ranked as a ‘high’ alert species with the Cal-IPC (2007). On the Preserve, this species is ranked as a high priority for removal due to its aggressive spread and concern for fire hazard as it is extremely flammable, dries rapidly, and has the ability to transfer ground fires into neighboring tree canopies. Treatment of giant reed involves removing the plant by cutting it off aboveground and performing management of re-growth by additional manual cutting and herbicide application.
- **Pampas grass (*Cortaderia* spp.):** Located in the southern willow scrub habitat within the Preserve and ranked as a ‘high’ alert species with the Cal-IPC (2007). This species is an aggressive spreading plant that increases the potential for fire ignition and/or spread and is therefore ranked as a high priority for removal. Treatment and removal involves either hand digging or pulling/wincing plants out of the ground. Plumes should also be treated carefully to prevent seed spread.
- **Sweet Fennel (*Foeniculum vulgare*):** Sweet fennel is listed as having a severe ecological impact on physical processes, plant and animal communities and vegetation structure (Cal-IPC 2007). This species is ranked as a moderate priority for removal on the Preserve. Fennel was noted along the upland portion, above the banks of Lusardi Creek. This location could result in significant spread during rain events and from wildlife movement. Effective treatment includes an integrated pest management system that includes manual removal and/or herbicide (glyphosate) application.
- **Tamarisk (*Tamarix ramosissima*):** Located in the southern willow scrub habitat within the Preserve and ranked as a ‘high’ alert species with the Cal-IPC (2007). Tamarisk presents the greatest risk of reducing habitat quality within the riparian areas and therefore is ranked as a high priority for removal on the Preserve. Although some riparian birds will use tamarisk for foraging, in general, sensitive riparian birds do not include tamarisk as a preferred habitat component. This species would be a priority for removal. Because tamarisk is a sizable plant, it can be well controlled by mechanical methods. Limited chemical methods may be required after the initial mechanical removal. Removed invasive plants should be properly disposed of to off-site facilities. The area where tamarisk would be removed from is potentially appropriate for replanting with other riparian plant species.

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3.2 Removal Methods

3.2.1 Herbicides

The application of herbicide to control target invasive species on the Preserve will be limited to secondary treatments following manual or mechanical removal for the purposes of controlling sprout growth and regeneration. Herbicide application is recommended following removal of all target invasive tree species. Herbicide use should be limited to localized applications rather than foliar applications to eliminate the possibility for drift and impacts to neighboring desirable species. There are a wide range of available herbicides 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.

3.2.2 Manual Removal

Manual vegetation removal is a low impact method of controlling target invasive species, non-native grasses, and forbs within a focused area of native plant species. Manual vegetation removal may occur for all invasive species observed on the Preserve, depending on the timing of the removal. Young plants of all types should be removed manually when observed. More mature plants will limit the ability for manual removal based on their size and root mass. Semi-mature and some mature sweet fennel and artichoke thistle may be manually removed. Manual removal should be incorporated where herbicide application is ineffective or sensitive plant species proximity prevents safe application (e.g., drifting of herbicides). Further, in accordance with Implementation Measure B.2.1 of the Resource Management Plan for the Preserve (County of San Diego 2009b), it is anticipated that DPR park rangers will routinely pull weeds or remove any non-native plant species in early stages of growth when found along trails and they will coordinate with volunteer groups to do non-native plant species removal at locations identified during invasive plant surveys and monitoring. Removed grasses and forbs should be removed from the Preserve for disposal.

3.2.3 Mechanical Removal

Mechanical removal will be necessary for control of some target invasive species, such as eucalyptus, fan palms, pampas grass, and tamarisk and can be combined with herbicide application. Cutting and removal of the aboveground plant material will be conducted via the use of chainsaws and/or hand saws and the resulting material chipped and hauled off site. Subsequent application of herbicides shall 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 on site.

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3.2.4 Cut and Daub

Cut and daub treatment is recommended for giant reed and castor bean removal, eucalyptus, and other larger invasive plants to control re-growth in subsequent years. Cut and daub involves the cutting of invasive plant stalks and then the direct application of herbicide (such as glyphosate) directly to the freshly cut stump. Other related methods include drill and fill where holes are drilled into the trunk and herbicide is injected; or the glove method, where a herbicide soaked glove is used to apply directly to plant foliage or freshly cut stumps.

4.0 HABITAT RESTORATION

The Preserve is generally composed of high quality habitat and even the non-native grassland areas serve important functions for foraging for raptors. However, due to the recent wildfires, some of the Diegan coastal sage scrub and chaparral habitat areas appear to be recovering slowly. This may especially be due to the recent low rainfall years prior to winter 2009/2010. Depending on precipitation over the next few growing seasons, there is a possibility for type conversion for some areas where exotics, especially artichoke thistle, are aggressively establishing. These areas will require continued monitoring to gauge the necessity of intervention. Ideally, in the event rainfall levels continue to increase (building on 2010's increased levels) the Preserve's recovery will improve.

The goal of habitat restoration is to reestablish or enhance the biological functions and values of habitat that has been degraded from either human or natural causes. Restoration methods range from active revegetation, which re-creates habitat, to passive management. For preserve lands, restoration is typically not required, however in some cases, if resources are available, active restoration may assist the recovery of an area that has been disturbed and is showing difficulty in recovering. The need for restoration activities will be determined based on the results of habitat monitoring and trail maintenance activities. Any proposed restoration activity should utilize current, accepted techniques and avoid/minimize impacts to sensitive species or native habitats. Any proposed revegetation activities should use only local native species. Based on the Resource Management Plan for the Preserve (County of San Diego 2009b), no active restoration is currently necessary on the Preserve. Passive restoration (recovery from fire) is ongoing.

4.1 Proposed Restoration Areas

Restoration opportunities for the Preserve include restoration of areas that would provide habitat for sensitive species that inhabit the Preserve, such as Diegan coastal sage scrub (benefiting coastal California gnatcatcher), as well as restoring disturbed habitats if they appear to decline further based on the monitoring studies conducted in accordance with the Resource Management

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Plan for the Preserve. No potential active restoration sites are designated at this time and no imminent restoration projects are identified. Future monitoring will focus on the need for restoration activities. Should a wildfire or other disturbance occur within the Preserve, the need for restoration will be re-evaluated and restoration areas prioritized, as necessary.

4.2 Restoration Methods

Currently, no active restoration efforts are necessary for the Preserve (County of San Diego 2009b). Recent wildfires on site have altered habitat structure, which will be monitored.

5.0 FIRE MANAGEMENT

5.1 Current Fire Management Practices

Currently, fire management practices on the Preserve include a 30-foot-wide fuel modification zone in the southwest corner of the Preserve adjacent to an existing off-site private residence which provides a total of 100 feet of fuel modification for the neighboring structure. The existing dirt roads on the Preserve are not adequate for fire apparatus access due to their narrow width and lack of roadside vegetation management. 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.

5.2 Fire Environment

Fire environments are dynamic systems and include many types of environmental factors. Fires can occur in any environment where conditions are conducive to ignition and fire movement. Natural open space areas, like the Preserve, are typically comprised of conditions favorable to wildfire spread. 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 understand the potential for fire within and around the Preserve.

Wildland fires are a common natural hazard in southern California. Open space areas, like that found on the Preserve include large tracts of contiguous grass, shrub, and/or riparian scrub dominated plant communities. Wildfire in these areas is strongly influenced by regional climate and local topographic conditions and ultimately affects the structure and function of these various vegetation communities (Keeley and Keeley 1984). Large wildfires have had, and will continue to have a substantial and recurring role in native California landscapes (Keeley and

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Fotheringham 2003), in part because (1) native landscapes, from forest to grasslands, 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 wildland-urban (WUI) areas. Human influences account for most of the burned acreage in southern California (Keeley and Keeley 1984).

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. In response to the fuel accumulation, creating vegetation mosaics through prescribed burning or other fuel modification efforts has been thought to reduce the spread of wildfires (Minnich and Dezzani 1998). However, large fires, such as the 2003 and 2007 wildfires in San Diego County, appeared to only be minimally constrained by mosaics of varying fuel loads (Moritz et al. 2004), especially during extreme fire weather inherent to the region. The apparent combined affects of suppression policies, climate change and prolonged drought, have resulted in a situation where human intervention will likely be necessary, as feasible, to mitigate risk from wildfires and minimize ecological impacts. 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.

Reptile species may be affected by fire as a result of direct mortality if they cannot outrun the fire or by loss of habitat; however, since they are fossorial for at least portions of their life-cycle, they may be affected less by the temporal loss of vegetative cover than other wildlife species.

Although most bird species may leave an area that has recently burned, some birds are opportunistic and take advantage of resources that become available after a fire such as woodpeckers using newly made cavities in burned snags. Other bird populations are generally known to decline as an immediate response to wildfires as a result of movement to unburned patches and also from direct fatalities as result of overexposure to the fire. During the 1996 Elfin Forest fire, Dudek biologists noted several birds that were observed killed directly.

The degree to which mammals are successful at surviving wildfire depends both on their mobility and the uniformity, severity, size, and duration of the fire and the size of the animal. Small mammals usually attempt to escape wildfire by using subterranean shelters similar to reptiles. Small rodents that construct surface dwellings, such as woodrats, are particularly vulnerable and will lose their home, shelter, and forage in a fire. More mobile, large mammals such as carnivores and ungulates may be able to outrun most fires but then must find refuge in unburned patches or along the periphery of the fire. Large mammal death is generally rare, but

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possible when fronts are fast moving, wide, and actively crowning with thick ground smoke as was noted in the Elfin Forest fire that occurred in 1996 (Dudek pers. comm.).

5.2.1 Climate

As with most of southern California, the Preserve area is influenced to a certain extent by the Pacific Ocean and is frequently under the influence of a seasonal, migratory subtropical high pressure cell known as the Pacific High. Wetter 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.

In order to evaluate specific weather variables for the Preserve, data from the Camp Pendleton (CMP) Target Range (Roblar) Remote Automated Weather Station (RAWS) was analyzed. As of the date of this report, no RAWS are located on the Preserve property. The CMP Target Range RAWS is located approximately 27 miles to the northwest of the Preserve and is located in a similar inland position as the Preserve. While the San Pasqual RAWS is located closer to the Preserve, data is only available starting in October 2009. The following summarizes the location and available data ranges for the CMP Target Range RAWS:

- CMP Target Range RAWS
 - Latitude: 33.372222
 - Longitude: -117.358889
 - Elevation: 917 feet
 - Data years: 1992 to 1995, 1997 to 2009.

The inland location of the Preserve affects the degree of influence of the Pacific Ocean, resulting in less regulated temperatures. The average high temperature for this area is approximately 83.4° Fahrenheit (F), with higher temperatures in summer and early fall (July through October) reaching up a recorded record of 112°F at the nearby CMP Target Range RAWS on July 23, 2006, although this extreme temperature is rarely approached. The mean precipitation for the area is 10.5 inches per year, with the majority of rainfall concentrated in the months of December (0.99 inch), January (1.87 inches), February (3.85 inches), and March (1.84 inches).

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

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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.

In southern California the fire season 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.

Utilizing the FireFamily Plus v. 4.0.2 (FireFamily Plus 2007) software package, data from the Target Range RAWS was processed and analyzed to determine general weather conditions for the region, presented in Table 5. In addition, RAWS data was analyzed to determine extreme fire weather conditions, specifically, 97th percentile wind and fuel moisture conditions to be 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 B.

**Table 5
Weather Conditions for the Preserve**

Season	Wind Speed (mph)		Air Temp. (°F)			Relative Humidity (%)			Avg. Monthly Precipitation (in.)
	Avg.	Max.	Avg.	Max.	Min.	Avg.	Max.	Min.	
Summer (6/21–9/21)	9.9	24.0	72	112*	51	59	100	4	0.02
Fall (9/22–12/20)	9.0	27.0	69	104	32	49	100	1	0.43
Winter (12/21–3/19)	8.4	32.0	59	106	16**	52	100	2	2.86
Spring (3/20–6/20)	11.0	30.0	62	91	46	67	100	4	0.48

* The high temperature of 112 degrees occurred on July 23, 2006.

** The low temperature of 16 degrees occurred on January 13, 2007.

5.2.2 Topography

The topography of the Preserve is influenced primarily by the Lusardi Creek Valley running through the southern portion of the Preserve and the larger San Dieguito River Valley immediately adjacent to the west of the Preserve. Upland areas in the northern portion of the Preserve are bisected by small tributary drainages to Lusardi Creek that have created several narrow, steep canyons or ravines. A north-facing slope characterizes the southern portion of the Preserve, which is also bisected by several small gullies and drainages. On site elevation ranges from approximately 390 feet AMSL at the north-central edge of the Preserve to a minimum of approximately 60 feet AMSL in the west-

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central edge of the Preserve along the bottom of Lusardi Creek near the confluence with the San Dieguito River. North and south-facing slopes characterize the Preserve, rising upward from Lusardi Creek with slope gradients reaching up to 85%. Site topography is graphically presented in Figure 6.

5.2.3 Watershed Description

Lusardi Creek is the primary drainage feature within the Preserve and flows from east to west toward the San Dieguito River. Lusardi Creek is situated primarily along the eastern and southern boundaries of the Preserve, but flows north-westerly and exits the Preserve approximately mid-way along the Preserve's western boundary. The northern portion of the Preserve drains southward toward Lusardi Creek via small sub-drainages, gullies, and draws. The southern portion drains northward toward Lusardi Creek, also via small sub-drainages, gullies, and draws. The San Dieguito River receives flows from Lusardi Creek at their confluence, located approximately 600 feet west of the Preserve boundary.

The San Dieguito River flows southwest, ultimately draining into the Pacific Ocean approximately 6.5 miles from its confluence with Lusardi Creek. Prior to reaching the ocean, the San Dieguito River is dammed, resulting in a small reservoir immediately east of its intersection with Via de Santa Fe Road. Designated beneficial uses for the San Dieguito River include potential agricultural and industrial supply; contact and non-contact water recreation; warm and cold freshwater habitat; wildlife habitat; and spawning, reproduction, and/or early development uses (California Regional Water Quality Control Board 1994).

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 condition associated with the Preserve combine to create a unique situation capable of supporting large-scale, high-intensity wildfires. The history of wildfires on the Preserve is graphically portrayed in Figure 7.

Based on historical fire perimeter data (FRAP 2010)¹, the entire Preserve has burned at least once during the recorded data period, with nearly one third of the site having burned three times between 1943 and 2007. Table 6 presents the quantity of times the Preserve has burned, by land area (acreage).

¹ Based on polygon GIS data from Cal Fire's Fire and Resource Assessment Program (FRAP), which includes data from Cal Fire, USDA Forest Service Region 5, BLM, NPS, 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 2008.

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**Table 6
Quantity of Times Preserve has Burned**

Quantity of Times Burned*	Acreage	Percentage
2	117.98	60.6
3	76.57	39.4
Total	194.55	100.0

*FRAP 2010

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 to be 32 years with intervals ranging between 28 and 36 years. Based on this analysis, it is expected that the Lusardi Creek property would be subject to wildfire occurrence every 32 years, with the realistic possibility of shorter interval occurrences. Table 7 presents the fire interval data for the Preserve.

**Table 7
Fire Intervals for the Preserve**

Fire Year*	Fire Name	Interval (years)	Acreage Burned on Preserve	Percent of Preserve Burned**
1943	Un-named Fire	N/A	194.55	100.0
1979	Un-named Fire	36	119.15	61.2
2007	Witch Fire	28	151.98	78.1

*FRAP 2010

**Based on total Preserve acreage of 194.55

Finally, fire history is a useful data set from which to determine vegetation age classes for the Preserve. Based on an analysis of the fire history, over 78% of the Preserve burned during the 2007 Witch Fire. The remainder of the Preserve (nearly 22%) burned most recently in 1979. Accordingly, vegetation age on site is either 2 years old (151.98 acres (78.1%)), resulting from the 2007 Witch Fire, or 30 years old (42.57 acres (21.9%)), resulting from an un-named fire in 1979. Based on these ages, the majority of the vegetation is considered young and less susceptible to fire than the older vegetation on the Preserve; however, all vegetation is capable of igniting and carrying fire, especially during extreme weather (Red Flag Warning Conditions).

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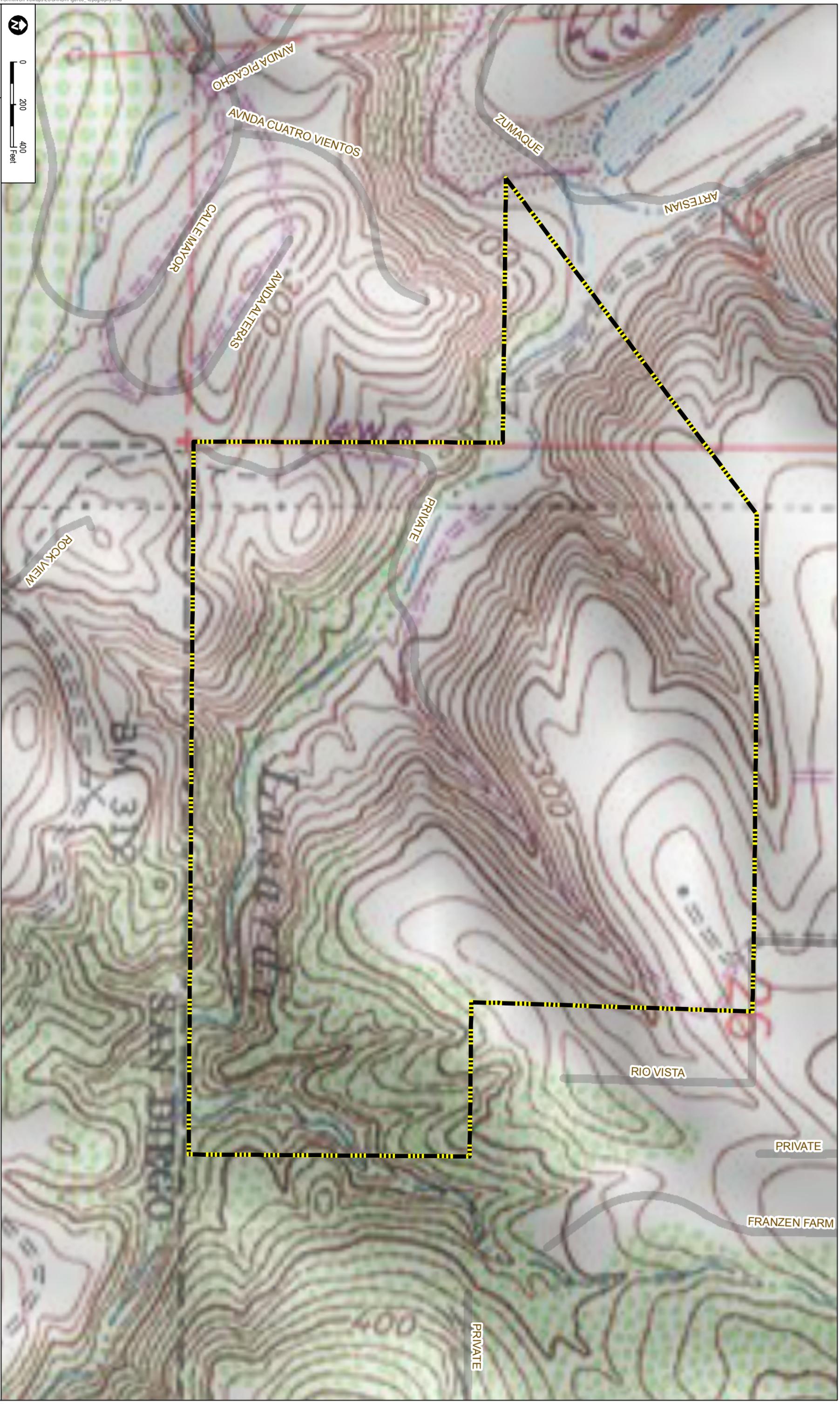


0 200 400 Feet



SOURCE: DigitalGlobe, 2008; SanGIS, 2007; USGS Digital Raster Graphic - Rancho Santa Fe Quadrangle

FIGURE 6
Preserve Topographic Map - Lusardi Creek Vegetation Management Plan



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Final Lusardi Creek Preserve Vegetation Management Plan

5.2.5 Vegetation Dynamics and Fuel Loads

Vegetation mapping was conducted in 2008 (ICF Jones & Stokes 2008a) and resulted in the mapping of a total of nine vegetation communities and land covers on the Preserve (Table 1). Vegetation distribution throughout the Preserve varies by location and topography. Riparian trees and scrub are concentrated along Lusardi Creek, while upland areas typically support shrub cover (either Diegan coastal sage scrub or chaparral) or non-native grass cover. The dominant land cover for the Preserve is grassland (54%), with significant areas covered by southern mixed chaparral (16%) and Diegan coastal sage scrub (14%). Grasslands are distributed primarily in areas not burned in the 2007 Witch Fire.

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 8, 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). For example, chaparral and sage scrub species found in portions of the Preserve are considered to exhibit higher potential hazard based on such criteria, including the following species: coastal sagebrush (*Artemisia californica*), chamise (*Adenostoma fasciculatum*), California buckwheat (*Eriogonum fasciculatum*), and black sage (*Salvia mellifera*). Non-native invasive species presenting similar attributes include: mustard (*Brassica* spp.), thistle, tree tobacco (*Nicotiana* spp.), and juniper (*Juniperus* spp.). Non-native invasive plants can increase the frequency of fires by providing more continuous fuels that are more easily ignited (Brooks, et al 2004). Invasive plants also present hazards when located adjacent to neighboring structures or within fuel modification zones that are meant to provide defensible space. The importance of vegetation and species types on fire suppression efforts is their role in affecting fire behavior. For example, while fires burning in grasslands may exhibit lower flame lengths than those burning in chaparral or sage scrub, fire spread rates in grasslands are often much more rapid than those in other vegetation types.

Table 8
Vegetation Communities and Associated Fuel Models

Vegetation Community/Land Cover	Fuel Model	Acres	Percentage
Chamise Chaparral	SH7	12.05	6.2
Diegan Coastal Sage Scrub	SCAL18	27.97	14.4
Disturbed Habitat	1*	5.13	2.6
Non-native Grassland	1	98.03	50.4
Riparian Scrub	8	0.82	0.4
Southern Maritime Chaparral	SH7	4.94	2.5

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Table 8 (Continued)

Vegetation Community/Land Cover	Fuel Model	Acres	Percentage
Southern Mixed Chaparral	SH7	30.21	15.5
Southern Willow Scrub	8	8.33	4.3
Valley Needlegrass Grassland	1	7.07	3.6
Total		194.54	100.0

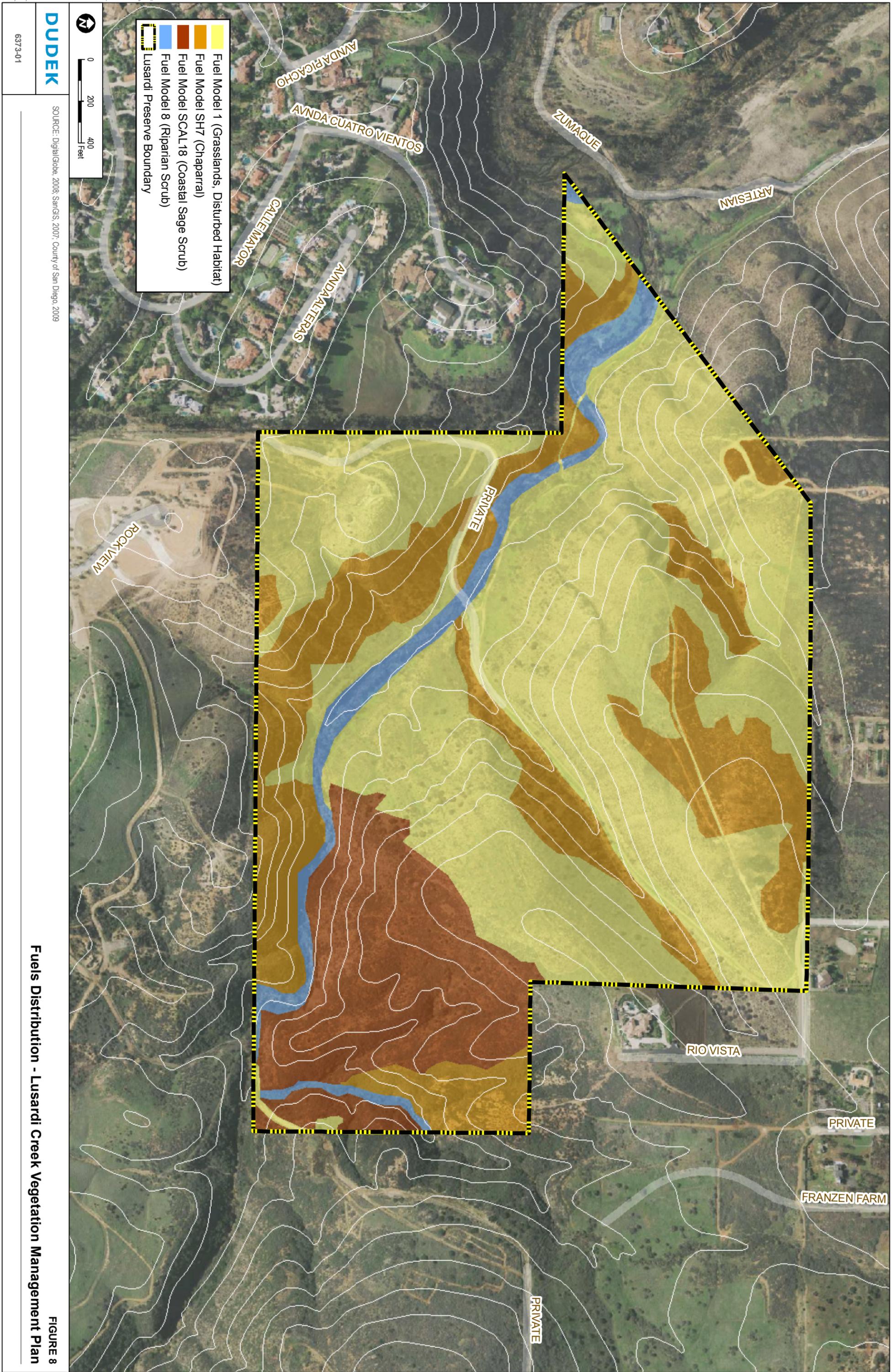
*Assumes conversion to grassland-type fuels

Vegetation Dynamics

Vegetation plays a significant role in fire behavior and is an important component of the fire behavior models discussed in this section. 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. Succession of plant communities, most notably the gradual conversion of shrublands to grasslands with high frequency fires and grasslands to shrublands with fire exclusion, is highly dependent on the fire regime.

Biomass and associated fuel loading will increase over time, assuming that disturbance or fuel treatment/reduction efforts are not realized. Depending on the success of fire exclusion activities and any prescribed burn plan ultimately designed for the Preserve, the current vegetation composition and density will tend to continue increasing volume, establishing exotic species and/or continuing degradation of shrublands and persistence of annual grasses. As mentioned, exotic species establishment is undesirable from a habitat perspective and also from a fuel continuity and increased fire frequency regime perspective.

Wildfire disturbances can also have dramatic impacts on individual plants and plant composition. Heat shock, accumulation of post-fire charite, and change in photoperiods due to removal of shrub canopies may all stimulate seed germination (Keeley and Keeley 1984). The post-fire response for most species is vegetative reproduction and stimulation of flowering and fruiting. The combustion of aboveground biomass alters seedbeds and temporarily eliminates competition for moisture, nutrients, heat, and light (Wright and Heinselman 1973). Species that can rapidly take advantage of the available resources will flourish. It is possible to alter successional pathways for varying plant communities through varying the frequency and intensity of fire. This concept is a key component for fire management efforts in the Preserve.



- Fuel Model 1 (Grasslands, Disturbed Habitat)
- Fuel Model SH7 (Chaparral)
- Fuel Model SCAL18 (Coastal Sage Scrub)
- Fuel Model 8 (Riparian Scrub)
- Lusardi Preserve Boundary



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SOURCE: DigitalGlobe, 2008; SanGIS, 2007; County of San Diego, 2009

FIGURE 8
Fuels Distribution - Lusardi Creek Vegetation Management Plan

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Grassland Fire Effects

Annual grassland is the most common vegetation type within the Preserve, encompassing 105.1 acres (including non-native grassland and valley needlegrass grassland). Annual grassland responses to fire are varied. An extensive review and analysis of the response to burning and grazing of California grasslands indicates that prescribed burning temporarily reduces exotic annual grasses but also results in increased exotic and native forbs (Rice 2005; Bainbridge and D'Antonio 2003; D'Antonio et al. 2003). These studies indicate that single prescribed burns often decrease exotic annual grasses, but they recover by the third year in the absence of additional disturbance. Grazing or follow-up burns hinder the recovery of exotic annual grasses and maintains forb cover, which would be beneficial to the Preserve.

However, annual grassland responses to fire are varied. One effect that appears to be fairly common among exotic grasses is that lower-intensity grassland fires rarely damage seeds on or near the soil surface (Daubenmire 1968). One study included a May burn (following seed dispersal) to remove annual grasses from a severely degraded coastal sage scrub site in California (Cione et al. 2002). The investigators noted that there were many exotic annual grass seeds lying on the soil surface after the controlled burn. 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). As such, the logical conclusion is that non-native grassland burns must be timed appropriately so that the seeds are consumed, resulting in decreased re-establishment of non-natives and reduced competition for annual forbs.

Diegan Coastal Sage Scrub Fire Effects

Diegan coastal sage scrub occupies 27.97 acres within the Preserve. Species within this vegetation community include: California buckwheat, California everlasting (*Gnaphalium californicum*), goldenbush (*Isocoma menziesii*), and laurel sumac (*Malosma laurina*). Generally, sage scrub communities tend to lose their leaves and go dormant creating dead, dry fuels that are readily available for burning (Carle 2008).

Following fire, typical sage scrub succession includes a predominance of annual herbs during the first year. Exotic species may dominate a landscape after wildfire due to their success in establishing quickly and outcompeting many native species. Exotics 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 re-sprouts, show low recruitment from the soil seed bank. Unlike herbaceous annuals, the overall diversity of perennial understory herbs

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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 burn areas over time. Recovering shrub cover is less likely to burn in the first 20 years during typical weather conditions, but will burn under extreme fire events (Moritz 2003). The Preserve's vegetation is predominantly young at approximately 2 years old at the time of this report, still establishing following the 2007 fire. Once established, the shrub cover will increase in volume, and, following approximately 20 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 ornamental landscaping to the Preserve.

Chaparral Fire Effects

Chaparral communities on site cover a total of 47.2 acres, with chamise chaparral covering 12.05 acres, southern mixed chaparral covering 30.21 acres, and southern maritime chaparral covering 4.94 acres. Vegetation typically ranges from 1 to 3 meters (3 to 10 feet) tall with little herbaceous understory in mature stands. Chamise chaparral often occurs on xeric slopes and ridges. This vegetation community is adapted to repeated fires and responds via stump sprouting to reestablish after such disturbance (Holland 1986). Some species commonly associated with chamise chaparral include manzanita (*Arctostaphylos* spp.), ceanothus (*Ceanothus* spp.), birchleaf mountain-mahogany (*Cercocarpus betuloides*), bush poppy (*Dendromecon rigida*), and California buckwheat (Holland 1986). Chamise chaparral is the predominant chaparral type in Ventura, Los Angeles, San Bernardino, Riverside, and San Diego Counties (Holland 1986).

Fire Behavior

Fire behavior modeling includes a high level of analysis and information detail to arrive at 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. In addition to fuels data, topographic and weather data were utilized in developing fire

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behavior models for two separate weather conditions: summer (on-shore flow) and fall (off-shore flow). Results of fire behavior modeling efforts for the Preserve are presented in Appendix B.

Predicting wildland fire behavior is not an exact science. As such, the minute-by-minute movement of a fire will probably never be predictable, especially when considering the variable state of weather and the fact that weather conditions are typically estimated from forecasts made many hours before a fire. Nevertheless, field-tested and experienced judgment in assessing the fire environment, coupled with a systematic method of calculating fire behavior, yields accurate results (Rothermel 1983).

The FlamMap (version 3.0) software package (Finney 2004) 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 fireline intensities. It is a flexible system that can be adapted to a variety of specific wildland fire planning and management needs.

FlamMap is ideally suited for real-time predictions of the behavior of wildfires. The calculations that come from FlamMap are based on the BehavePlus Fire Modeling System algorithms but result in 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, such as preserved sage scrub. 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.

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- The software assumes that weather is 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.
- 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.

5.3 Fire Hazard Evaluation

Based on site and data analysis 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 north, traveling down the San Dieguito River valley, as seen in the 2007 Witch Fire. Fires during typical on-shore wind patterns are likely to enter the site from either the adjacent WUI or from open-space areas east or west of the Preserve.
2. A WUI threat exists along the west, north, and eastern boundaries of the Preserve. Residential development is most dense along the western boundary, with lower density rural-residential development along the north and east boundaries.
3. Potential ignitions include a variety of residential related sources including structure fire, hot works, and yard machines, amongst others. Ignition sources not associated with residential development include vehicular associated ignitions (car fire, catalytic converter, tossed cigarette, etc.) along Camino del Sur to the east, San Dieguito Road to the south, and Del Dios Highway to the north. Additional non-residential 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 tall. 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

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(greater than 20 feet) and associated heat output (in excess of 5,000 British thermal units btu).

5. A fire originating in a structure within approximately a one mile range of the Preserve could result in burning embers landing within the Preserve before the ember decays to the point of being unable to ignite fuels, potentially resulting in vegetation ignition if there is a receptive fuel bed.
6. 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 roads 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 Warnings periods. Red Flag Warnings are declared by the National Weather Service. The Preserve is located in Fire Weather Zone 243, San Diego Coastal Areas. Accordingly, Red Flag Warnings are issued when humidity is 15% or lower (for at least six hours) and sustained winds are 25 mph (with gusts greater than or equal to 35 mph) (National Interagency Fire Center 2009).

5.3.1 Fire Response Plan

The RSFFPD is the primary responder to the Preserve, with assistance from Cal Fire. Both are extremely qualified and experienced for responding to vegetation fires.

The RSFFPD has prepared wildland pre-response plans with tactical worksheets for high-value assets at risk for most of their jurisdiction wildland urban interface areas, including the Preserve. The response plans are customized for fast viewing, quick hazard recognition, and actions to be taken during wildfire emergencies. Pertinent information provided in this plan will be shared with the RSFFPD to be included in their wildland pre-response plans for the Preserve.

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

- Air tankers

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- Helicopters
- Airtactical aircraft (AA)
- Various 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 engines with three personnel each
- Medium – includes three 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 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 occur during the normally declared fire season, June through October. There is some variation in the timing of the dispatch levels, based entirely on weather.

RSFFPD 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 Plan stresses the need for fire response to minimize impacts to natural resources, when possible, by using pre-planned fire suppression tactics and actions within the boundary of the Preserve. For example, drivable utility maintenance roads and trails (Appendix A) within portions of the Preserve are adequate for fire access during non-extreme weather. They are also

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useful for conducting fire operations. They may also serve as fuel breaks for non-extreme weather fires.

The need for ground-disturbing activities should be carefully considered based on the location of roads and other valuable resources. 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 engines (limited to paved roadways just outside the Preserve), type III 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 engines, fire crews, helicopters, and firing operations, according to the wildland preresponse plans that RSFFPD has prepared for its District. 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 engine access or constructing line or secondary line for preservation of high-value resources, including plant and animal species, habitats, people, or property.

5.3.2 Primary Actions and Contacts for Wildfire Emergency

The following persons/agencies should be contacted in the event of a wildfire on the Preserve.

Cal Fire
San Diego Unit
Emergency: 911
Unit Chief – El Cajon: 619.590.3100

Rancho Santa Fe Fire Protection District (RSFFPD):
Emergency: 911
Non-Emergency: 858.756.3006

5.3.3 Roads/Access/Gates

Road access on the Preserve is relatively limited due to terrain. However, the Preserve contains approximately three miles of existing dirt roads that are currently used as trails. These roads are

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used for access by the Olivenhain Municipal Water District (OMWD) and San Diego Gas & Electric (SDG&E) to access infrastructure within and immediately adjacent to the Preserve.

Existing site access includes the following points:

- Gated access on an existing dirt road within Preserve, located south of Rio Vista Road
- Gated access via an SDG&E access road in the northwestern portion of the Preserve
- Gated access on the western border of Preserve via the OMWD easement road
- Gated access at the southwestern corner of Preserve via an SDG&E access road.

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

From a fire suppression perspective, access is limited to one dirt road from Rio Vista and an SDG&E road to the south. To improve the potential for firefighting crews to enter the Preserve during wildfire, extension of the dirt road westerly to Artesian Road would enhance the ability to manage a wildfire from the north. Also, the following road improvements within the Preserve would be needed to accommodate response:

- Knox padlocks on all gates
- Increase the width of all dirt roads to be used for emergency fire access to 16 feet
- Design water bars/erosion features to be consistent with fire apparatus limitations
- Provide a minimum of 30 feet of fuel modification on both sides of roadways
- Provide for year-round creek crossing capabilities.

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.

5.3.4 Fuel Management

Successful fire management requires pre-planning and utilization of fire prevention techniques and strategies. Although the Preserve has recently burned (2007) and the need for fuels management is currently low, the vegetation will quickly recover and can carry fire in as little as a few years, as occurred in other regions where large areas that had burned in 2003 again burned in 2007. There are no current necessities for fuel reduction, though the process and methods require definition as they may be necessary over time. To that end, VMUs have been delineated on the Preserve to assist with invasive species management, restoration management, and fuel

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management planning. Figure 9 illustrates the VMU boundaries. VMU specific fuel reduction recommendations are provided in Section 6.3.

There is an existing network of roads that may be utilized as fuel breaks by fire agency personnel in fire suppression efforts. However, these roads are not wide enough to provide acceptable fire spread slowing during wind driven wildfires. No other known natural or man-made fuel breaks were identified on site.

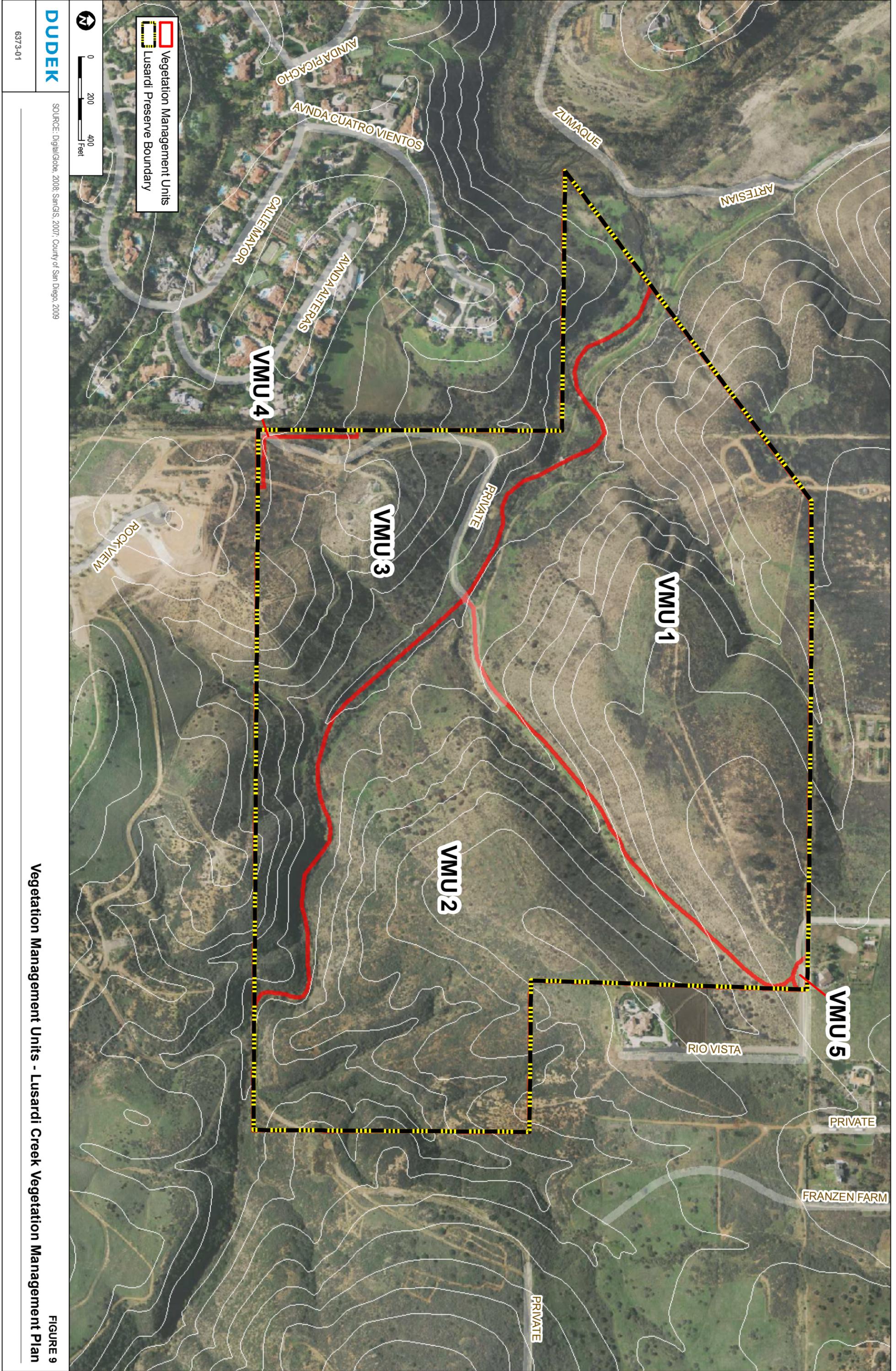
An additional fuel break is provided as a fuel modification zone in the southwest corner of the Preserve. The RSFFPD requires 100 feet of fuel modification from combustible structures. Appendix A presents all fuel modification zones that extend onto the Preserve. An additional fuel modification zone extension may be required in the northeast corner of the Preserve (Appendix A). The RSFFPD recommends field markers for the outer boundary of the fuel modification zones to identify limits of work and prevent potential excessive thinning beyond the required distance.

The following are fuel management recommendations for the Preserve:

- **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 would need to be highly managed to avoid introducing and spreading non-native species, overgrazing, or escape grazing. Currently there is no pressing need to introduce grazing. However, the method should remain in the management tool box for specific applications should the need arise.
- **Mowing:** Mowing is one of the most common and successful methods for reducing fuel loads and is compatible with Preserve management goals; it may be of limited use in rocky and rugged terrain. Mowing is a feasible option for the Preserve to meet RSFFPD requests for roadside fuel modification. Grasslands along roadways and as part of off-site structure fuel modification areas are good areas for implementation of mowing. Depending on the goal to maintain grass cover, mowing should occur annually following seed drop and should reduce grass height to 4 inches stubble.
- **Herbicides:** Chemical means to control fuels/exotic plants is an effective method, but one that has a negative connotation and that has 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 like glyphosate and other selective chemicals a feasible alternative.
- **Prescribed Fire:** Prescribed fire on this Preserve can only be implemented by the RSFFPD, CalFire, or a similar fire authority with experience and certifications to conduct

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burns. Prescribed fire can be the least expensive but overall least feasible form of fuel reduction. The advantages of prescribed fire include its compatibility with many species that require occasional fire for their persistence. The sage scrubs, chaparral, grasslands, and to a lesser extent, the riparian areas are generally adapted to occasional wildfire. When wildfire occurs at appropriate intervals, allowing the native plants to resprout and recover, these plant communities are able to regenerate with higher species diversity for the initial years following fire and over time, return to pre-fire conditions. The recovery to pre-fire conditions may possibly require 20 or more years. When burned too often, type conversion to annual grasslands often occurs, negatively impacting many wildlife species and creating a community that is prone to fire on much shorter intervals. Therefore, the benefits must be weighed against difficulties in getting burns implemented, potential for escape, air quality issues, public opposition, and propensity to result in non-native grass and weed reestablishment if implemented too frequently, as discussed in the Preserve Management Section that follows.



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SOURCE: DigitalGlobe, 2008; SanGIS, 2007; County of San Diego, 2009

FIGURE 9
Vegetation Management Units - Lusardi Creek Vegetation Management Plan

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Prescribed fire is not recommended in wildland urban interface/intermix areas due to potential hazards associated with burn operations. The 2007 Witch Fire burned most of the site and has resulted in returning the plant communities to earlier successional stages and younger fuels. However, those fuels will continue to mature and over time, will become susceptible to wildfire. Prescribed burning is one way that the habitat can be maintained in a healthy state.

Grazing, mowing, and herbicide application should be utilized as the first options for fuel reduction and prescribed fire only where appropriate, such as in conjunction with burning on neighboring open space lands or for burning slash piles after mechanical fuel reduction occurs. Prescribed fire should only be considered for areas where large expanses of hazardous fuels are available for burning, with minimal risk to public safety and property and only under optimum burn conditions. Although not likely to be implemented on the Preserve, prescribed burning should not be prohibited as a potential management tool as technological advances or new techniques may someday make it feasible to conduct prescribed burns in areas currently constrained by urbanization and valued assets.

Despite the potential complications associated with prescribed fire, it provides benefits that cannot be mimicked by grazing, mowing, or herbicide use. However, it is anticipated that wildfire will continue to occur on the Preserve due to the numerous and increasing ignition sources in the region and may fulfill some of the beneficial fire effects that are lacking from alternative management methods, unless they occur too frequently and result in type conversion.

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 for a large agency, such as Cal Fire, then it would be considered a prescribed fire. If natural fire occurs on the Preserve and the fire poses no threat to life or high-value resources, the fire may be allowed to burn if it meets fire authority 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 should 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.

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Winter burns, when weather typically allows for prescribed burns, will usually result in non-native species dominance (Keeley 2005). Avoidance of winter burns is recommended, with spring burns being the preferred period, although experimental winter burns may provide insight into the vegetative response on the Preserve. It is recommended that a trained and experienced fire ecologist be involved to help determine the optimal timing of burns to favor the growth of annual forbs and development of open, bare ground patches.

- **Thinning:** Thinning can reduce fuel continuity and loading by selective removal of dead and dying, overly dense horizontal and vertical bunches, and exotics. Most useful in the interface and intermix areas around high-value resources, such as residences. Adjacent residences would have to maintain their own defensible space off site, but on site extensions should be provided by the Preserve. 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 occur and results in dense, dead vegetation. At the time of this VMP, there are no significant thinning needs.
- **Fuel Breaks:** Fuel breaks provide areas of removed fuels that play an important role in helping contain wildfires. Roads require annual maintenance in order to be kept free of vegetation. The Preserve currently includes one primary road from which firefighting personnel can conduct operations. Improvements to these roads will be required to accommodate firefighting access, as discussed in Section 5.3.4 Based on the topography of the Preserve and the existing road network, it is not recommended that additional breaks be created.

5.3.5 Emergency Staging Areas

Due to the terrain on the Preserve, it is not anticipated that fire response staging areas will be situated on the Preserve. Staging areas, important for incident command and to organize, plan, and implement firefighting strategies, typically cause higher ground disturbance from personnel, vehicles, and equipment in confined areas. Staging areas for fires on the Preserve will likely occur off-site in the flatter areas south and east of the Preserve.

5.3.6 Fire Hydrants

No fire hydrants are located on the Preserve. Fire hydrants are located within adjacent residential development areas and on the periphery of the Preserve along existing roadways. Fire hydrants may be utilized during a fire event to refill engines, as necessary.

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5.3.7 Other Water Sources

Other water sources which may be available during a wildfire event include:

- The reservoir along the San Dieguito River, approximately two miles west of the Preserve. Engine access may be restricted, but helicopter use is likely.
- The OMWD water tank located at the end of Artesian Trail, approximately 0.5 mile east of the Preserve.

6.0 MANAGEMENT DIRECTIVES

6.1 Invasive Species Removal

The short term management directives address high priority invasive species removal while longer term management directives consider invasive species at to their risk of reducing habitat quality over time.

Management Directive Invasive 1 – High Priority Removal of Aggressive Species. Remove aggressive invasive non-native species and those with a high fire hazard within the Preserve, such as tamarisk, giant reed, and artichoke thistle as a high priority. Preserve rangers shall conduct weed (i.e., exotic species) removal as soon as possible.

Management Directive Invasive 2 – Identify and Pursue Funding for Longer Term Invasives Removals. Preserve managers to work with other agencies, organizations, and groups to seek funding and resources to conduct non-native plant removal operations

Management Directive Invasive 3 – Monitoring. Monitor other identified non-native species to determine if removal efforts are warranted to ensure maintenance and/or improvement of habitat quality.

Management Directive Invasive 4 – Educational Outreach. Prepare invasive species educational outreach program/materials to reduce use of these plants by adjacent property owners.

6.2 Restoration

The primary management directives for habitat restoration include:

Management Directive Restoration 1 – Habitat Quality and Function. Reestablishment or enhancement of the biological functions and values of habitats that have been degraded.

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1A – Short Term Restoration: The 2007 Witch fire resulted in degradation to Diegan coastal sage scrub habitat in various locations of the Preserve. There are no *focused*, active restoration efforts (site preparation, planting, maintenance) identified at this time. However, there are activities related to restoration, primarily non-native species removal, that require attention during 2010 and then on-going, perhaps on a phased approach. This type of restoration is consistent with the Invasive Species Management Directives presented in Section 6.1.

1B – Longer-term Restoration: Restoration activities will occur following landscape changing disturbances that remove, damage, degrade, or alter the desired native habitats. 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:

- Habitat establishment/creation;
- Habitat enhancement;
- Removal of invasive plants when they are young;
- Application of herbicides, pesticides and fertilizers; and
- Application of supplemental irrigation.

Restoration will also include *passive* management directives, which support natural re-establishment of a site through natural processes, such as:

Management Directive Restoration 2 – Monitoring Invasive Removal Sites. Monitor non-native species removal sites to ensure passive natural recruitment is successful;

Management Directive Restoration 3 – Monitoring Habitat Quality. Monitor the quality of Diegan coastal sage scrub and the number of gnatcatcher pairs to determine if more active restoration of Diegan coastal sage scrub is required to return the habitat to pre-fire habitat quality; and

Management Directive Restoration 4 – Monitoring 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. The

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long-term strategic fire plan for the Preserve must prioritize public safety while meeting habitat management goals. Management directives are as follows.

Management Directive Fire 1 – 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 coastal sage scrub habitat may be from 10 to 60 years or more. 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.

Management Directive Fire 2 – Fuel Modification Area Maintenance. Annually maintain fuel modification areas on the Preserve boundaries that are extensions of off-site residential structure fuel modification zones, as identified in Appendix A.

Management Directive Fire 3 – Fuel Modification Area Delineations. Install and maintain fuel modification extent markers for the two fuel modification areas identified in Appendix A to minimize additional thinning outside intended area.

Management Directive Fire 4 – Emergency Fire Access. Improve road access for fire emergencies by widening to 16 feet and providing fuel modification (30 feet each side) to roadways intended for fire access.

Management Directive Fire 5 – Access Data Sharing. Provide gate codes and locations, install signs with access road names, and provide road quality to RSFFPD and Cal Fire responders. This information will be included in their wildland pre-response plans, resulting in more efficient responses.

Management Directive Fire 6 – Illegal Access. Restrict off-highway vehicles and shooting access. These are other potential sources for fire that must be managed through restricting access (fence, gates) and by establishing a high profile presence of Preserve staff.

Management Directive Fire 7 – Educational Outreach. Private property owners in the interface or intermix (located adjacent to the Preserve) can 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, herbicides, and prescribed fire. As such, this plan recommends a concerted effort to reach property owners who are situated in locations that may be affected by wildfire on the Preserve or who may serve as ignition points to Preserve fires. Educational material can be customized for these

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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 Use². 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.

Management Directive Fire 8 – Ignition Reduction: Ignition sources are present on and adjacent the Preserve. The transmission line that crosses a portion of the Preserve presents one potential source. Adjacent sources include roadways with vehicular travel, residences, and people, amongst 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. Fuel modification buffers on the preserve edges near existing homes is provided in some instances, but will need to be provided for all adjacent ignition sources such that the source has 100 feet of fuel modification. Likewise, fuel reduction beneath the transmission line, as appropriate, and along utility line access roadways will reduce the likelihood of ignitions and fire spread from the line or from vehicles on the access roads.

Management Directive Fire 9 – Fuels Management. Provide Fuels Management per Vegetation Management Units as presented in Table 9. Table 9 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.

²On-line at: http://www.fire.ca.gov/cdfbofdb/pdfs/4291finalguidelines2_23_06.pdf
and http://www.sdcounty.ca.gov/dplu/fire_resistant.html

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**Table 9
Fuel Management Activities by Vegetation Management Unit**

Vegetation Management Unit	High Value Resource	Fuel Reduction Practice
1	<p>Sensitive Animal Species: California Gnatcatcher Northern Harrier Coastal Western Whiptail Orange-throated Whiptail San Diego Black-tailed Jackrabbit</p> <p>Sensitive Plant Species: California Adolphia San Diego Barrel Cactus Palmer's Grappling Hook Western Dichondra San Diego Marsh Elder</p>	<p>Annual mowing and grazing would provide the most feasible form of fuel reduction, and can be focused adjacent to the northern boundary near neighboring residential structures. Efforts should be focused in the non-native grassland areas in this region of VMU1. Some manual thinning of chaparral in this region of VMU 1 is also recommended to minimize fuel loads in the interface. Otherwise, fuel treatment in VMU1 should be limited to invasive species removal since the entire VMU was burned in 2007 and plant communities are still recovering.</p> <p>Reduction of fires through strategic mowing/fuel reduction along ignition source areas, especially access roads and trails. The road dividing VMU 1 and VMU 2 should be maintained free of vegetation to effectively maintain a north-south fire break.</p> <p>Thinning/vegetation reduction may be necessary to reduce potential for catastrophic fire near VMU 1 sensitive species locations. Establishment of non-native plants, disease or pest-caused mortality of adjacent plants, or other means that result in increased ignition potential may require strategic thinning. No ground disturbing activities shall occur and thinning will be carried out via manual or targeted chemical applications.</p> <p>Cultural sites within VMU 1 are non-flammable and therefore not vulnerable to wildfires. Therefore, cultural locations shall be avoided with regards to thinning/fuel reduction unless necessary to control exotic species or to remove dead/dying vegetation. If necessary, vegetation will be removed via manual methods with minimal ground disturbance or chemical applications.</p>
2	<p>Sensitive Animal Species: California Gnatcatcher Southern California Rufous-crowned Sparrow San Diego Horned Lizard Red Diamond Rattlesnake Cooper's Hawk</p> <p>Sensitive Plant Species: Del Mar Manzanita California Adolphia San Diego Barrel Cactus Western Dichondra San Diego Marsh Elder Variegated Dudleya</p>	<p>Annual mowing and grazing would provide the most feasible form of fuel reduction, and can be focused adjacent to the north-eastern boundary near neighboring residential structures. Efforts should be focused in the non-native grassland areas in this region of VMU2. Some manual thinning of chaparral and Diegan coastal sage scrub in this region of VMU 2 is also recommended to minimize fuel loads in the interface. Otherwise, fuel treatment in VMU2 should be limited to invasive species removal as the over half of VMU 2 was burned in 2007 and plant communities are still recovering.</p> <p>Del Mar Manzanita population in this VMU will benefit from the manual thinning. If possible, thinning beneath the Manzanita plants will reduce competition and simultaneously the likelihood of fire ladders leading to crown fires and loss of plants. Prescribed fire preceded by mechanical/manual thinning would</p>

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Table 9 (Continued)

Vegetation Management Unit	High Value Resource	Fuel Reduction Practice
	<p>Small Flowered Morning Glory Robinson's Pepper Grass Nuttall's Scrub Oak</p>	<p>be beneficial to Manzanita and other chaparral plants, but is not likely feasible on this Preserve, as discussed in Section 5.3.</p> <p>Reduction of fires through strategic mowing/fuel reduction along ignition source areas, especially access roads and trails. The road dividing VMU 1 and VMU 2 should be maintained free of vegetation to effectively maintain a north-south fire break.</p> <p>Thinning/vegetation reduction may be necessary to reduce potential for catastrophic fire near VMU 2 sensitive species locations. Establishment of non-native plants, disease or pest caused mortality of adjacent plants, or other means that result in increased ignition potential may require strategic thinning. No ground disturbing activities shall occur and thinning will be carried out via manual or targeted chemical applications.</p> <p>Cultural sites within VMU 2 are non-flammable and therefore not vulnerable to wildfires. Therefore, cultural locations shall be avoided with regards to thinning/fuel reduction unless necessary to control exotic species or to remove dead/dying vegetation. If necessary, vegetation will be removed via manual methods with minimal ground disturbance or chemical applications.</p>
3	<p>Sensitive Animal Species: California Gnatcatcher Southern California Rufous-crowned Sparrow Orange-throated Whiptail Coronado Skink Barn Owl White-tailed Kite</p> <p>Sensitive Plant Species: Graceful Tarplant California Adolphia Southwestern Spiny Rush San Diego Marsh Elder Summer Holly</p>	<p>Steep terrain in this VMU limits access and the amount of mowing or thinning that would be possible. Grazing is not applicable due to the limited extent of grasslands. Minimizing fire spread during wildfire will be a key component to habitat enhancement in this VMU. Timed prescribed fire could be used on a long-term basis to strategically reduce fuel loads.</p> <p>The road leading from the southwest corner of the Preserve to the bottom of Lusardi Creek should be maintained free of vegetation to effectively maintain a north-south fire break that connects to the one dividing VMU 1 and VMU 2.</p> <p>Thinning/vegetation reduction may be necessary to reduce potential for catastrophic fire near VMU 3 sensitive species locations. Establishment of non-native plants, disease or pest-caused mortality of adjacent plants, or other means that result in increased ignition potential may require strategic thinning. No ground disturbing activities shall occur and thinning will be carried out via manual or targeted chemical applications.</p> <p>Cultural sites within VMU 3 are non-flammable and therefore not vulnerable to wildfires. Therefore, cultural locations shall be avoided with regards to thinning/fuel reduction unless necessary to control exotic species or to remove dead/dying vegetation. If</p>

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Table 9 (Continued)

Vegetation Management Unit	High Value Resource	Fuel Reduction Practice
		necessary, vegetation will be removed via manual methods with minimal ground disturbance or chemical applications.
4 & 5 (Wildland Urban Interface Fuel Modification Zones)	Residence	<p>This zone is characterized by the adjacent residential development in limited locations in the southwest and northeast portions of the Preserve. Fuel reduction by manual thinning, mowing, and exotics removal should be conducted routinely to minimize fire spread and ignition potential from residential development.</p> <p>There are no sensitive species or cultural resources known from VMU 4 or VMU 5.</p>

Management Directive Fire 10 – Post Fire Management. This management directive would provide controls following fire events to minimize potential for erosion. One of the first concerns following wildfire is stabilization of soils in the burn area, especially if sloped areas are included in a burn. A goal should be to have erosion control best management practices (BMPs) in place as soon as possible and prior to the onset of the winter rainy season. There are various erosion control practices available for slowing the rate of erosion. Recent research indicates that mechanical rehabilitation treatments, including straw mulch, hay bales, and jute rolls are more predictable for reducing soil erosion and post-fire hydrological problems than seeding or other treatments (Robichard et al. 2000). Mulching may introduce exotics (Kruse et al. 2004), so erosion potential should be high before the decision to place these erosion-mitigating features in the Preserve is finalized.

Management Directive Fire 11 – Research and Monitoring. Provide a robust monitoring program in conjunction with Invasive Species and Restoration monitoring that includes adaptive management approach to vegetation management methods.

Because this Plan is based on strategies that are commonly utilized for fire management and for habitat enhancement but are untested on the Preserve and may require additional experimentation, pre- and post-fire research and monitoring are strongly recommended. The following list identifies primary areas for potential research, experimentation, and monitoring:

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On-Going Vegetation Management

- Identify areas in particular need for disturbances and which are in need of re-burning to maintain designated habitat value
- Experimentally determine the optimal disturbance frequency
 - Experiment with 4-, 5-, and 7-year mowing, grazing, and as possible, burning
 - Efficacy of “guided or controlled” wildfires to provide the benefits associated with prescribed burning
 - Mowing and grazing effects on annual grasslands
 - Low-cost native grass re-establishment
- Maintain fire frequency between 4 and 8 years to control non-native grasses in grassland areas
- Two permanent plant transects in each VMU completed and analyzed each year
- Study protocol to be adjusted or terminated after determining that fire frequencies are detrimental or are suitable.

Long-Term Monitoring

- Plant Community Response
 - Follow Resource Management Plan guidelines for monitoring
 - Qualitative and quantitative data
 - Prior to and following burn annually
- Animal Community Response
 - Follow Resource Management Plan guidelines for monitoring
 - Mammal monitoring surveys using live-trapping techniques
 - Avian monitoring surveys using transects or point counts
 - Herpetile and ground invertebrate monitoring surveys using pit-fall traps.

Management Directive Fire 12 – Data Management. Provide a database to house fire-related information generated pre- and post-fire.

Data management is an important aspect for fire management on the Preserve. Assuming research and monitoring information is collected as recommended in this and other Preserve

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plans, it will be necessary to house that information within a secure database in a format that is compatible with statistical and trend analysis software applications. Data analysis results will, over time, become the basis for fire management adaptations to more closely match Preserve management goals should current recommendations prove inadequate. Data collected prior to, during, and following disturbance events should be made available to DPR park staff managing Preserves with similar habitat management goals so that larger data sets can be evaluated. Optimal disturbance return intervals may vary by site, and comparisons among DPR Preserve land data will be important for long-term fire and habitat management within DPR properties.

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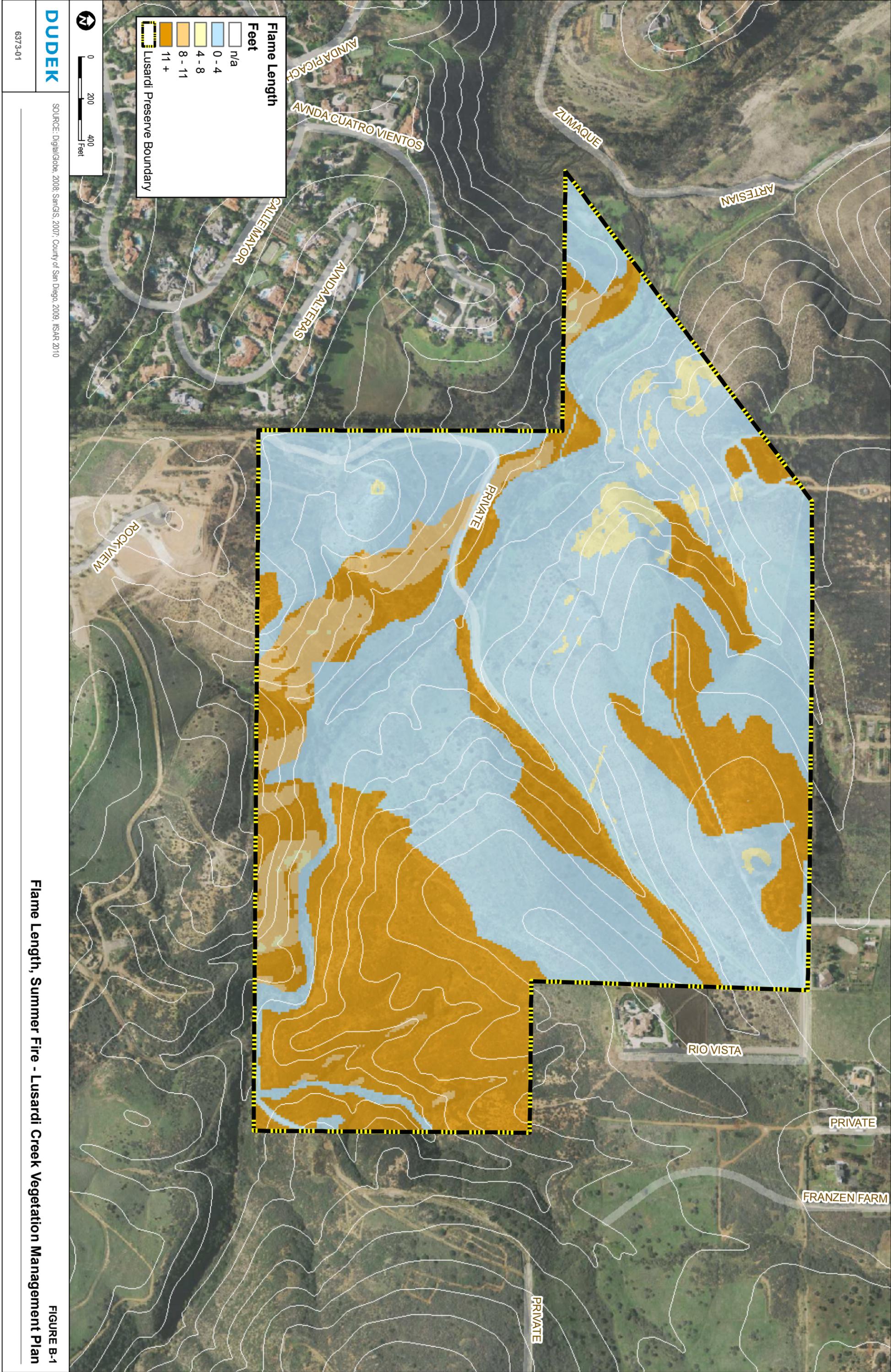
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APPENDIX A

*Preserve Map with Vegetation Distribution and
Access Ways*

APPENDIX B
Fire Behavior Modeling Results



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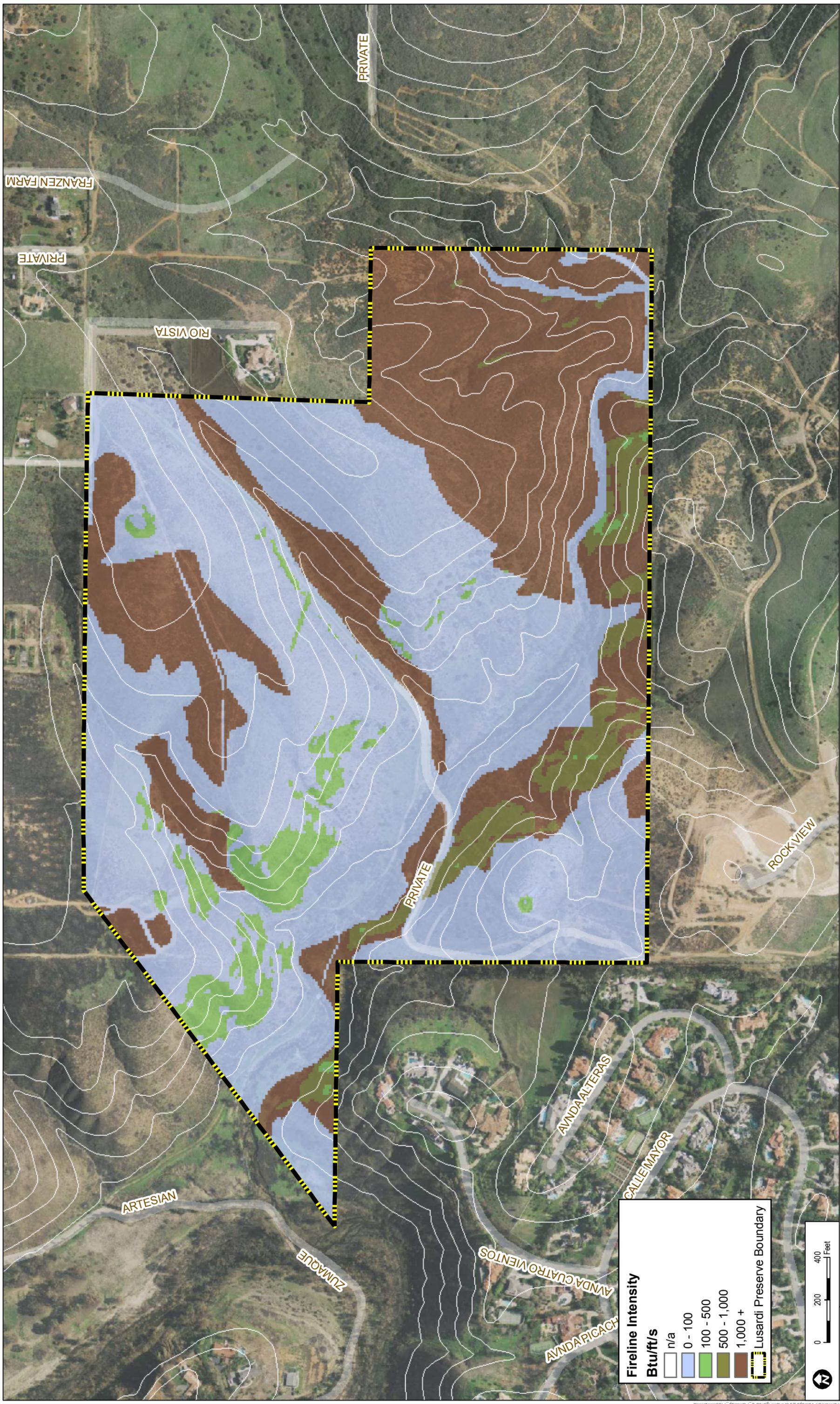
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SOURCE: DigitalGlobe, 2008; SanGIS, 2007; County of San Diego, 2009; IFSAR 2010

Flame Length, Summer Fire - Lusardi Creek Vegetation Management Plan

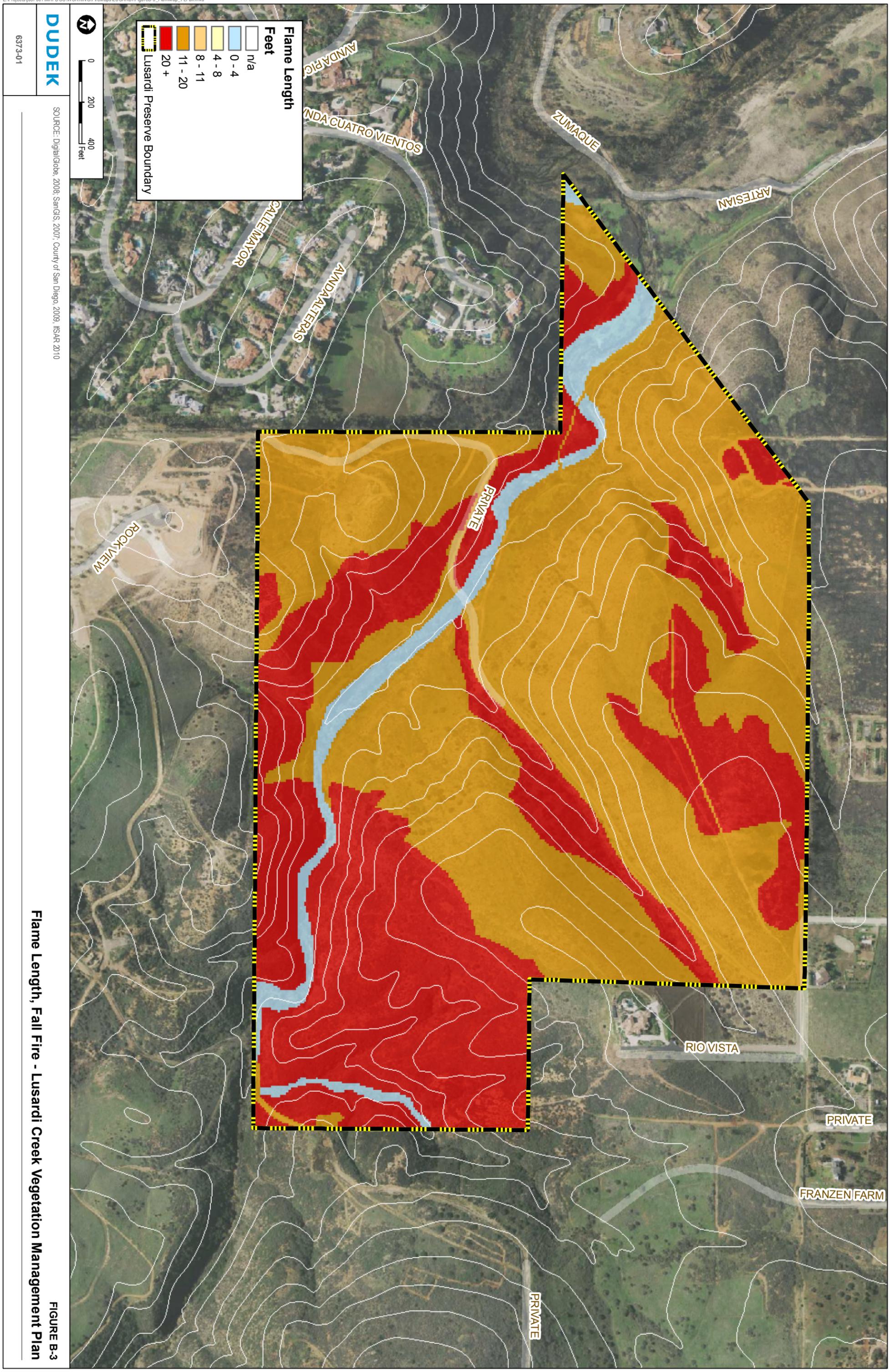
FIGURE B-1



Fireline Intensity
Btu/ft/s

[White Box]	n/a
[Light Blue Box]	0 - 100
[Light Green Box]	100 - 500
[Dark Green Box]	500 - 1,000
[Brown Box]	1,000 +
[Thick Dashed Line]	Lusardi Preserve Boundary





Flame Length
Feet

- n/a
- 0 - 4
- 4 - 8
- 8 - 11
- 11 - 20
- 20 +

--- Lusardi Preserve Boundary

0 200 400
Feet

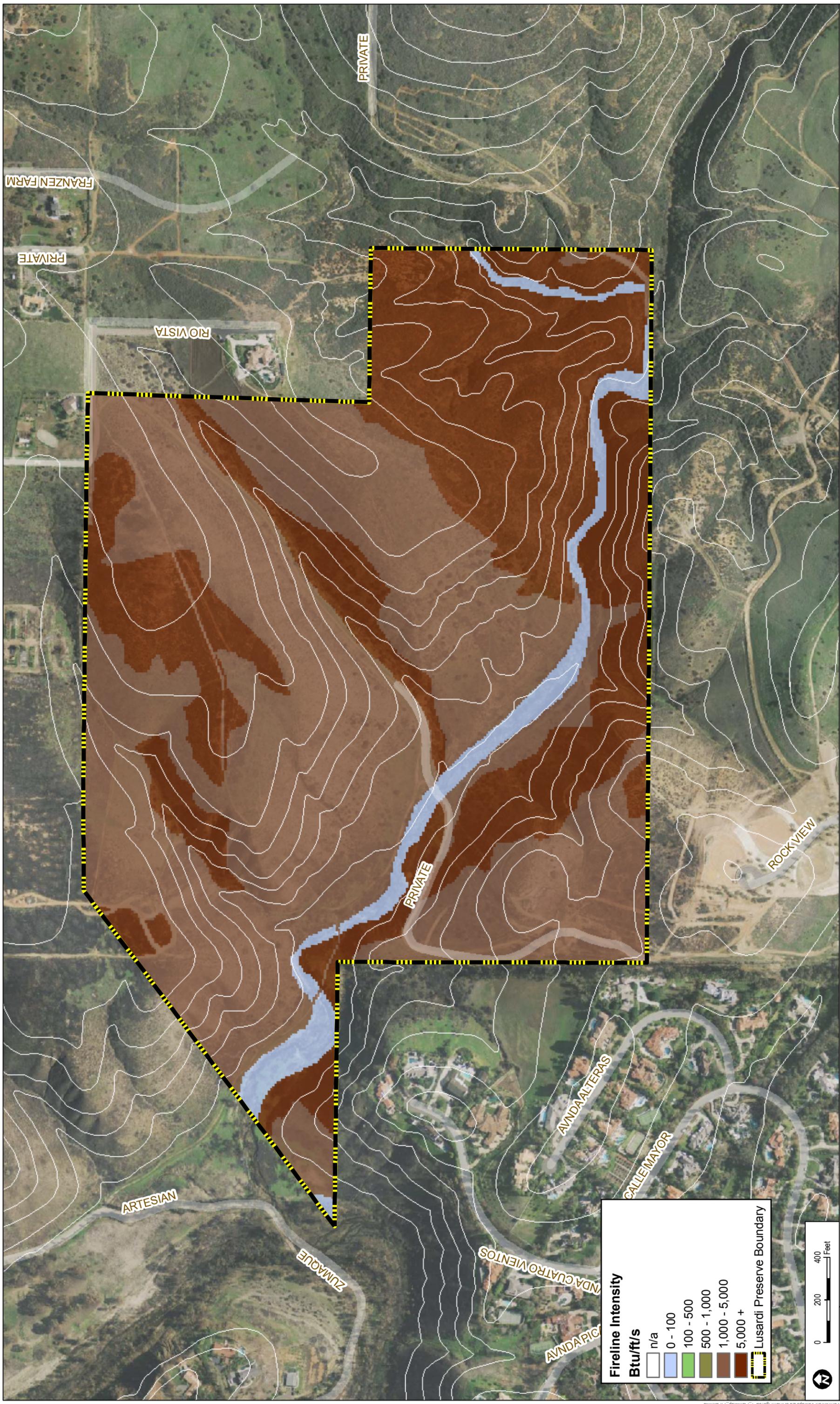
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SOURCE: DigitalGlobe, 2008; SanGIS, 2007; County of San Diego, 2009; IFSAR 2010

Flame Length, Fall Fire - Lusardi Creek Vegetation Management Plan

FIGURE B-3



Fireline Intensity
Btu/ft/s

White	n/a
Light Blue	0 - 100
Light Green	100 - 500
Medium Green	500 - 1,000
Dark Green	1,000 - 5,000
Brown	5,000 +

Lusardi Preserve Boundary

