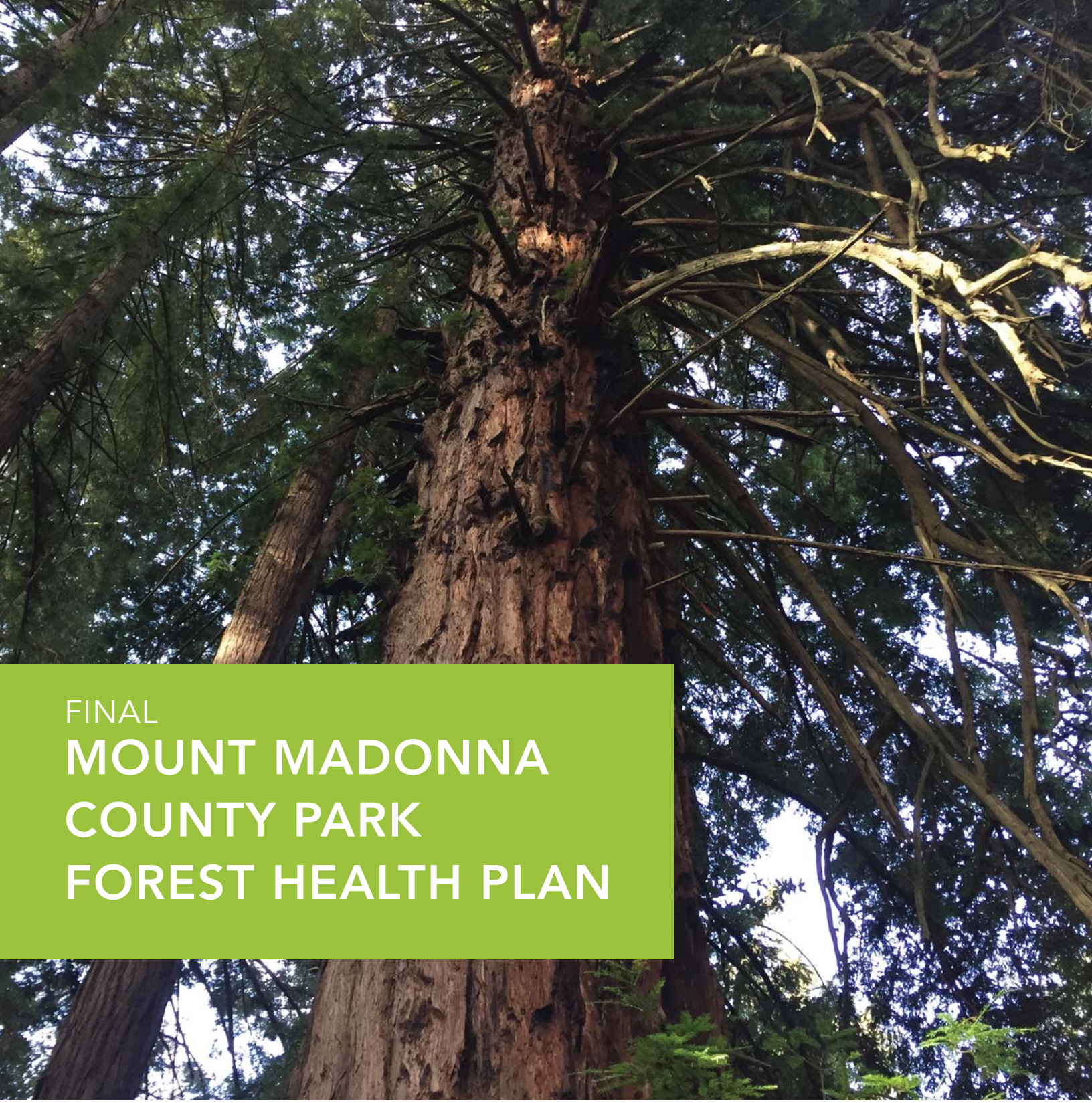

FINAL

MOUNT MADONNA COUNTY PARK FOREST HEALTH PLAN

SANTA CLARA COUNTY PARKS

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APPENDICES

ACRONYMS AND ABBREVIATIONS

Acronym	Definition
amsl	above mean sea level
ANSI	American National Standards Institute
BAAQMD	Bay Area Air Quality Management District
BMP	Best Management Practices
CCC	California Conservation Corps
CAL FIRE	California Department of Forestry and Fire Protection
CDFW	California Department of Fish and Wildlife
CDFA	California Department of Food and Agriculture
CDPR	California Department of Pesticide Regulation
CEQA	California Environmental Quality Act
CAL-IPC	California Invasive Plant Council
CNPS	California Native Plant Society
CNDDB	California Natural Diversity Database
CFI	Continuous Forest Inventory
CWPP	Community Wildfire Protection Plan
EPA	Environmental Protection Agency
EHR	Erosion Hazard Rating
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FPR	Forest Practice Rules
GIS	Geographic Information System
ISA	International Society of Arboriculture
LSF	Late Successional Forest
MSDS	Material Safety Data Sheets
NRMZ	Natural Resource Management Zone
PCA	Pest Control Advisor
QMD	Quadratic Mean Diameter
RPF	Registered Professional Forester
SCVHCP	Santa Clara Valley Habitat Conservation Plan
SOD	Sudden Oak Death
THP	Timber Harvesting Plan
TRAQ	Tree Risk Assessment Qualification
TPA	Trees Per Acre
USFWS	United States Fish and Wildlife Service
VMP	Vegetation Management Program
WUI	Wildland Urban Interface

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1 INTRODUCTION

Mt. Madonna County Park (Park) is a 4,605-acre park comprised primarily of redwood forest and situated atop the Santa Cruz Mountain range. The Park is a popular destination for camping, hiking, horseback riding, archery, picnicking. Relaxing in the Park's forests and quiet recreational opportunities are its prime attractions. In more recent years, the Park has been subject to forest pathogen outbreaks and corresponding tree failures in high-use recreational areas and low-use backcountry areas. These events have necessitated large-scale tree removal in high-use portions of the Park; however, such outbreaks are indicative of broader scale forest health issues driven by biotic factors, such competition and forest pathogens, and abiotic factors, such as drought and forest management policies and practices. Park forests are also faced with additional threats that increase tree stress, including pest and disease infestations, invasive species establishment, and wildfires. Climate change also increases the threat to Park forests through increased temperatures and decreased precipitation. Such threats increase the potential for tree mortality and failure, posing a risk to Park staff and visitors. Additionally, unhealthy forests have the potential for species loss, reduction in species diversity, epidemic levels of pests and disease, air and water quality degradation, and negatively impact wildlife populations, increase wildfire hazard, and reduce recreational benefits.

This Forest Health Plan (Plan) identifies general practice and project-specific management recommendations to address forest threats in the Park and acknowledges that trees, vegetation, and forest threats are dynamic and their management necessitates an adaptive management approach. The goals, objectives, and recommendations identified in this Plan are based on existing field conditions and have been identified to reduce risks to Park staff and visitors and promote overall forest health in the Park, as a healthier forest is more resilient to forest threats. This Plan also identifies Best Management Practices (BMPs) to be implemented during Park operations and maintenance activities and during implementation of recommended projects to reduce or avoid impacts to Park resources.

1.1 Purpose

Park forest health is being affected by numerous threats, primarily pests and pathogens, fuel loading and wildfire hazard, drought, and invasive species. The management history of the Park's redwood stands, the dominant forest type in the Park, has shaped stand density and composition, increasing competition for resources and contributing to emerging forest health issues. Climate change represents a future threat to Park forests and warrants consideration in forest management. Current and potential future threats to Park forests can increase tree stress, resulting in increased pest and/or disease infestations, tree mortality, fire hazard, and corresponding risk to Park staff and visitors. Operations and maintenance activities, as well as proposed future development in the

Park, can also contribute to forest health degradation via direct impacts to trees and stands. The purpose of this Plan is to identify Park forest health issues, identify management actions and specific projects to minimize the effects of threats on Park forests, and provide a framework for managing Park forests over the Plan timeframe. While this Plan is intended to be a stand-alone document, the information and recommendations presented herein are intended to be used by Park staff in evaluating forest health management needs on an ongoing basis.

1.2 Plan Scope and Timeframe

The scope of this Plan covers all forested areas within the Park, as well as any non-forested areas that fall within recommended project areas (e.g., chaparral in fuel breaks). This Plan also recognizes that the Park's Natural Resources Program is actively addressing tree risk in high-use areas of the Park under its Tree Safety Program, which includes biannual surveys of high-use areas and as-needed tree risk assessments for trees exhibiting signs of poor health or structure. This Plan recommends continuation of that program while implementing the general practice and project-specific management recommendations identified herein. Project recommendations included in this Plan are focused primarily in the Park's high-use areas, concentrated near the summit of Mount Madonna; however, the general practice recommendations are applicable in all forested areas of the Park and are recommended for implementation now and during future development activities conducted under the Park Master Plan.

The timeframe for this Plan is 20 years, a timeframe suitable to accomplish this Plan's management recommendations and evaluate their effectiveness in meeting the Plan's goals and objectives. The goals, objectives and recommendations contained herein should be reviewed at the end of the 20-year timeframe, following a re-evaluation of the Park's forestland areas and the success of management activities recommended in this Plan. Following such a review, revisions to Plan goals, objectives and/or recommendations may be necessary to reflect forest conditions within the Park at that time.

1.3 Mount Madonna County Park Location

The Park is located in the unincorporated portion of Santa Clara County between the cities of Gilroy and Watsonville (Figure 1). The southern Park boundary coincides with the Santa Clara/Santa Cruz County line. The area immediately surrounding the Park is primarily residential and rural in nature. The County of Santa Clara General Plan (County of Santa Clara 1994) surrounding land use designations are Hillsides (20-160 acres per dwelling unit) and Ranchlands (20-160 acres per dwelling unit), while the adjacent land within Santa Cruz County is Mountain Residential (10-40 acres per dwelling unit) per their General Plan (County of Santa Cruz 1994). The Park is largely undeveloped, with approximately 4,200 acres remaining in an undeveloped,

natural state, and approximately 400 acres developed with visitor-serving amenities (e.g., campgrounds, picnic areas) and roadways. The Park's legal description is summarized in Table 1.

Table 1
Mount Madonna County Park Location

Sections	Township	Range	Acreage
25	10S	2E	181
34	10S	2E	33
35	10S	2E	284
36	10S	2E	669
30	10S	3E	86
31	10S	3E	609
32	10S	3E	4
1	11S	2E	650
2	11S	2E	377
10	11S	2E	13
11	11S	2E	92
12	11S	2E	46
4	11S	3E	43
5	11S	3E	114
6	11S	3E	683
7	11S	3E	135
8	11S	3E	296
9	11S	3E	290
		Total Acreage:	**4,605**

* Mount Diablo Base and Meridian

1.4 Forest Health Plan Goals and Objectives

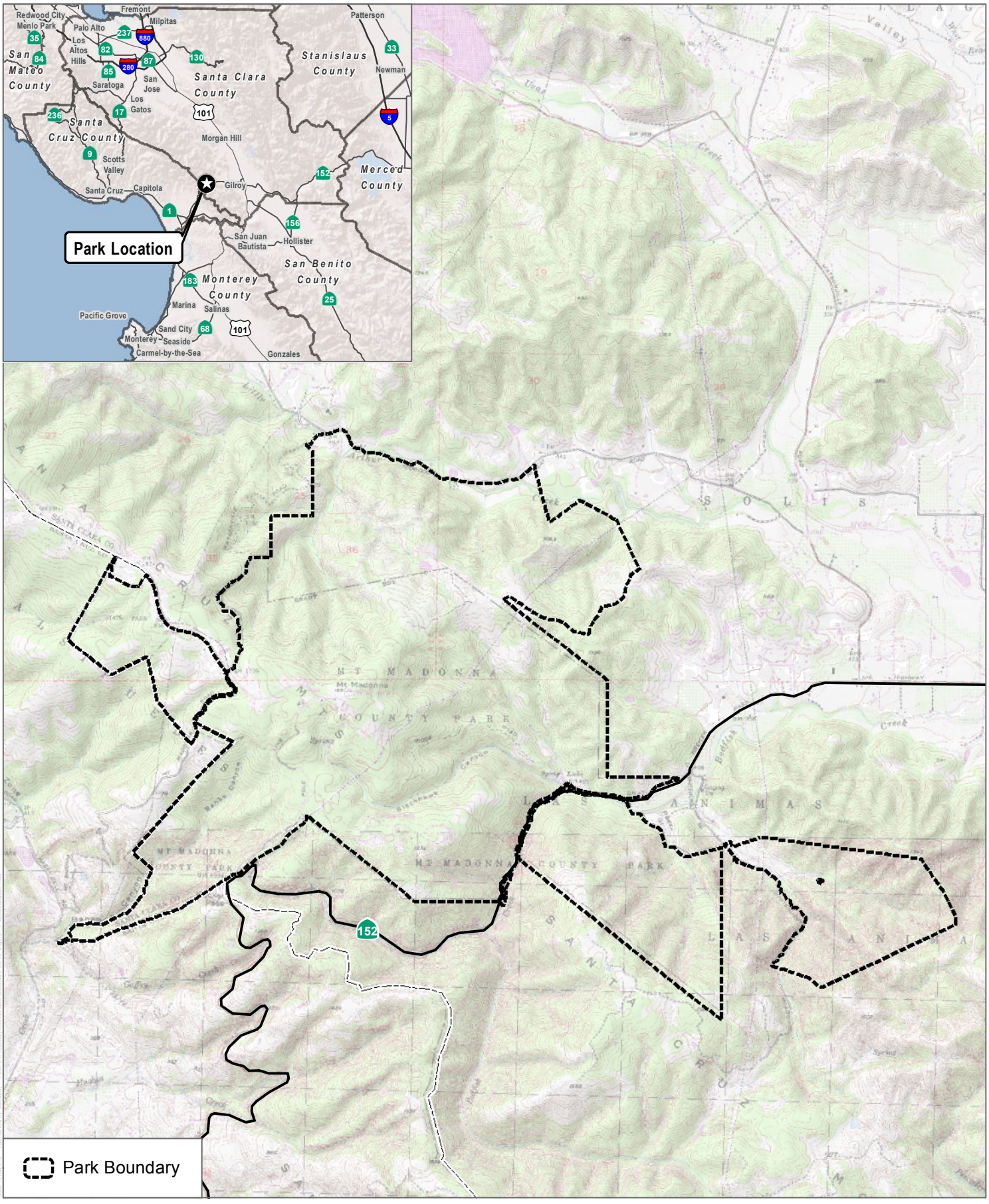
Three primary goals were identified to guide implementation of this Plan. The goals provide a framework under which specific management objectives and recommendations were developed. The goals of this Plan are to:

1. Mitigate hazards to Park users and employees.
2. Promote forest resiliency to drought, pest and disease infestation, catastrophic wildfire, and climate change.
3. Avoid or minimize impacts to other natural resources and recreational facilities.

To achieve these management goals, the following objectives were developed to achieve or maintain desired forest conditions in the Park. The purpose of the objectives is to inform the Plan's

project-specific recommendations, recommendations for park operations and maintenance activities that affect individual trees or the forest, and recommendations for minimizing impacts to retained trees and forestland during future development under the Park Master Plan. The objectives of this Plan are to:

1. Remove hazards to life and property in and around areas of public use.
2. Monitor threats to forest health.
3. Identify and prioritize potential fuel management activities based on hazard, location, and relationship to regional and local fire hazard reduction efforts.
4. Improve forest stand conditions to minimize the effect of forest threats and promote long-term forest health.
5. Implement BMPs that avoid or minimize potential adverse effects of forest management activities on residual trees, sensitive biological resources, cultural resources, water resources, aesthetics, soils, slope stability, and recreational resources.
6. Outline management recommendations that provide direction to Park staff for operations and maintenance activities in forested areas.
7. Routinely evaluate the effectiveness of forest management activities in the Park towards meeting these objectives.



SOURCE: Esri Basemaps; USGS 7.5-Minute Series Mount Madonna & Watsonville Quadrangles

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FIGURE 1

Mount Madonna County Park Location Map

Mount Madonna County Park Forest Health Plan

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2 PARK DESCRIPTION

2.1 Natural Resource Management Zones

Natural Resource Management Zones were developed for use in the Santa Clara County Park System and are defined by logical boundaries within the landscape, including, but not limited to drainages, ridgelines, roads, and trails. (SCCDPR 2008). The function of NRMZs is to simplify management of natural resources, identify management needs, and act as an instrument of planning for park use, development, prioritization and natural resource protection (SCCDPR 2008). The Park contains nine NRMZs, which are summarized in Table 2. This Plan retains the existing nine NRMZs in the Park and management recommendations contained herein are identified by NRMZ.

Table 2
Mount Madonna County Park Natural Resource Management Zones

NRMZ	Acreage	Description
1	539	High use, nearly all Park infrastructure present in this zone, redwood forest dominated
2	724	Low use, recreation limited to trails, redwood and mixed evergreen forest dominated
3	265	Low use, not currently open to the public, redwood forest dominated
4	420	Moderate use, trails and trailheads present, redwood forest dominated, large eucalyptus stand at west end
5	660	Moderate use, trails and Sprig trailhead at south end, redwood forest and coast live oak forest dominated
6	525	High use, campgrounds, trails, and trailheads present, redwood forest dominated
7	549	Low use, not currently open to the public, no access, redwood forest and mixed oak woodland dominated
8	423	Low use, not currently open to the public, mixed oak woodland and coastal scrub dominated
9	500	Low use, not currently open to the public, mixed oak woodland and redwood forest dominated

Source: County of Santa Clara 2017d

2.2 Physical Environment

This section describes the Park's physical environment that contributes to and influences tree growth and forest dynamics, including a discussion of water resources that may be affected by recommended management actions and the history of tree harvesting and wildfire in the Park, both of which have contributed to current forest stand compositions. A more detailed description forest resources is provided in Section 3.

2.2.1 Climate

The climate of the Park is influenced by its locale adjacent to the Pacific Ocean and is frequently under the influence of a seasonal, migratory, subtropical high-pressure cell known as the Pacific

High (WRCC 2017). Wet winters and dry summers with mild seasonal changes generally characterize the southern Santa Cruz Mountains. This climate pattern is occasionally interrupted by heat waves, cold snaps, isolated thunderstorms, fog, or dry easterly winds (WRCC 2017). In general, the climate in the Park is relatively mild with an average annual temperature of 56 degrees Fahrenheit, although some variance in temperatures occurs due to the influence of elevation and aspect (solar exposure). Summer temperatures will normally have highs between 80 and 90 degrees, with nighttime temperatures dropping to near 50 degrees (Fahrenheit) (SCCDPR 2008).

The regional prevailing wind pattern is from the west (on-shore). The summit exposure, coastal fog, and accompanying on-shore breezes can affect temperatures in short periods of time. Light snowfall is not uncommon near the summit of Mount Madonna during the winter months. The growing season lasts approximately 225 to 250 days per year, with the last frost typically occurring near the end of March. Total annual rainfall in the Park is approximately 44 inches, with the majority of rainfall occurring in November (13.3 inches), December (8.7 inches), January (5.4 inches), February (3.3 inches), March (4.5 inches), and April (5.1 inches) (SCCDPR 2008).

2.2.2 Topography

The Park is located at the southern end of the steep, coastal Santa Cruz Mountains. The topography of the Park affects several factors that influences forest growth, including soil type, solar exposure, rainfall, and fog drip, amongst others. The peak of Mount Madonna is the Park's highest point at 1,897 feet above mean sea level (amsl). The Park's topography is influenced by the peak of Mount Madonna and its location along the ridge of the Santa Cruz Mountains. The west side of the Park is along the coastal side of the Santa Cruz Mountains, with slopes dropping downward toward the coastal plain. The slopes and drainages along east side of the Park drop downward toward the Salinas Valley. Several significant drainages in the Park (Blackhawk Canyon, Banks Canyon, and Bodfish Creek) also contribute to the Park's topography.

Topography affects air temperature, solar exposure, and precipitation, each of which affect vegetation composition and distribution. Cooler temperatures and higher rainfall totals are found at higher elevations. Aspect (the direction a slope faces) influences solar exposure and therefore vegetation type and/or density. All slope aspects are represented in the Park. South and west-facing slopes are subject to more thermal heating from the sun and consequently have higher temperatures and are typically dominated by lighter vegetation types (brush, grasses). North and east-facing slopes receive less solar exposure and are therefore cooler and are typically dominated by tree/forest cover. Table 3 summarizes elevation ranges in the Park, by NRMZ.

Table 3
Mount Madonna County Park Elevation Ranges, by NRMZ

NRMZ	Minimum Elevation (ft.)	Maximum Elevation (ft.)	Range (ft.)
1	1,270	1,900	630
2	440	1,660	1,220
3	1,285	1,885	600
4	305	1,700	1,395
5	440	1,725	1,285
6	475	1,615	1,140
7	405	1,570	1,165
8	415	1,475	1,060
9	360	1,195	835

Source: SCVWD 2007

Slope is also an important component in erosion potential and the ability to conduct forest management operations. Table 4 summarizes slope ranges in the Park, by NRMZ.

Table 4
Mount Madonna County Park Slope Ranges, by NRMZ

Slope Range (percent)	Acres (by NRMZ)									Total
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	
0-4%	28	10	4	3	3	8	2	4	11	**73**
5-15%	134	39	47	25	32	48	29	27	45	**426**
16-30%	177	108	92	68	145	108	118	34	77	**927**
31-40%	75	102	48	58	131	76	93	34	68	**685**
41-50%	52	114	38	69	131	85	103	51	73	**716**
51-70%	64	233	33	128	183	154	159	169	145	**1,268**
71-80%	7	74	3	36	28	33	36	70	53	**340**
81% +	2	44	0	33	7	13	9	34	28	**170**
Total	**539**	**724**	**265**	**420**	**660**	**525**	**549**	**423**	**500**	**4,605**

Source: SCVWD 2007

Topography also affects wildfire movement and spread. Steep terrain typically results in faster up-slope fire spread due to pre-heating of uphill vegetation while flat areas typically result in slower fire spread, absent of windy conditions. Topographic features such as saddles, canyons, and chimneys (land formations that collect and funnel heated air upward along a slope) may form unique circulation conditions that concentrate winds and funnel or accelerate fire spread. Figure 2 presents the Park's topography and water resources.

2.2.3 Soils and Geology

The primary soils represented in the Park include the Felton, Lompico-Felton, Los Gatos, and Maymen series, which are briefly summarized below. An evaluation of soils data (USDA 2018) was conducted in preparation of this Plan. The primary soils represented in the Park include the Felton, Lompico-Felton, Los Gatos, and Maymen series, which are briefly summarized below. A summary of all Park soils is presented in Table 5, by NRMZ. Park soils are also presented in Figure 3.

- Maymen: Shallow, somewhat excessively drained soils formed from shale, schist, greenstone, sandstone and conglomerate. These are mountain soils with slopes ranging from 5 to 100 percent. Dominant vegetation includes open stands of chaparral consisting of chamise, manzanita, ceanothus, scrub oak, and scattered small trees (USDA 2018).
- Felton: Deep, well drained soils formed from shale, sandstone or mica schist. Felton soils are on uplands and have slopes ranging from 5 to 75 percent. Dominant vegetation is redwood, Douglas fir, madrone, and oak (USDA 2018).
- Lompico: Moderately deep, well drained soils formed from sandstone, shale, conglomerate, and granodiorite. Lompico soils are on uplands and have slopes ranging from 5 to 75 percent. Dominant vegetation is redwood, madrone, tanoak, ferns, poison oak, and some Douglas fir (USDA 2018).
- Los Gatos: Fine, loamy, mixed mesic soils. Dominant vegetation is hardwoods and grass (USDA 2018).

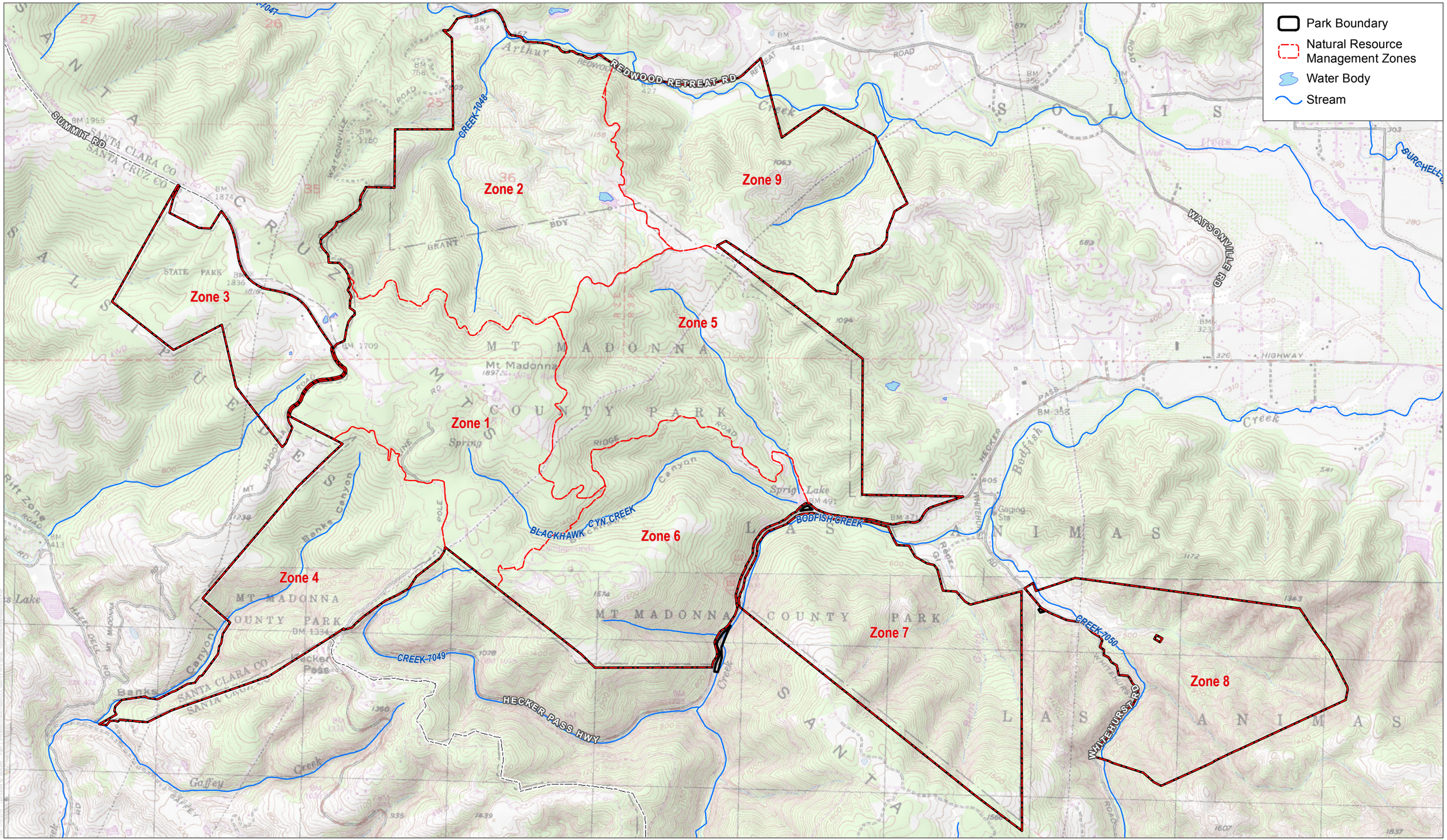
Table 5
Mount Madonna County Park Soil Types, by NRMZ

Soil Type	Acres (by NRMZ)									Total
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	
Aptos loam, warm, 15 to 30 percent slopes				19						19
Aptos loam, warm, 30 to 50 percent slopes			11							11
Ben Lomond fine sandy loam, 50 to 75 percent slopes	33	269								302
Bonnydoon loam, 5 to 30 percent slopes	0		100							100
Elkhorn sandy loam, 9 to 15 percent slopes				0						0
Felton silt loam, 15 to 30 percent slopes	32				3	18				53
Felton silt loam, 30 to 50 percent slopes	93	6			35	69				203
Felton silt loam, 50 to 75 percent slopes	78				104	338	308			828
Garretson gravelly loam, 0 to 5 percent slopes								10	2	12
Garretson loam, gravel substratum, 0 to 2 percent slopes		0								0
Gilroy clay loam, 5 to 30 percent slopes								2		2
Gilroy clay loam, 30 to 50 percent slopes					28	14	11	6		59
Gilroy clay loam, 50 to 75 percent slopes							28	54		82
Hillgate silt loam, 2 to 9 percent slopes									5	5
Inks stony clay loam, 30 to 75 percent slopes, severely eroded								67		67
Lompico-Felton complex, 5 to 30 percent slopes			38							38
Lompico-Felton complex, 30 to 50 percent slopes	212	4	86	93						395
Lompico-Felton complex, 50 to 75 percent slopes	14		24	214						252
Los Gatos gravelly loam, 15 to 30 percent slopes, eroded					7		1	1		9
Los Gatos gravelly loam, 30 to 50 percent slopes		24			11		42	9	38	124
Los Gatos gravelly loam, 50 to 75 percent slopes		158			244	26	99	162	291	980
Los Osos clay loam, 15 to 30 percent slopes							29			29
Los Osos loam, 15 to 30 percent slopes				0						0
Los Osos loam, 30 to 50 percent slopes				1						1
Madonna loam, 15 to 30 percent slopes	31		0	2		14				47

Table 5
Mount Madonna County Park Soil Types, by NRMZ

Soil Type	Acres (by NRMZ)									Total
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	
Madonna loam, 30 to 50 percent slopes							0			0
Madonna loam, 50 to 75 percent slopes									0	0
Maymen fine sandy loam, 15 to 50 percent slopes, eroded	42				16	19				77
Maymen rocky fine sandy loam, 50 to 75 percent slopes, eroded		243			159	27	31	93	121	674
Maymen stony loam, 15 to 30 percent slopes			6							6
Maymen stony loam, 30 to 75 percent slopes	4			27						31
Maymen-Madonna complex, 30 to 75 percent slopes				54						54
Montara rocky clay loam, 15 to 50 percent slopes, eroded		11			53				13	77
Pinto loam, 9 to 15 percent slopes				9						9
Pleasanton gravelly loam, 2 to 9 percent slopes		9					0			9
Pleasanton gravelly loam, 9 to 15 percent slopes, eroded								19	17	36
Pleasanton loam, 2 to 9 percent slopes									1	1
Riverwash									12	12
Santa Lucia shaly loam, 30 to 50 percent slopes, eroded				1						1
Water						0				0
Total:	**539**	**724**	**265**	**420**	**660**	**525**	**549**	**423**	**500**	**4,605**

Source: USDA 2018



SOURCE: USGS 7.5-Minute Series Mount Madonna & Watsonville Quadrangles; Santa Clara County GIS (2017)

DUDEK

0 1,000 2,000 Feet

FIGURE 2

Mount Madonna County Park Topography and Water Resources

Mount Madonna County Park Forest Health Plan

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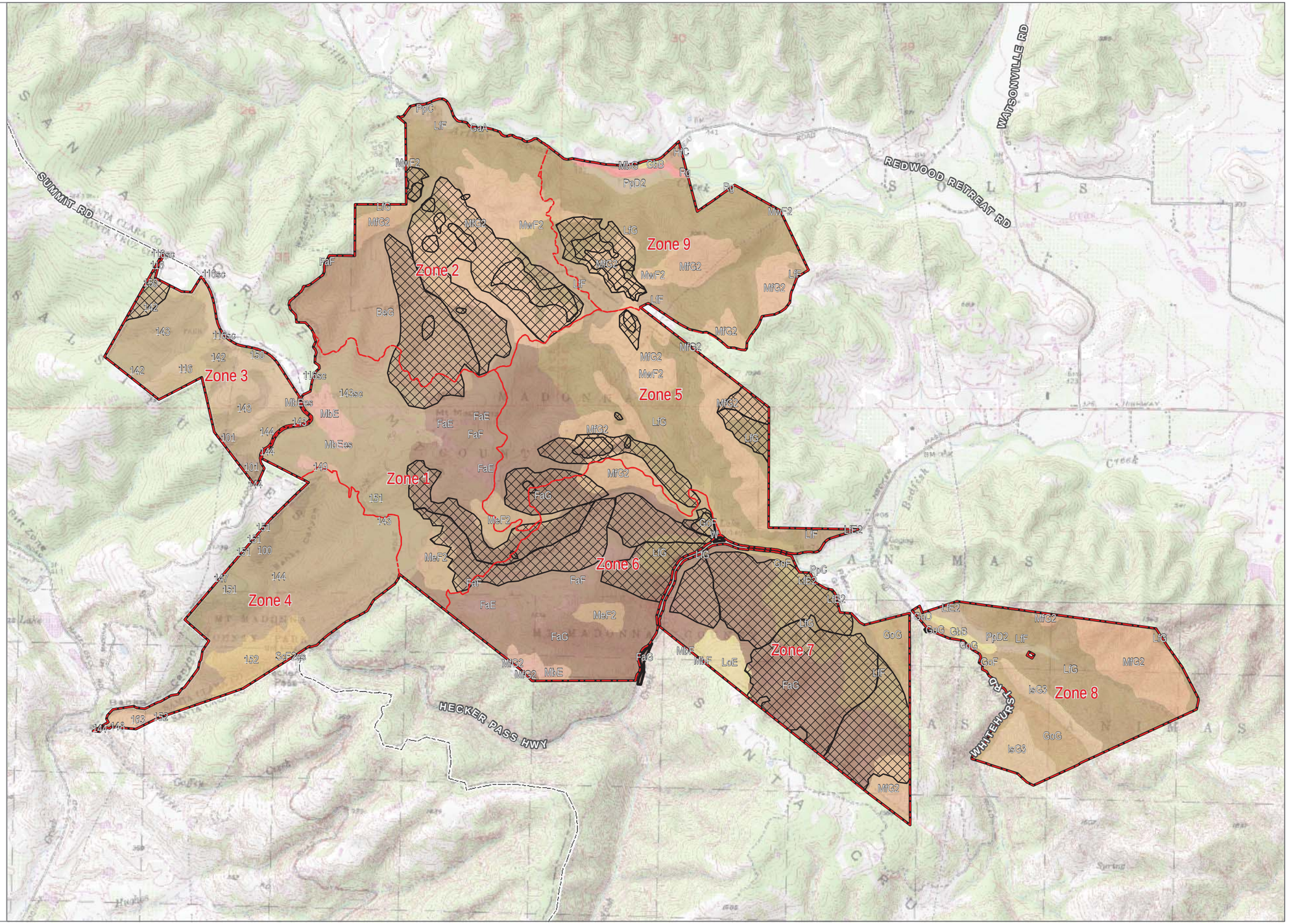
Soil Type

- Aptos loam
- Ben Lomond fine sandy loam
- Bonnydoon loam
- Elkhorn sandy loam
- Felton silt loam
- Garretson gravelly loam
- Garretson loam, gravel substratum
- Gilroy clay loam
- Hillgate silt loam
- Inks stony clay loam
- Lompico-Felton complex
- Los Gatos gravelly loam
- Los Osos clay loam
- Los Osos loam
- Madonna loam
- Maymen fine sandy loam
- Maymen rocky fine sandy loam
- Maymen stony loam
- Maymen-Madonna complex
- Montara rocky clay loam
- Pinto loam
- Pleasanton gravelly loam
- Pleasanton loam
- Santa Lucia shaly loam
- Riverwash
- Water
- Slope Instability Area
- Natural Resource Management Zones
- Park Boundary



SOURCE: USGS 7.5-Minute Series Mount Madonna & Watsonville Quadrangles; Santa Clara County GIS (2017); USDA SSURGO Soils (2017)

DUDEK

0 1,250 2,500 Feet

FIGURE 3

Mount Madonna County Park Soil Types and Slope Instability Areas

Mount Madonna County Park Forest Health Plan

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Soils types also contribute to erosion potential. A discussion of erosion hazard ratings (EHR) and identification of BMPs for minimizing erosion potential are presented in Section 8.3. Several slope instability areas have been identified in the Park and are summarized in Table 6 and presented in Figure 3. Slope instability areas are landslide hazard zones mapped within the unincorporated areas of Santa Clara County and depict an unstable condition arising from the presence or likely future occurrence of slope failure (County of Santa Clara 2017a).

Table 6
Mount Madonna County Park Slope Instability Areas, by NRMZ

NRMZ	Acreage	Percentage
1	105	19.5
2	365	51.8
3	15	5.5
5	132	19.8
6	223	42.5
7	417	76.0
9	80	15.5

Source: County of Santa Clara 2017a.

2.2.4 Water Resources

There are three streams in the Park that flow year-round. Blackhawk Canyon Creek (NRMZs 1 and 6) and Bodfish Creek (NRMZ 7) meet at the site of the former Sprig Lake (now Sprig Day Use Area) at the eastern edge of NRMZ 6 and the southern edge of NRMZ 5. Arthur Creek flows along the northern edge of NRMZ 2 and though the northern portion of NRMZ 9. There are also numerous other un-named intermittent streams throughout the Park.

The California Forest Practice Rules (California Code of Regulations, Title 14, Section 916.5) define Class I, II, III, and IV waterbodies. Class I waterbodies are those where fish are always or seasonally present onsite. Bodfish Creek would be classified as a Class I stream as it supports spawning and rearing by steelhead. Those fish found upstream of barriers in Bodfish Creek are resident rainbow trout, rather than anadromous steelhead (Smith 2002). Arthur Creek and Blackhawk Canyon Creek may have portions of their reaches that would be classified as Class I, II, or III. Other, unnamed intermittent streams and tributaries exist throughout the Park and may be classified as Class II, Class III, or unclassified streams. There are no known manmade watercourses, Class IV, originating within the Park boundaries.

Several small ponds exist in the Park, including Nielson Lake in NRMZ 2 (1.05 acres), a small un-named pond south of the old Nielson house in NRMZ 2 (>0.1 acre), and a small un-named pond in

NRMZ 3 (>0.1 acre). Numerous seeps and springs also occur in the Park, notably along the Rock Springs and Blue Springs Trails and on the Blackhawk Canyon Trail. It is anticipated that seep and spring locations will be assessed and mapped during the specific project planning process such that impacts are minimized. Figure 2 presents graphically portrays the Park's water resources.

The Park is also located in the CALWATER Planning Watersheds summarized in Table 7. CALWATER provides a standard nested watershed delineation scheme using the State Water Resources Control Board numbering scheme. Its standardized boundary delineation, coding, and naming of California watersheds is used by government agencies in evaluating mapping, and documenting water resources and water quality information and regulations and evaluating a project's cumulative impacts. Each of these watersheds is subject to the Coastal Anadromy Zone Forest Practice Rules.

Table 7
Mount Madonna County Park CALWATER Planning Watersheds

Name	Number
Hughes Creek	3305.100302
Arthur Creek	3305.200202
Blackhawk Canyon	3305.200303
unidentified	3305.300100

Source: CALWATER 2.2.1 (2016)

2.2.5 Vegetation Communities/Land Cover Types

This section summarizes the vegetation communities and land cover types present in the Park. Preparation of the Santa Clara Valley Habitat Plan (ICF 2012) included vegetation community/land cover type mapping and the resulting data set covered the entirety of the Park (County of Santa Clara 2017b). The Habitat Plan vegetation community/land cover mapping effort involved a classification system based primarily on the classification system of the California Department of Fish and Wildlife (CDFW), which is based on the Manual of California Vegetation (Sawyer and Keeler-Wolf 1995, ICF 2012). Development of the Habitat Plan vegetation community/land cover mapping data also involved a review of other local and state vegetation mapping data sets and field visits by project biologists (ICF 2012).

This vegetation community/land cover data set was evaluated and utilized in preparation of this Plan to understand the Park's dominant vegetation types. More detailed descriptions for forested areas are presented in Section 3 and are augmented with summaries of Dudek's observations made

during field assessment efforts. The Park includes 9 different vegetation communities and 17 different land cover types, as summarized below[1].

- **Grassland**
  - California Annual Grassland: An herbaceous plant community dominated by nonnative annual grasses (ICF 2012). In the Park, annual grasslands also occur as meadows within forestland areas, functioning as a rare and important habitat valued for biodiversity. Meadows in forestland also break up vegetation structure continuity and can serve as or augment fuel breaks.
  - Serpentine Bunchgrass Grassland: Bunchgrass occurring on serpentine soils, which generally have lower overall cover of vegetation and are characterized by low plant growth and productivity (ICF 2012).
- **Chaparral and Scrub**
  - Mixed Serpentine Chaparral: Chaparral found on serpentine soils, generally more open than other chaparral types, and shrubs are typically shorter with reduced, curled, or thickened leaves (ICF 2012).
  - Northern Coastal Scrub/Diablan Sage Scrub: Coastal scrub composed primarily of evergreen shrubs with an herbaceous understory in openings, typically found at elevations below 300 feet (ICF 2012).
  - Northern Mixed Chaparral/Chamise Chaparral: Chaparral consisting of broad-leaved sclerophyll shrubs forming dense stands with little or no understory vegetation (ICF 2012).
- **Oak Woodland**
  - Blue Oak Woodland: Variable woodlands including single species (blue oak (*Quercus douglassii*)) stands with little shrub understory or open stands with widely spaced, mature trees with a dense shrub understory (ICF 2012).
  - Coast Live Oak Forest and Woodland: Oak woodlands dominated by stands of coast live oak (*Quercus agrifolia*), although California bay (*Umbellularia californica*) and other oaks and scattered deciduous trees can be stand components (ICF 2012).
  - Mixed Oak Woodland and Forest: Typically closed-canopy oak woodlands where no species is clearly dominant, or where different types of oak woodlands are present in small-scale mosaics (ICF 2012).

[1] More detailed information about vegetation communities/land cover types mapped in support of the Habitat Plan can be found at: https://scv-habitatagency.org/DocumentCenter/Home/View/125

- Valley Oak Woodland: Woodlands dominated by valley oak (*Quercus lobata*) trees, although often forming a mosaic with annual grasslands and found adjacent to mixed oak woodland, blue oak woodland, and riparian woodland types (ICF 2012).
- Mixed Evergreen Forest: Typically occurring on north-facing slopes, closed canopy stands dominated by California bay, madrone (*Arbutus menziesii*), tanoak (*Notholithocarpus densiflorus*), coast live oak, interior live oak (*Quercus wislizenii*), and canyon live oak (*Quercus chrysolepis*) (ICF 2012).

- **Riparian Forest and Scrub**
  - Willow Riparian Forest and Scrub: Willow-dominated stands along the margins of active channels on intermittent and perennial streams, often including cottonwood (*Populus* spp.), alder (*Alnus* spp.), maple (*Acer* spp.), sycamore (*Platanus racemosa*), and coast live oaks (ICF 2012).
  - Mixed Riparian Woodland and Forest: Similar to Willow Riparian Forest and Scrub, although no species is dominant (ICF 2012).
- **Conifer Woodland**
  - Redwood Forest: Redwood (*Sequoia sempervirens*)-dominated stands, with associated species including tanoak, madrone, and California bay (ICF 2012).
- **Wetlands**
  - Coastal and Valley Freshwater Marsh: Dominated by emergent herbaceous plants (reeds, sedges, grasses) with either intermittent flooded or perennially saturated soils (ICF 2012).
- **Open Water**
  - Pond: Small perennial or season water bodies (e.g., Sprig Lake).
- **Irrigated Agriculture**
  - Grain, Row Crop, Hay and Pasture, Disked: Tilled land not supporting orchards or vineyards (ICF 2012).
- **Developed**
  - Rural Residential: Developed land (e.g., Ranger Station/Visitor Center).

Table 8 summarizes vegetation community/land cover types in the Park, by NRMZ.

Table 8
Mount Madonna County Park Land Covers, by NRMZ

Land Cover Type	Acres (by NRMZ)									Total
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	
Blue Oak Woodland								35	16	**51**
California Annual Grassland	13	3	38		1				8	**63**
Coast Live Oak Forest and Woodland		1			184	18			3	**206**
Coastal and Valley Freshwater Marsh			1							**2**
Grain, Row-crop, Hay and Pasture, Disked		8						21	9	**38**
Mixed Evergreen Forest	26	183	6	38	82	44	14		34	**427**
Mixed Oak Woodland and Forest	15	5			5		116	173	182	**496**
Mixed Riparian Forest and Woodland		3						9	11	**23**
Mixed Serpentine Chaparral		15			17				35	**67**
Northern Coastal Scrub / Diablan Sage Scrub		28		35	46	15		102	26	**252**
Northern Mixed Chaparral / Chamise Chaparral		82	12	38	20	14	14	15	36	**231**
Pond		2							1	**3**
Redwood Forest	463	392	207	309	277	434	405	66	125	**2,678**
Rural Residential	21		1							**22**
Serpentine Bunchgrass Grassland		2			29				13	**44**
Valley Oak Woodland										**0**
Willow Riparian Forest and Scrub								2		**2**
Total:	**539**	**724**	**265**	**420**	**660**	**525**	**549**	**423**	**500**	**4,605**

Source: County of Santa Clara 2017b

As presented in Table 8, the dominant vegetation community in the Park is redwood forest (58% of the Park), with significant cover of mixed evergreen forest (9% of the Park) and mixed oak woodland and forest (11% of the Park). Figure 4 presents the distribution of the different vegetation communities/land covers in the Park.

2.2.6 Fire and Logging History

Throughout the latter part of the nineteenth century, logging was a critical commercial activity in the Santa Cruz Mountains and portions of the land that now comprise the Park were logged (County of Santa Clara 2017c). This activity occurred within the Park's redwood forestland, clar-cutting most of the 'old growth' redwood forest to provide lumber for urban portions of the San Francisco Bay Area (County of Santa Clara 2017c). Due to changes in land ownership and a shift away from commercial logging in the area encompassing the Park, subsequent redwood harvesting did not occur. The result is that the majority of the current redwood forest in the Park is second growth, resulting in a different, denser stand structure. A more detailed discussion regarding redwood stand structure is presented in Section 3.1. Field observations indicated that no logging

or significant removal of trees occurred in the oak woodland land cover types present in the Park, based on the lack of observable stumps, logging roads, skid trails, or other features consistent with logging operations.

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

Fire history is also an important component in understanding fire frequency, fire type, significant ignition sources, and vulnerable areas. The topography, vegetation, and climatic conditions associated with the Santa Cruz Mountains combine to create a unique situation capable of supporting large-scale, high-intensity, and sometimes damaging wildfires. The history of wildfires burning within 5 miles of the Park boundary is presented in Table 9 and graphically depicted in Figure 5.

Table 9
History of Wildfires within 5 Miles of Mount Madonna County Park

Year	Name	Acres	Cause[2]
1984	Rocha VMP Escape #2	1,240	Miscellaneous
1985	Hayes	241	Miscellaneous
1988	Uvas	413	Equipment Use
1989	Dahlberg	205	Unknown/Unidentified
1989	San Martin	261	Miscellaneous
1997	Redwood Retreat	90	Vehicle
2002	Croy	3,007	Equipment Use

[2] Fire cause is assigned by CAL FIRE. Miscellaneous refers to fires ignited by events or activities not classified as arson, campfire, debris burning, equipment use, lightning, playing with fire, powerline, railroad, smoking, vehicle, or undetermined. Undetermined refers to fires that have been investigated or are under investigation although there is insufficient information to classify them further or the fire cause has not yet been investigated.

Table 9
History of Wildfires within 5 Miles of Mount Madonna County Park

Year	Name	Acres	Cause[2]
2008	Whitehurst	256	Lightning
2008	Hummingbird	786	Lightning
2008	Summit	4,175	Debris
2017	Bally	109	Unknown/Unidentified

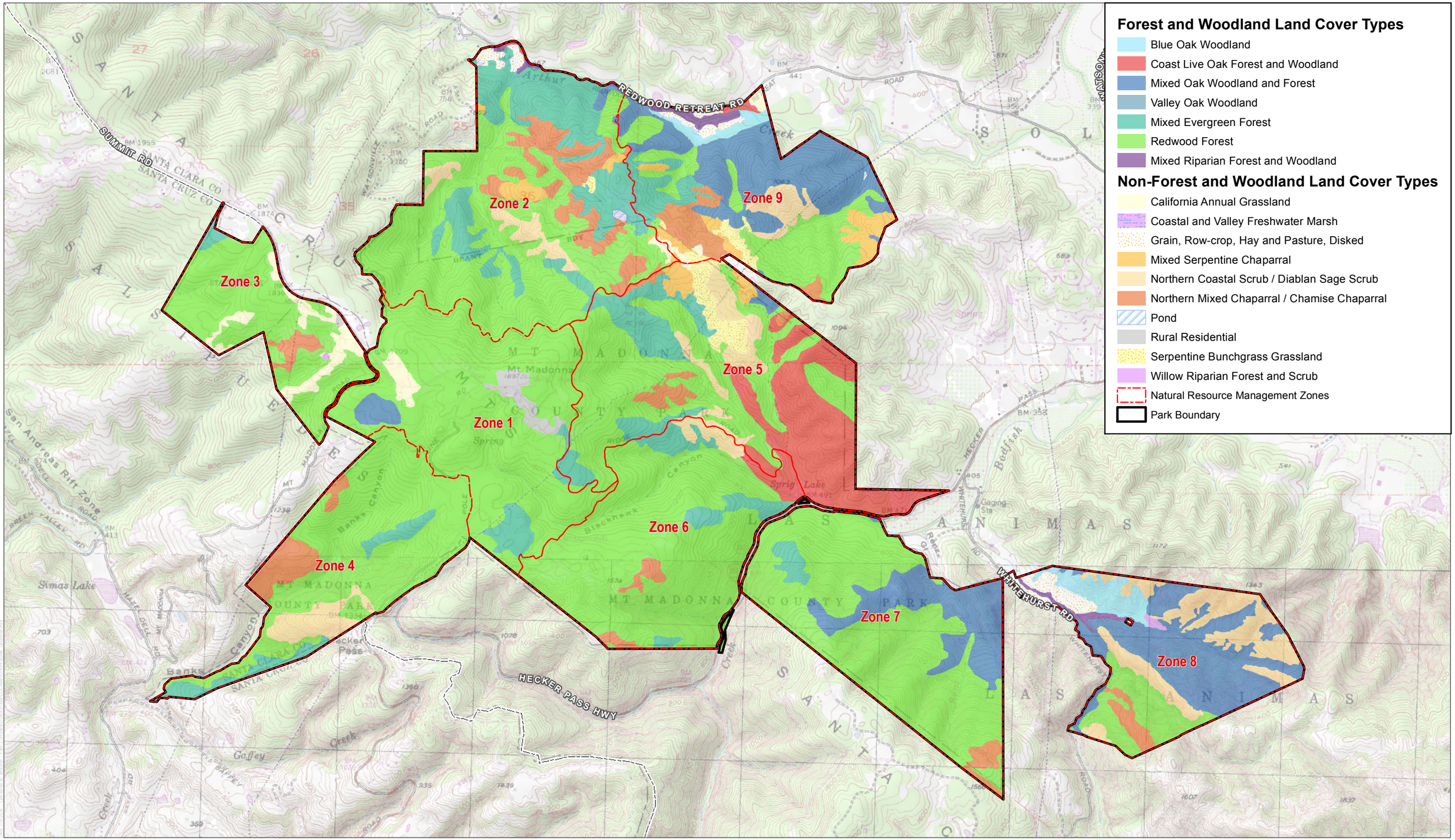
Source: CAL FIRE 2018

In addition to the fires listed in Table 9 and presented in Figure 5, other notable large wildfires in similar locations along the ridge of the Santa Cruz Mountains have occurred, as summarized below:

- Lexington Fire: Burning in July 1985, this fire was the result of arson and burned a total of 13,800 acres in the Los Gatos Creek drainage. A total of 4,500 people were evacuated and 44 structures were destroyed, including houses and outbuildings (CAL FIRE 2014).
- Summit Fire: Burning in May 2008, this fire burned 4,270 acres in the upper portion of the Soquel and Corralitos Creek watersheds. A total of 35 houses and 64 outbuildings were destroyed (CAL FIRE 2014).
- Loma Fire (2009): Burning in October 2009, this fire burned 485 acres within the Soquel Creek watershed. One trailer and two outbuildings were destroyed (CAL FIRE 2014).
- Loma Fire (2016): Burning in September and October 2016, this fire burned a total of 4,474 acres. Twelve residences and 16 outbuildings were destroyed (CAL FIRE 2018).

The Park has experienced limited wildfires. Only one wildfire in the recorded database (CAL FIRE 2018) burned in the Park - the 2008 Whitehurst Fire, which burned almost entirely in the Park in NRMZ 6. The relative lack of fire activity in the Park has helped to shape the distribution and condition of its forests. A natural fire return interval in the area is approximately 10 to 20 years (CAL FIRE 2014) in the absence of suppression activities. Natural fires at this interval serve to eliminate surface and ladder fuels, allowing for lower-intensity burns when they do occur. However, the relative lack of fire in the Park, combined with the lack of active fuel management, has resulted in hazardous fuel accumulations that could result in higher-intensity wildfires (e.g., crown fires) in the Park, should they occur. The potential for a wildfire to occur in the Park is considered high, considering potential ignition sources (e.g., Hwy 152, Park visitors) and current fuel loading conditions. Additionally, the Park occurs within an area classified by CAL FIRE as either a High or Very High Fire Hazard Severity Zone. California Public Resources Code Sections 4201–4204 and Government Code Sections 51175–51189 direct CAL FIRE to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. The resulting

FHSZs define the application of various mitigation strategies to reduce risk associated with wildland fires (CAL FIRE 2016). The model used to determine the extent of FHSZs is based on an analysis of potential fire behavior, fire probability predicated on frequency of fire weather, ignition patterns, expected rate of spread, ember (brand) production, and/or past fire history (CAL FIRE 2016a).



SOURCE: USGS 7.5-Minute Series Mount Madonna & Watsonville Quadrangles; Santa Clara County GIS (2017)

DUDEK

0 1,100 2,200 Feet

FIGURE 4

Mount Madonna County Park Land Cover Types

Mount Madonna County Park Forest Health Plan

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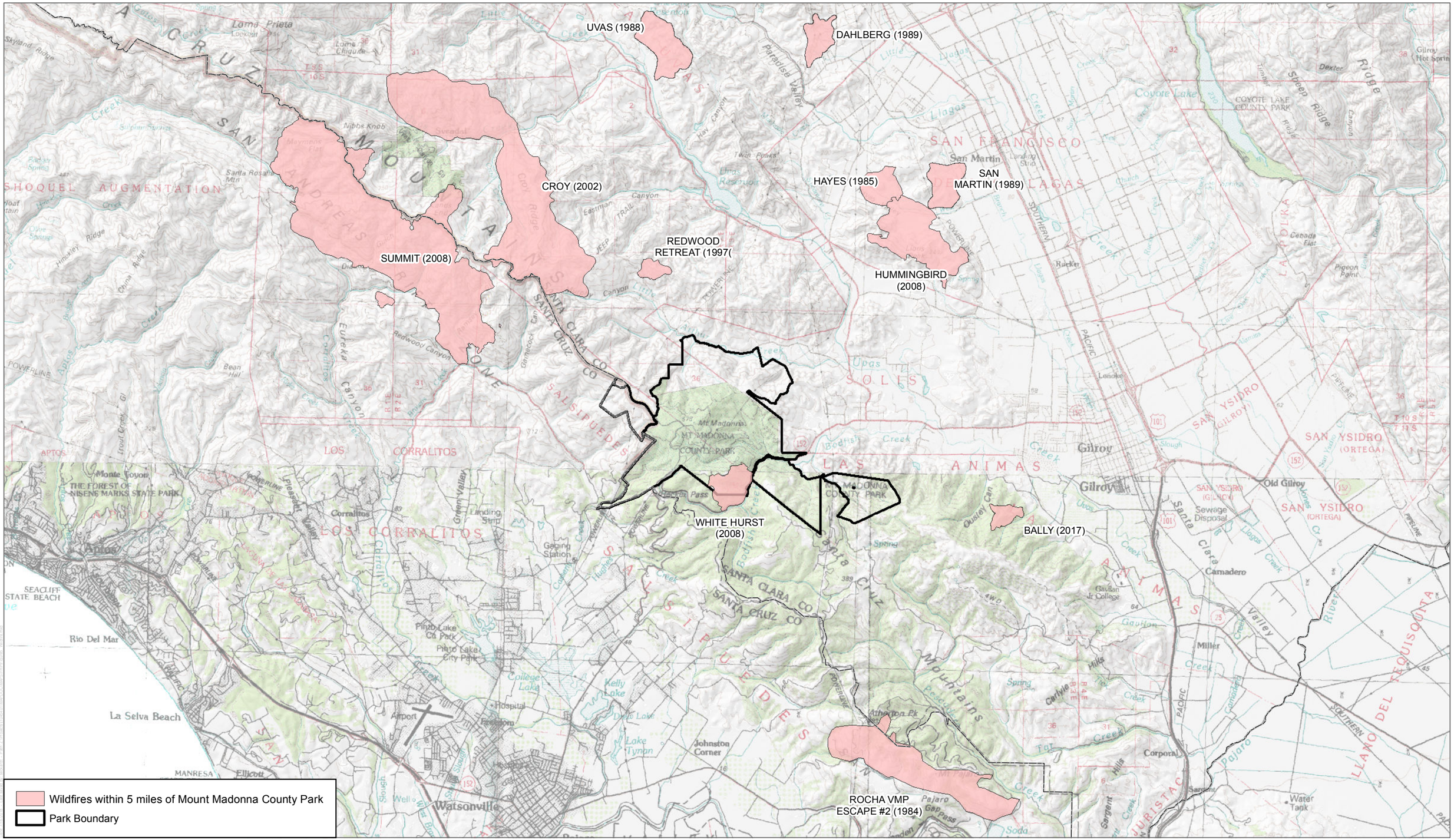

SOURCE: USGS 7.5-Minute Series Mount Madonna & Watsonville Quadrangles; Santa Clara County GIS (2017); CAL FIRE 2018

DUDEK 0 4,200 8,400 Feet

FIGURE 5

Historic Wildfires in the Vicinity of Mount Madonna County Park

Mount Madonna County Park Forest Health Plan

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2.3 Built Environment

Mount Madonna County Park provides numerous recreational amenities that draw visitors to the Park. The developed portion of the Park covers approximately 400 acres near the summit of Mount Madonna. This section summarizes the amenities provided in the Park, most of which are concentrated in NRMZs 1 and 6. A map depicting the Parks' built environment is provided in Figure 6.

2.3.1 Camping and Day-Use Areas

The Park is a popular regional destination and includes eight campgrounds (including 83 tent sites, 29 recreational vehicle sites, and 5 yurts) with numerous picnic/day use areas, concentrated in NRMZs 1 and 6. NRMZ 1 includes the Tan Oak and Valley View 1 campgrounds (including camping yurts) and the Huckleberry, Manzanita, Bayview, and West Deer Pen group campgrounds. NRMZ 1 also includes the Amphitheater, Hilltop, and Redwood group day-use areas. The Park's ranger station/visitor center, entry kiosk, amphitheater, and the Miller House ruins are also included in NRMZ 1. NRMZ 6 includes the Valley View 2 and Valley View 3 campgrounds and the Azalea and Lone Maple picnic areas.

2.3.2 Roads and Trails

Access to the Park is primarily obtained from California State Highway 152, which connects Watsonville to Gilroy. Pole Line Road, which bisects the Park and provides access to residential areas north of the Park, serves as the main access road within the Park. Pole Line Road is a County road, maintained by the County's Department of Roads and Airports. Other major roads that are used within and in the vicinity of the Park include: Summit Road (which extends north from the Park and provides access to the Mount Madonna Center), Redwood Retreat Road (which provides access to the northern portion of the Park), Mount Madonna Road (which provides access to residences north of the Park and to Watsonville Road), and Whitehurst Road (which provides access to the Clark Canyon property).

The Park's trail system contains 22-miles of trails that include 8.5 miles of hiking trails and 13.6 miles of hiking/equestrian trails. Major trails within the Park include the Loop Trail, the Sprig Trail, the Meadow Trail, the Bayview Trail, the Redwood Trail, the Tan Oak Trail, and the Blue Springs Trail. Four trail alignments that would connect to the Park are proposed within the Countywide Trails Master Plan (County of Santa Clara 1995) and the Gilroy Trails Master Plan (City of Gilroy 2005): the Bay Area Ridge Trail, Little Arthur Creek Trail, Gilroy Gardens Trail Spur, and Hecker Pass Trail.

2.3.3 Archery Range

The Park contains an archery range (in NRMZ 1) that is located on Ridge Road approximately 0.5 miles from the Park's ranger station/visitor center. The archery range includes 42 targets and is open 7 days per week during the Park's hours of operation. The range is currently managed by County Parks and includes a picnic area and parking lot.

2.3.4 Park Buildings and Facilities

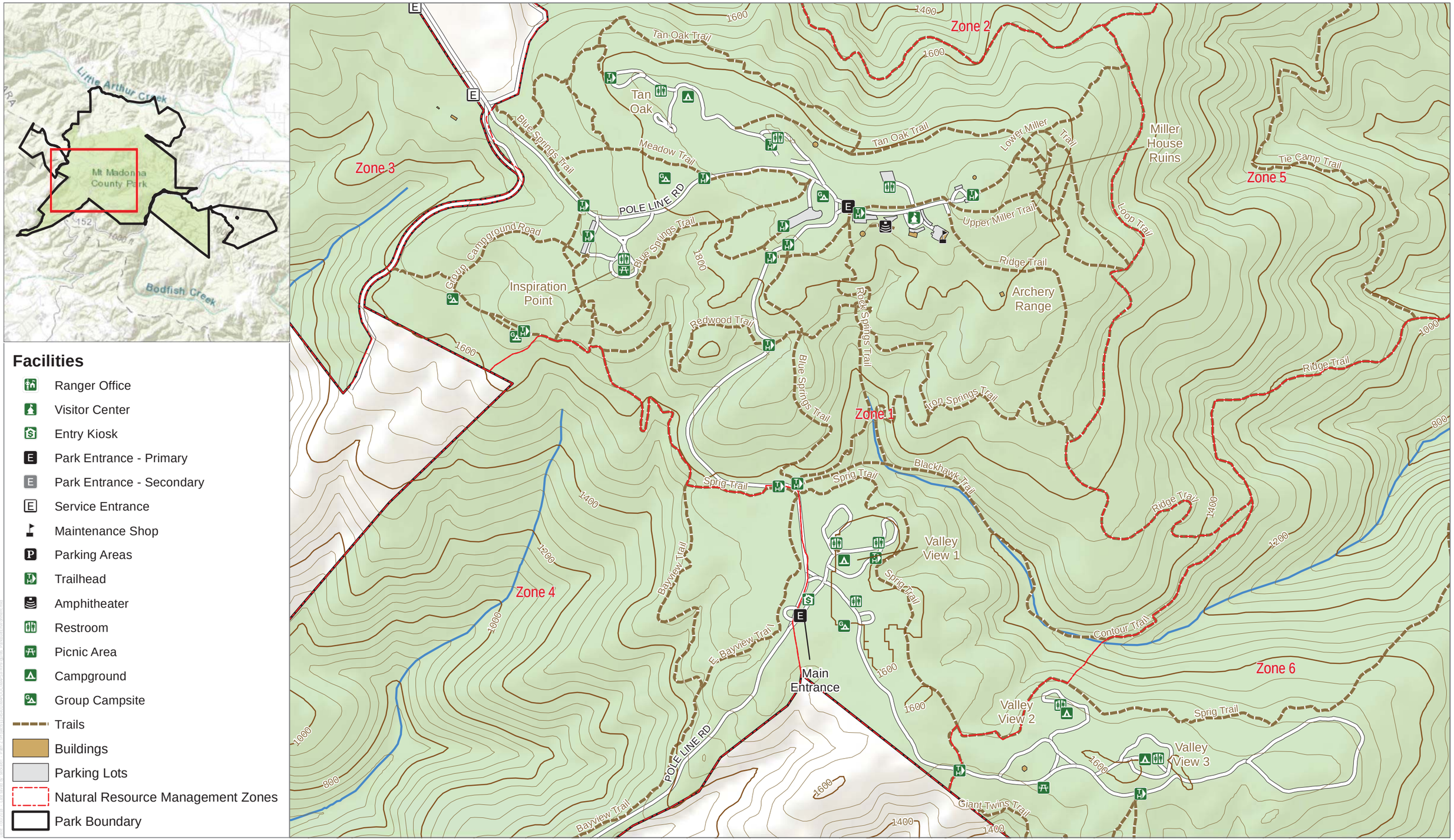
The Park contains ten picnic areas, four of which are reservable and six of which are non-reservable. The central portion of the Park where daytime use is highest (NRMZ 1), referred to as a High-Use Zone in the Park's Master Plan (Santa Clara County 2017), includes several recreational features, including tent camping, group camping, youth camping, a visitor center/staff office, an amphitheater, deer pens, archery range, a staff maintenance shop, the Henry Miller home site, and hiking and equestrian trails. The Park also includes an entrance kiosk at the entrance of the Park along Pole Line Road.

2.3.5 Historic Resources

The ruins of the Henry Miller home are located in the High-Use Zone of the Park (NRMZ 1). Cattle baron Henry Miller built his summer home in this location between 1890 and 1902. All buildings were removed in 1933 except the ruins of the Sarah Miller House. A self-guided interpretive trail has been placed through the former home site.

2.3.6 Scenic Overlook

There are several scenic overlooks within the Park allowing views toward the Monterey Bay and the Santa Clara and Salinas Valleys. One scenic overlook, known as Inspiration Point, has all but disappeared due to growth of the adjacent forest. Mt. Madonna once provided a commanding view of the Santa Clara Valley, but this view has also been obscured by the growing forests and, in the case of Inspiration Point, invasive species growth (eucalyptus). An unnamed overlook at the end of Valley View Road provides a view of the Santa Clara Valley, but no other Park developments occur near this area to draw visitors. Restoration of scenic overlooks is discussed further in Section 7.1 Project Recommendations.



Facilities

- Ranger Office
- Visitor Center
- Entry Kiosk
- Park Entrance - Primary
- Park Entrance - Secondary
- Service Entrance
- Maintenance Shop
- Parking Areas
- Trailhead
- Amphitheater
- Restroom
- Picnic Area
- Campground
- Group Campsite
- Trails
- Buildings
- Parking Lots
- Natural Resource Management Zones
- Park Boundary

SOURCE: ESRI 2018; Santa Clara County GIS (2017)

DUDEK

0 360 720 Feet

FIGURE 6

Mount Madonna County Park Built Environment

Mount Madonna County Park Forest Health Plan

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2.4 Planned Development

The Mount Madonna County Park Master Plan (County of Santa Clara 2017c) was developed in response to an increase in visitors and demand for Park facilities. The purpose of the Master Plan is to guide the expansion of recreational uses and infrastructure needed to maintain them, while ensuring the unique natural beauty of the park remains intact. The Master Plan primarily focuses on existing developed and high use areas of the Park, specifically NRMZs 1, 3, and 6 in order to maximize improvements to the Park in an efficient manner while minimizing environmental impacts. Recommendations to improve Park facilities within high existing or projected demand areas are included in the Plan and implementation projects are proposed to fulfill Master Plan goals and recommendations. Most Master Plan recommendations aim to expand or improve existing facilities and visitor serving uses. The primary goals of the Master Plan include providing development that is consistent with the Park's natural character and history and that promotes and maintains ecological processes, to develop an activity hub with a new visitor center, to enhance the entrance to the Park and improve wayfinding throughout the Park, to increase natural and active recreational opportunities within the Park, to prioritize protection of water resources, and to ensure Park development and operation occurs in a fiscally sustainable manner. Proposed improvements identified in the Master Plan may require tree removal or have the potential for impacting retained trees. Best management practices identified for minimizing impacts to trees are presented in Section 8.9.

Implementation projects proposed to achieve these goals are listed in Table 10.

Table 10
Mount Madonna County Park Master Plan Implementation Projects

Phase	Timeline	Projects	Zone
1	1-5 years	1. Planning and improvement of existing water system 2. Other needed infrastructure improvements 3. Site planning for road improvements and day-use expansion in High Use Zone 4. Site planning for changes to Valley View campgrounds 5. Plan improved Park wayfinding system	High Use Valley View

Table 10
Mount Madonna County Park Master Plan Implementation Projects

Phase	Timeline	Projects	Zone
2	2-8 years	1. Convert tent area in Valley View I to cabins or yurts. Develop a new loop road for the yurts or cabins to improve existing traffic flow along Valley View Road. 2. Add tent camping at Valley View IV 3. Develop campfire circles or other central gathering features at key points throughout Valley View 4. Develop camp store pilot program 5. Expand day-use picnic areas throughout the High Use Zone 6. Execute improvements to Tan Oak Road 7. Convert Tan Oak Campground to day-use/add new children's adventure play area adjacent to the future visitor center 8. Install improved Park wayfinding system	High Use Valley View
3	4-10 years	1. Plan, design and construct new visitor center near former deer pen 2. Convert former visitor center to staff office 3. Anchor Park wayfinding with improvements to Park entrance with gateway features relating to the new visitor center in High Use Zone 4. Incorporate new interpretive features throughout Park to promote education and learning	High Use Valley View
4	As funding and operation and maintenance needs are available	1. Seek partner or concession for active adventure-style recreational uses including zip lines, physical challenge courses, ropes course or other similar facilities in Summit Zone. 2. Develop plans for these new facilities and construct	Summit

Source: County of Santa Clara 2017c

3 PARK FOREST RESOURCES

This section summarizes Mount Madonna County Park's forest resources. The following components summarize the forest health evaluation efforts conducted in support of this Plan:

- Field Assessments: Conducted to identify and assess Park forest conditions, including qualitative assessments of stand conditions (species composition, density, tree conditions), fuel loading, presence of insects and or disease, terrain, and access. Field assessments involved ground-based evaluations by a Registered Professional Forester (RPF) of each NRMZ. A total of six days were spent on site between September and November 2017 conducting forest health field assessments. More time was dedicated to assessments near NRMZs with higher visitation and Park development versus NRMZs that are remote and inaccessible to Park visitors. Documentation of field conditions was conducted using data collection forms that summarized symptoms of forest health problems, hazardous fuel conditions, and conditions near proposed future development. Field assessments were coordinated with Park staff and key areas visited together to better understand and document current forest health issues (e.g., areas of pathogen infestation), current Park operations associated with tree or forest management, and any operational constraints associated with tree or forest management. Field data collection forms are provided in Appendix A along with representative site photographs.
- Geographic Information Systems (GIS) Analysis: Conducted to evaluate Park conditions, including terrain, vegetative cover, soils, water resources, NRMZs, developed uses, sensitive biological resources, fire history, and the extent of Park roads and trails. GIS data was acquired from Park staff, or other publicly available sources (e.g., County of Santa Clara, the California Department of Forestry and Fire Protection, CDFW). All GIS data was managed and evaluated using ArcGIS 10.5 and used to generate many of the data tables and maps included in this Plan. Data sources are cited in the appropriate sections in this Plan.
- Research: Conducted to evaluate existing site conditions, potentially occurring special-status species and other sensitive biological resources in the Park, and the history of tree/forest health issues facing the Park (e.g., previous pathogen studies). Research was also conducted to better understand the planning and regulatory environment affecting potential forest management activities in the Park, including a review of existing master plans, management plans and programs (e.g., Mount Madonna County Park Master Plan, Park Tree Safety Program), regulations (e.g., County Tree Preservation and Removal Ordinance), Park staffing and available equipment, and current Park management practices associated with or affecting trees or forests.

The following sections provide more detailed information about the Parks forestland, forest health issues, sensitive biological resources, and cultural resources that are a component of the Park's forestland.

3.1 Forest and Woodland Types

As described in Section 2.2.5, the Park consists of numerous vegetation communities/land cover types, including several forest and woodland types. The diversity of forest and woodland types in the Park is typical of its location along the ridgeline of the Santa Cruz Mountains, where environmental conditions favor establishment of forest types from each neighboring region (e.g., redwood along the coastal side, oak woodlands along the valley side). Within the Park, conditions range from sheltered canyons with regular summer fog inundation, to dry exposed slopes with shallow soils. This section describes the Park's existing forest and woodland types, as identified in Section 2.2.5, their distribution within the Park, and current observed conditions. Acreages of each forest and woodland type, by NRMZ, are presented in Table 8 in Section 2.2.5.

3.1.1 Oak Woodland

The oak woodland vegetation community encompasses numerous land cover types, as summarized in the following sections. Dominant overstory tree species are noted in each description. Oak woodlands are drought tolerant, fire-adapted, and able to regenerate via stump sprouting after cutting or fire. Some oak woodlands have poor regeneration rates and are subject to insect and disease infestations (e.g., sudden oak death). Potential threats to oak woodlands include high-intensity wildfire, air pollution, development impacts, competition with invasive species, and the spread of pests and pathogens, notably the sudden oak death pathogen (further described in Section 6.1). Proposed development in oak woodlands under the Park Master Plan is minimal. In general, the oak woodlands in the Park were observed to be healthy, with mortality and recruitment/in-growth in relative equilibrium. No significant tree mortality or decline was observed in the Park's oak woodlands.

3.1.1.1 Blue Oak Woodland

Blue oak woodlands are located at lower elevations where conifer forestland transitions to rangelands in the Santa Clara Valley to the east of the Park. This land cover type is not widely distributed throughout the Park (50.8 total acres) and is localized on drier mid-slope sites in the lower elevations of NRMZ 8 and NRMZ 9, a significant distance from the high-use areas in NRMZs 1 and 6. Typical associated overstory species include coast live oak and California buckeye (*Aesculus californica*). Understory species include annual grasses, poison-oak (*Toxicodendron diversilobum*), coffeeberry *(Rhamnus californica*), chamise (*Adenostoma fasciculatum*), ceanothus (*Ceanothus* spp.), and manzanita (*Arctostaphylos* spp.). Stand densities

range from sparsely scattered overstory trees on poor sites to nearly closed canopies on good quality sites (UCANR 2018). Blue oak woodland is considered a sensitive community by CDFW (ICF 2012). In blue oak woodlands, Park uses are limited to hiking and horseback riding, with access provided by a few trails and native surface roads.

3.1.1.2 Coast Live Oak Woodland and Forest

Coast live oak woodlands are located at lower elevations and typically on slopes with south and west aspects. This land cover type is not widely distributed through the Park (206.1 total acres) and is localized on drier mid-slope sites in the lower elevations of NRMZ 5, a very small portion of NRMZ 6 near the Sprig trailhead, and a very small portion of NRMZ 9 at lower elevations along Arthur Creek. Typical associated overstory species include madrone, California bay, tanoak, canyon live oak, and foothill pine (*Pinus sabiniana*). Understory species include annual grasses, poison-oak, coffeeberry, toyon (*Heteromeles arbutifolia*), chamise, ceanothus, and manzanita. Stand densities range from sparsely scattered overstory trees on poor sites to nearly closed canopies on good quality sites (UCANR 2018). In coast live oak woodlands, Park uses are limited to hiking and horseback riding, with access provided by a few trails and native surface roads.

3.1.1.3 Mixed Oak Woodland and Forest

Mixed oak woodlands are located at lower and mid elevations where conifer forestland transitions to rangelands in the Santa Clara Valley to the east of the Park. This land cover type is not widely distributed through the Park (495.6 total acres) and is located on drier mid-slope sites in NRMZs 5, 7, 8, and 9. Typical associated overstory species include foothill pine, California buckeye, valley oak, interior live oak, coast live oak, canyon live oak, and California black oak (*Quercus kelloggii*). Understory species include annual grasses, poison oak, coffeeberry, ceanothus, and manzanita. Stand densities range from sparsely scattered overstory trees on poor sites to nearly closed canopies on good quality sites (UCANR 2018). In mixed oak woodlands, Park uses are limited to hiking and horseback riding, with access provided by a few trails and native surface roads.

3.1.1.4 Valley Oak Woodland

Valley oak woodlands represent a very small portion of the Park's land cover (> 0.1 acre) and are present in only one location at the northern portion of NRMZ 9 along Arthur Creek. This land cover type is dominated by valley oaks and no significant tree mortality or decline was observed.

3.1.1.5 Mixed Evergreen Forest

Typically associated with areas of poor site quality surrounded by redwood-dominated stands, mixed evergreen forests in the Park are primarily tanoak stands and are located at mid- and upper-

elevations throughout the Park. Mixed evergreen forest is widely distributed throughout the Park and occurs in small amounts in every NRMZ except NRMZ 8, although its largest concentration is in the northern portion of NRMZ 2, along the mid-slope above Arthur Creek. Many of the tanoak trees comprising this land cover type (and those present in redwood stands) were observed to have minimal stem (trunk) taper, a condition resulting from dense, fast-growing stands that have not been subject to regular disturbance or thinning. Stem taper correlates with trunk strength, where little/no taper results in lower strength. Typical associated overstory species include redwood, madrone, and California bay. Understory species include poison oak, coffeeberry, toyon, coyote brush (*Baccharis pilularis*), ceanothus, and manzanita. In mixed evergreen forests, Park uses include hiking and horseback riding, with access provided by a few trails and native surface roads. Popular trails in NRMZs 1, 4, 5, and 6 traverse mixed evergreen forest areas.

3.1.2 Evergreen Forests

3.1.2.1 Redwood Forest

Redwood forest is the most prominent forest type in the Park (2,677.1 total acres) and the dominant forest type in all NRMZs except NRMZs 8 and 9. Redwood forests prefer deep, shady canyons with regular fog inundation. These conditions can be found in many Park locations, except in the lower, valley-side portions of the Park where oak woodlands dominate (NRMZs 8 and 9). Park uses are extensive within the redwood forest. Given its aesthetic appeal, most of the Park's facilities, including campgrounds, picnic areas, trails, roads, administrative buildings, and other structures are all found in or near redwood forest. Also, nearly all trailheads, with the exception of Sprig Trailhead, are located in redwood forest.

Typical associated overstory species include tanoak, madrone, and California bay. Understory species include poison oak, coffeeberry, toyon, coyote brush, ceanothus, and manzanita. Densities range from sparsely scattered overstory trees on poor sites to nearly closed canopies on good quality sites. Actual stand density values measured in trees per acre, basal area, or quadratic mean diameter (QMD) are not identified in this Plan, nor are other calculations typically derived from statistical plot sampling such as timber volume, growth rate, carbon storage and sequestration, age, diameter range, heights, ingrowth, species distribution, and crown cover or density. Statistical sampling, in the form of a forest resources inventory, is recommended as a preliminary step in implementing redwood stand restoration recommendations outlined in Section 7.1.4. Common forest resource inventory sampling methods vary from continuous forest inventory (CFI), strip cruise, 3P, variable-radius plots, and others.

The Park's redwood trees are generally healthy, with little mortality. Field observations noted relatively few trees exhibiting symptoms of water stress and related secondary pests, including

dead tops and chlorotic leaves. Only two old-age trees, the Giant Twins (NRMZ 6), remain as monuments to the redwood's long lifespan and history. The Giant Twins have multiple tops, large limb diameters, fire scars, and low trunk taper. It is likely that other old-age redwood trees exist in various locations within the Park, and their presence tells the story of "high-grading" silvicultural practices conducted in the early 20th century. This practice left less-desirable specimens on the landscape when trees with premium commercial value were harvested. Presence of late-successional forests (LSF), as defined by the California Forest Practice Rules (California Code of Regulations, Title 14, Section 895.1), is unknown at this time and further study is needed to confirm if any stands meet this definition. Observations during field evaluations found no indication that LSFs existed within the Park boundaries. The clear-cut of the redwood forests in the early 20th century would also support the conclusion that there is little, if any, LSF within the Park. Field observations also found very low quantities of late-seral elements such as snags, downed woody debris, basal hollows, multiple canopy layers, and trees with complex structure which are functional elements of late seral stage redwood forests.

Most redwood stands in the Park would be characterized as very dense, although specific stand density measurements, such as trees per acre, are unknown at this time. This is often the case in second growth redwood stands, due to their capacity for sprouting multiple trees from one stump (Lindquist 2007). This is compounded by the successional stage of the Park's redwood stands, which exhibit a once-dominant tanoak component (that grew vigorously post-harvesting) that is now being overtaken by redwoods. The condition of these stands was confirmed by visual estimation during field evaluations. Additionally, the lack of significant disturbance in the Park's redwoods following the initial clear-cut, such as wildfire, insects or diseases, blowdown, or tree cutting, allows disproportionately high tree densities to occur compared to redwood stands that are regularly thinned by these disturbances. Such high stand density conditions increase competition and reduce tree vigor, predisposing trees to stress from drought, nutrient deprivation, and poor lighting. Secondary agents, the pests and pathogens in the forest, take advantage of a tree's weakened defenses. Throughout western forests, catastrophic tree die-off events are occurring due to wildfire, pests and disease outbreaks, and/or the stress associated with climate change. Restoration silvicultural treatments in the Park's redwood stands, as recommended in Section 7.1.4 of this Plan, are intended to restore balance to the system such that stressors are kept in check by a healthy, vigorous forest.

As with other forest types, threats to the health of redwood stands include abiotic factors such as wildfire, air pollution, and drought, and biotic factors including competition, poor regeneration, and, to a lesser degree, insects and disease. A recent trend showing measurable decreases in fog inundation, even in years with normal rainfall, suggest that the threat of drought to redwood stands began before, and continues beyond, the 2011-2017 drought. The redwood forests in the Park are

also the location of pathogen outbreaks primarily affecting its other dominant overstory trees, tanoak and madrone. A more detailed discussion of the pathogen issues facing Park trees is included in Section 6.1.

3.1.3 Mixed Riparian Forest and Woodland

Mixed riparian forests and woodlands represent a very small portion land covers in the Park (22.1 total acres) and are located at lower elevations along Bodfish Creek, and its tributaries in NRMZs 7 and 8, and Arthur Creek in NRMZs 2 and 9. This land cover type is not widely distributed in the Park and is found far from areas used by Park visitors. Mixed riparian forests and woodlands were observed to be generally healthy, with no significant tree mortality or decline observed. Threats to the health of these stands include abiotic factors such as wildfire, air pollution, and drought, and biotic factors including competition, poor regeneration, insects, and disease. Typical associated overstory species include white alder (*Alnus rhombifolia*), bigleaf maple (*Acer macrophyllum*), sycamore, California bay, and buckeye. Understory species include annual grasses, poison oak, coffeeberry, Himalayan blackberry (*Rubus armeniacus*), willow (*Salix* spp.), dogwood (*Cornus nuttallii*), and horsetail (*equisetum* L.). Stand densities range from sparsely scattered overstory trees on poor sites to nearly closed canopies on good quality sites. There are no developed trails or roads within this land cover type.

3.1.4 Other

3.1.4.1 Eucalyptus

Several eucalyptus stands exist in the Park and are not mapped separately in the vegetation community/land cover type mapping presented in this Plan. However, a discussion of these stands is important in understanding existing forest conditions. All eucalyptus trees observed in the Park were blue gum (*Eucalyptus globulus*). Blue gum is identified as an invasive species by the California Invasive Plant Council (Cal-IPC) (Cal-IPC 2017). A broader discussion of blue gum is presented in Section 6.2. Eucalyptus stands in the Park are moderately to highly dense with larger, mature overstory trees and understories comprised of grass, brush, eucalyptus seedlings, saplings, small trees, and eucalyptus leaf, twig, branch and bark litter. From a wildfire hazard perspective, fuel loading in these stands is considered high.

Three main eucalyptus stands were identified in the Park. The first is located at Inspiration Point (NRMZ 1), measures approximately 15-acres in size, and occurs within an area mapped as coast live oak forest. The second is located along the south side of Pole Line Road (NRMZ 4), west of the Valley View 1 campground, and measures approximately 3 acres in size. The third is located at the southwestern end of NRMZ 4, along Banks Canyon and measures approximately 48 acres in size.

There are several other small stands of eucalyptus trees present in the Park, typically with 10 or fewer large diameter trees, with no observable regeneration, located along dirt Park access roads.

3.2 Special-Status Plant and Wildlife Species

Special-status biological resources present or potentially present in the Park were identified through a records search using the following sources: U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC); Trust Resource Report (USFWS 2017); CDFW California Natural Diversity Database (CNDDB) (CDFW 2017); and the California Native Plant Society (CNPS) online Inventory of Rare and Endangered Vascular Plants (CNPS 2017). Records searches were conducted for the United States Geological Society 7.5-minute Mount Madonna quadrangle and the surrounding eight quadrangles. Following review of these search results, the potential for each species to occur within the Park was determined based on a review of vegetation communities and land cover types, habitat types, soils, and elevation preferences, as well as the known geographic range of each species. For example, if the Park is within the elevation range of a particular plant species, but a specific soil type for the species is not present, the species is considered to have low potential to occur in the Park. Also, species were not expected to occur when the Park was clearly outside of the known geographic or elevation range of the species.

Special-status species and habitats with moderate to high potential to occur, or which have been previously recorded at Mount Madonna County Park, are presented in Table 11. All special-status species identified during the records search conducted for this Plan are presented in Appendices B and C. Practices to avoid and/or minimize impacts to sensitive species are included in Section 8.6.

Table 11
Protected Species and Habitats with Moderate to High Potential, or Previously Recorded, at Mount Madonna County Park

Scientific Name	Common Name	Status
		Federal/State/CRPR or Other
Special-status Plant Species		
Arctostaphylos andersonii	Anderson's manzanita	None/None/1B.2
Arctostaphylos regismontana	Kings mountain manzanita	None/None/1B.2
Ceanothus ferrisiae	Coyote ceanothus	FE/None/1B.1
Dudleya abramsii ssp. *setchellii*	Santa Clara Valley dudleya	FE/None/1B.1
Hoita strobilina	Loma Prieta hoita	None/None/1B.1
Holocarpha macradenia	Santa Cruz tarplant	FT/CE/1B.1
Lessingia micradenia var. *glabrata*	smooth lessingia	None/None/1B.2
Malacothamnus arcuatus	arcuate bush-mallow	None/None/1B.2
Monolopia gracilens	woodland woolythreads	None/None/1B.2
Penstemon rattanii var. *kleei*	Santa Cruz Mountains beardtongue	None/None/1B.2

Table 11
Protected Species and Habitats with Moderate to High Potential, or Previously Recorded, at Mount Madonna County Park

Scientific Name	Common Name	Status
		Federal/State/CRPR or Other
Streptanthus albidus ssp. *peramoenus*	most beautiful jewelflower	None/None/1B.2
Special-status Wildlife Species		
Ambystoma macrodactylum croceum	Santa Cruz long-toed salamander	FE/CE/FP
Aneides flavipunctatus niger	Santa Cruz black salamander	None/SSC/None
Dicamptodon ensatus	California giant salamander	None/SSC/None
Rana draytonii	California red-legged frog	FT/SSC/None
Actinemys marmorata	western pond turtle	None/SSC/None
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat	None/CSS/None
Accipiter cooperii (nesting)	Cooper's hawk	None/WL/None
Oncorhynchus mykiss irideus	steelhead - central California coast DPS	FE/None/None
Protected Vegetation Communities		
Serpentine Bunchgrass	Serpentine Bunchgrass Grassland	G2/S2.2/None
Sequoia sempervirens Alliance	Redwood Forest	G3/S3/None
Umbellularia californica Alliance	California Bay Forest	G4/S3/None

Sources: CNPS 2017, CDFW 2017, USFWS 2017.
Notes: CRPR = California Rare Plant Rank.
Federal Status:
FE = federal endangered species
FT = federal threatened species
State Status:
CE = California endangered species
CSS = California species of special concern
FP = Fully protected
G2 = Imperiled – At high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors
G3 = Vulnerable – At moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors
S2 = Imperiled – Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 of fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.
S3 = Vulnerable – Vulnerable in the state due to restricted range, relatively few populations 9often 80 of fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
WL – A watch list species
CRPR:
1B = plants rare, threatened, or endangered in California and elsewhere
Threat Ranks:
.1 = seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)
.2 = moderately threatened in California (20%–80% of occurrences threatened/moderate degree and immediacy of threat)

3.3 Cultural Resources

Cultural resources in the Park consist of bedrock mortars, believed to be from the Ohlone Indians (County of Santa Clara 2017c) and the ruins of the Henry Miller Estate (SCCDPR 2008). Additional Native American resources have the potential to be found in the Park, given its history as a hunting and gathering site for the Ohlone Indians (SCCDPR 2008). Measures to minimize impacts to cultural resources are included in Section 8.7.

4 PARK FOREST MANAGEMENT

This section describes existing land or resource management plans and programs relevant to implementation of this Plan as well as a summary of Park staffing and equipment and current practices implemented in or near trees and forestland.

4.1 Planning and Regulatory Environment

4.1.1 County Plans, Programs, and Ordinances

4.1.1.1 Santa Clara County General Plan

The Santa Clara County General Plan (General Plan) (County of Santa Clara 1994) was adopted in December 1994 to address major challenges and opportunities facing Santa Clara County during its growth and development. The Resource Conservation Element of the County's General Plan is the official policy document addressing the protection and management of natural and heritage resources within the County. This General Plan element includes policies addressing water conservation, habitat protection and restoration, preservation of agricultural resources, mineral resource acquisition, heritage resource protection, and scenic view preservation, among others. Regarding tree and forest management, the General Plan discusses improving the current knowledge and awareness of habitats and natural areas, habitat protection and restoration, and biotic resource education.

4.1.1.2 Santa Clara County Parks and Recreation System Strategic Plan

The Santa Clara County Department of Parks and Recreation recently adopted an updated Strategic Plan (SCCDPR 2018). The Strategic Plan is intended to identify and prioritize current and future outdoor recreation values and needs, ensure that the Department's mission and guiding vision remain relevant, provide for great customer experiences, foster a nimble learning organization with engaged and empowered employees, and make progress towards a fiscally sustainable future. The Plan includes a focus on natural resource protection that balances conservation, habitat value, climate resiliency, reducing the likelihood of catastrophic wildfires, improving water quality, and protecting wildlife. The strategies and actions relating to natural resource management include completion of this Forest Health Plan.

4.1.1.3 Santa Clara Countywide Trails Master Plan

The Santa Clara Countywide Trails Master Plan (County of Santa Clara 1995) was adopted in November 1995 to direct the County's trail implementation efforts by providing a trails route map and policies for a countywide trail system. These policies are designed to guide future planning,

define trail implementation processes, identify priorities, mitigate environmental impacts, and direct trail design, operations and management. Strategy 2 of this plan incorporates policies that aim to provide public trail needs in accordance with environmental and landowner concerns. Relevant policies included in this strategy involve trail route location, design, and development in consideration of sensitive natural resources and hazards, and protection of sensitive species and habitats. Strategy 4 of the plan includes policies that encourage adequate operation and maintenance of trails. These policies include closure of trails during unsafe conditions or environmental damage, controlling levels-of-use and types-of-use on trails, developing a monitoring program, performing ongoing maintenance, and providing trail signage and marking.

4.1.1.4 Santa Clara Valley Habitat Conservation Plan

The Santa Clara Valley Habitat Conservation Plan (SCVHCP) (ICF 2012) is a framework for protecting, enhancing, and restoring natural resources within specified areas in Santa Clara County. The plan also allows for the streamlining of the permitting process for planned development, infrastructure and maintenance projects within the area covered by the plan. Santa Clara County, the Santa Clara Valley Water District, the Santa Clara Valley Transportation Authority and the cities of Gilroy, Morgan Hill, and San Jose are able to receive incidental take permits for their activities and projects and those under their jurisdiction as a result of the SCVHCP. The comprehensive approach of the plan allows for a more efficient and effective method to be implemented to respond to natural-resource impacts and provide mitigation. Additionally, the plan would more efficiently protect natural resources by setting aside larger and more ecologically valuable habitat reserves. The SCVHCP provides mitigation for impacts to certain land use activities and covers certain Rural Operations and Maintenance activities that may be conducted by County Parks. Covered management activities may include prescribed burns, mechanical fuel removal, invasive vegetation management, manual labor, herbicide use, management of other exotic nuisance species, and managed grazing. The SCVHCP does not cover timber harvesting activities in the County.

County Parks management of natural resources including grassland, oak woodland, and riparian natural communities; protection and enhancement of freshwater resources; erosion control; sensitive species management and monitoring outside of the Reserve System. Management may include prescribed burns, mechanical fuel removal, invasive vegetation management, manual labor, herbicide use, bullfrog management, feral pig removal, management of other exotic nuisance species, and managed grazing.

4.1.1.5 Santa Clara County Community Wildfire Protection Plan

The Draft Santa Clara County Community Wildfire Protection Plan (CWPP) (County of Santa Clara 2016) provides goals for reducing wildfire hazards and risk in the wildland-urban interface areas of Santa Clara County, and describes specific issues and projects to meet strategic goals. The Draft CWPP was prepared in accordance with the federal Healthy Forests Restoration Act of 2003 and meets its requirements by identifying and prioritizing fuel reduction treatments within the County, and addressing structural ignitability, and including collaboration with stakeholders. The Draft CWPP aims to prevent and mitigate the occurrence and effects of wildfire to protect human life and reduce property loss through a collaborative approach that includes cooperation within and between communities. In order to achieve this, the plan includes recommendations related to general planning projects, public outreach and education, structural ignitability, firefighting capabilities, and fuel reduction treatments. These recommendations are supported by summaries that identify specific implementation steps, implementing agencies, benefits, timelines, priorities and available resources.

4.1.1.6 Santa Clara County Tree Preservation and Removal Ordinance

The Santa Clara County Code of Ordinances Division C16 was enacted to preserve the County's trees on private and public property in order to establish and maintain the County's tree cover, protect property values, preserve aesthetic quality, prevent erosion and reduce flood and landslide hazards, counteract air pollutants, protect from high winds, provide shade and climatic balance, offer wildlife habitat and protect historical and community assets. The ordinance regulates tree removal, identifies protected trees, specifies the permit process required for removal of protected trees, and describes restrictions on commercial and heritage tree removal.

Any tree removal or pruning for the maintenance, operation, or development of County Parks property under established policies or procedures requires advance review and approval by the Director of the Parks and Recreation Department.

4.1.1.7 Santa Clara County Integrated Pest Management and Pesticide Use Ordinance

The Santa Clara County Integrated Pest Management and Pesticide Use Ordinance was established to protect the health and safety of County employees and the general public, the environment, and water quality and to provide sustainable solutions for pest control on County property. The ordinance aims to reduce pesticide use within the County to the maximum extent possible and give preference to non-pesticide alternatives. The ordinance applies only to property owned by Santa Clara County and describes regulations related to the County's Integrated Pest Management

program, and allowances, restrictions, posting, and record keeping and reporting of County pesticide use.

4.1.2 Regional or State Plans, Programs, and Regulations

4.1.2.1 California Forest Practice Rules

The California Department of Forestry and Fire Protection (CAL FIRE) enforces the California Forest Practice Act (California Code of Regulations, Title 14, Chapters 4, 4.5 and 10) which regulate commercial timber harvesting on non-federal lands in California. A Timber Harvesting Plan (THP), Exemption, or Emergency Notice must be prepared by a Registered Professional Forester for timber harvesting on non-federal lands in the state. THPs are prepared for timber operations and must be consistent with applicable laws and regulations, including, but not limited to, the California Environmental Quality Act (CEQA). THPs have been certified to serve as a functional equivalent of an Environmental Impact Report under CEQA, require public noticing and solicitation of public input, and include feasible mitigation measures and an evaluation of alternatives which would lessen or avoid adverse environmental impacts. Timber operations conducted under this Plan would require preparation of a THP, Exemption, or Emergency Notice by an RPF prior to operations. Timber operations include cutting/removal of trees for commercial purposes (where the resulting material would be sold, bartered exchanged, or traded). Timber operations would not include removal of smaller trees for fuel management or non-commercial purposes, with specific criteria outlined in California Public Resources Code Section 4527(b).

4.1.2.2 CAL FIRE/Santa Clara Unit Strategic Fire Plan

The 2017 CAL FIRE/Santa Clara Unit Strategic Fire Plan (CAL FIRE 2017) is produced on an annual basis for the coming fire season. The Plan includes an assessment of the fire situation in the Santa Clara Unit (which includes Santa Clara County), stakeholder contributions and priorities, and strategic targets for pre-fire solutions developed by people who reside and work in the local fire problem area. The Unit Strategic Fire Plan is designed to achieve the goals and objectives of the 2010 Strategic Fire Plan for California under the direction of the Unit's Pre-Fire Engineer. After identifying and evaluating existing wildfire hazards, the Plan supports collaboration between stakeholders in the implementation and development of actions to reduce potential for a wildfire and ensure adequate response in the event of a wildfire.

4.2 Park Plans and Programs

4.2.1 Mount Madonna County Park Master Plan

The Mount Madonna County Park Master Plan (County of Santa Clara 2017c) was approved by the County of Santa Clara Board of Supervisors in 2017. The purpose of the Master Plan is to plan for development within the Park while ensuring adequate protection, management and maintenance of the Park's existing resources. The Plan focuses planning efforts primarily on areas that are already developed in order to minimize environmental impacts and concentrate development in a way that would be most efficient for both future use and implementation purposes. The Plan primarily evaluates three zones within the Park, the Summit Zone, High-Use Zone, and Valley View Zone, as these areas are currently developed or are near developed areas. Existing conditions, opportunities and constraints are identified for each zone, and used to develop the recommended design for the Park and recommendations for improvements to visitor-serving amenities and revenue generating facilities. The Implementation chapter of the Plan describes how these recommendations will be prioritized and implemented.

4.2.2 Mount Madonna Interim Natural Resources Management Plan

The Mount Madonna Interim Natural Resources Management Plan (SCCDPR 2008) establishes tasks needed to implement a natural resource management program for the Mount Madonna/Chitactac-Adams County Park Management Unit. The Plan assesses existing natural resources, problems and threats, provides goals, and sets forth tasks and BMPs to achieve presented goals. The resource management tasks outlined in the Plan include to manage and control exotic and invasive plants, protect primary resources through patrol, prepare a forest management plan, and survey for special status plants and animals, among others. The Plan prioritizes for the management of a healthy forest community that is resilient and supports a diverse community of plants and animals. It emphasizes that locations with high ignition potential should be managed first to decrease fuel loading and create defensible space.

4.2.3 Mount Madonna/Chitactac Collaborative Park Management Plan

The Mount Madonna/Chitactac Collaborative Park Management Plan (SCCDPR 2017) provides goals, objectives, trends, and accounting information for both Mount Madonna County Park and Chitactac-Adams County Park. The Plan includes a summary of park usage and recreational trends, financial details, goals and outcomes for the previous year and following year, and a description of large events, projects and renovations that are happening at the parks. The Plan describes that Mount Madonna County Park is undergoing a planning process and suggests siting large picnic

areas near campgrounds, construction of an equestrian camping area, and opening a loop at the Nielson property that would connect to the Old Mine Trail within the Park.

4.2.4 Tree Safety Program

The Santa Clara County Department of Parks and Recreation (Santa Clara County Parks) Tree Safety Program (SCCDPR 2003) guides management of trees within Santa Clara County Parks in all areas where visitors and park staff congregate and remain stationary for periods of time. The Tree Safety Program reasonably manages trees, particularly in developed areas, to sustain their health, to maintain a representation of the natural ecosystem, and to identify and minimize problems that might result in tree failure, visitor or park staff injury, or property damage. The Tree Safety Program has documented processes and procedures for detection, monitoring, evaluation, and treatment of potentially hazardous trees. In general, native trees outside of designated public use areas will not be managed under the Tree Safety Program.

The implementation of the Tree Safety Program is the responsibility of the Parks' Natural Resource Management program. A formal safety inspection of all trees in each public use area within the Santa Clara County Park system is conducted by a trained Park Natural Resource program staff on a bi-annual basis. The formal inspections are augmented through informal observations of potentially hazardous trees by park unit staff and visitors throughout the Santa Clara County Park system. Trees with significant defects that pose a threat to public safety are identified by a numbered tag by a trained Park Natural Resource Management program staff. All significant tree defects, including environmental conditions such as soil conditions and wind exposure, are recorded and a treatment(s) to abate a hazardous situation is recommended. Treatments are completed by park unit staff or licensed contractors, and Natural Resource Management program staff confirms that treatment has been completed.

4.3 Park Staffing and Equipment

The staff at Mount Madonna County Park is part of the Mount Madonna Unit, which is also responsible for services and programs at Uvas Canyon and Chitactac-Adams County Parks. Park staff splits time between these parks, but the percentage of time spent in each park varies based on seasonal visitor use, maintenance requirements, and public events. The Park Maintenance and Operations staff are responsible for the day-to-day operation and maintenance of the Park while various other County Parks Programs, such as Natural Resources Management, identify and complete projects and provide guidance on program-related issues. The permanent staff allocations responsible for the Mount Madonna Unit are provided in Table 12.

Table 12
Mount Madonna County Park Staff

Program Area	Staff Allocations and Positions
Park Maintenance	(1) Senior Park Maintenance Worker (5) Park Maintenance Worker
Park Operations	(1) Senior Park Ranger (4.5) Park Ranger (1) Park Services Attendant
Natural Resources Management	(1) Natural Resource Program Coordinator*

* Also responsible for natural resources at other County Parks units within its Region

The Park Maintenance staff provide clean and safe amenities to the public at Mount Madonna County Park. The Park Maintenance staff is responsible for the maintenance of campgrounds, day-use areas, and groups sites throughout the park. The Park Maintenance staff also provides safe drinking water and clean restroom facilities. In addition to the public use areas of the park, the Park Maintenance staff maintain the grounds, vegetation, and aesthetics of the park, including maintenance of the trail and service road systems.

The Park Operations staff focus on public safety, interpretation, and resource management within Mount Madonna County Park. The Park Rangers provide a safe environment to allow visitors a memorable day-use and camping experience. The Park Rangers enforce County ordinances and routinely patrol the park to keep a pulse on the activities within the park. The Park Rangers also provide Search and Rescue response, medical aide, and fire safety necessary. The Park Service Attendants greet visitors coming into the park, collect fees, and provide users with information to enhance the experience.

The Mount Madonna Unit staff collaborate with the Natural Resources Management program to preserve, conserve and enhance the parks' natural resources and ecological processes. The Natural Resources Management program uses scientific data and management plans to implement management strategies that conserve and improve natural resources throughout the County Parks system. The Natural Resources Management program provides park staff with guidance to protect, enhance, or restore the park through effective vegetation, fire, wildlife, riparian, wetland, and exotic species management. The Natural Resources Management program also provides direction for implementation of best management practices, Integrated Pest Management, and environmental compliance. As projects described in the Mount Madonna Regional Park Master Plan (County of Santa Clara 2017c) are implemented, additional staffing may be required. Equipment available for conducting Park management and maintenance tasks is summarized in Table 13.

Table 13
Equipment Available for Mount Madonna County Park

Location	Equipment
Mount Madonna County Park	4x4 utility vehicle John Deere 210LE Landscape Loader John Deere 4720 Tractor AK-50-S Pump Unit & Peripherals AK-50 50 Gallon air fire pumper
Uvas Canyon County Park	Towable Bear Cat Chipper Polaris Ranger Kubota L5701HST Tractor
Central Yard	Takeuchi Excavator NorAm Grader Tractor/Loader/Backhoe (multiple) Front Mower (multiple) McConnell PA93M Flail Mower Water Truck Water Tank Trailer Fire pumper and 75-gallon tank Chippers Laymor Towable Sweeper 8HC Dump Trucks Portable generators
Natural Resources Management/Trail Crew	SWECO Trail Dozer John Deer 790 MFWD Tractor Bearcat Chipper John Deere Compact Excavator 27D John Deer Landscape Loader Kubota Tractor B3200HSD Kubota Land Pride Boxscraper B335SU Sutter 500 Trail Dozer

In addition to Park staff, County Parks signed agreements in 2015 with two agencies that provide skilled labor for fuel reduction project [the California Conservation Corps (CCC) and the San Jose Conservation Corps (SJCC)]. Both of these agencies can engage in fuel reduction projects on Parks lands and their agreements extend through 2020 (Santa Clara County 2016).

4.4 Current Park Forest Management Practices

Currently, proactive forest management practices conducted in the Park are limited to implementation of the Park's Tree Safety Program and treatment or removal of hazard trees identified during this effort. As noted, a formal safety inspection of all trees in each public use area within the Santa Clara County Park system is conducted by a trained Park Natural Resource

program staff on a bi-annual basis. Park Maintenance staff are then responsible for carrying out any necessary tree trimming or removal work under the Tree Safety Program. Currently, tree removal in the Park resulting from assessments conducted under the Tree Safety Program are limited in quantity. However, as discussed and summarized in Section 6.1.1, two previous efforts to remove significant numbers of hazard trees were conducted in 2001 and again in 2012. These efforts removed several hundred dead, dying, or diseased hardwoods (primarily tanoaks) in and around the developed, public-use portions of the Park (NRMZ 1).

Beyond these efforts, forest management efforts in the Park have been reactive in nature, treating fallen trees that prohibit access to or use of recreation areas (e.g., campgrounds, roads, trails). Current practices involve felling or cutting trees to clear them from Park facilities such that access is regained. In most cases, material is cut to sizes that allow it to be moved out of use areas or from trails and roads, and it is left to decompose in large, intact sections. These management actions contribute negatively to forest health in the Park, by increasing fuel loads and potential host material for forest pests/pathogens. Although done in previous years, pile burning efforts in the Park have been curtailed due to air quality concerns and permitting requirements. A previously-used burn pit near Bayview Road has been unused for years.

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5 PUBLIC ENGAGEMENT

Stakeholder engagement was conducted to support development of this Plan and its associated environmental review document under CEQA, which is forthcoming. The target audience for the stakeholder engagement effort included County elected officials, local stakeholder organizations, landowners, immediate neighbors, and the general public. Plan information was distributed via direct mail, email, and at a community meeting conducted at Mount Madonna County Park on July 17, 2018. Feedback on the Plan was collected via email and public comments submitted at or following the community meeting.

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6 FOREST THREATS

This section summarizes biotic and abiotic threats to forest health observed in the Park, or which have a high likelihood to occur in the Park. Also included is a discussion of historic pathogen outbreaks that have affected Park trees. Given the Park's location, and frequent public use, the introduction of more and/or new forest pests or invasive species in the future is likely. Project-specific recommendations included in this Plan are intended to address some forest threats directly, while BMPs are provided to minimize the potential negative effects to forest health. Park forest monitoring recommendations are intended to allow for detection of new/introduced threats.

6.1 Forest Pests

Forest pests, such as insects, fungi, other microbes, and vertebrates, are a natural component of California's native forests. Populations of pests are dynamic and fluctuate in response to climatic and environmental changes such as drought, stand density, fire, and other site disturbances. Healthy, vigorous trees are typically able to withstand pest attacks, when pest populations are at endemic levels. When stressors exist in forests (e.g., overstocking, shading, drought), tree vigor is reduced and tree susceptibility to pest attacks and infestations increases. Park management actions (e.g., root and soil disturbance, trunk damage) can also contribute to pest and pathogen spread (Glaeser and Smith 2010, USFS and CAL FIRE [no date]).

The primary issue facing Park trees are fungal pathogen outbreaks. No significant insect infestations have been documented in the Park and heavily stressed trees observed during field observations did not show signs of insect infestation. The history of fungal pathogen outbreaks in the Park is presented in the next section, while identification of potential regional pests is presented in Section 6.1.2.

6.1.1 History of Fungal Pathogen Outbreaks

In two distinct events (in 2001 and again in 2012), removal of several hundred dead, dying, or diseased hardwoods (primarily tanoaks and madrones) in and around the developed, high-use portions of the Park (NRMZ 1) was required. In both instances, numerous trees had failed, either by uprooting or breaking at mid-bole, and the removal efforts were intended to minimize risk from potential future tree failures. Numerous assessments of site conditions and individual affected trees were conducted to determine causation. Both tree removal events occurred over the summer months, necessitating closure of campgrounds for public safety purposes. Pathology investigations noted root and crown rot as well as heart and canker rot caused by the *Armillaria* and *Phytophthora* pathogens. As of the date of this Plan, the sudden oak death (SOD) pathogen (*Phytophthora ramorum*) has not been confirmed in the Park. In addition, an assessment of trees in the Park was

conducted in April 2014. The following summarizes observations and findings of tree assessments conducted between 2000 and 2014:

- **December 2000:** County staff conducted sampling in campgrounds, day-use areas, along Valley View Road, and at the old Deer Pen picnic site to identify the presence of SOD. Eight subsequent sampling efforts were conducted with no confirmation of SOD in the Park. Oak root fungus (*Armillaria mellea*) and *Phytophthora cinnamomi* were confirmed in the Park during these visits.
- **June/July 2001:** Consulting arborists conducted assessments in the Valley View 1, Valley View 2, and Tanoak campgrounds. Tanoaks and madrones presented decay during this assessment, though no decay was observed to be affecting redwoods. Some trees required removal, but many more were affected. *Phytophthora cinnamomi* was suspected and some bark beetle infestations were noted during this assessment. *Hypoxylon* fruiting bodies were also observed. Additionally, some redwoods were exhibiting stress and some tanoaks were exhibiting early stages of decline. The consulting arborists noted that recent trenching for waterlines likely affected root systems. Oak root fungus and trunk cankers exhibiting characteristics of SOD were also observed and samples were taken for SOD testing. The consulting arborists also observed ambrosia beetle boring evidence on some trees. The consulting arborists concluded that multiple factors were affecting the evaluated trees: waterline root impacts, stand density/competition, compacted soils, and multiple pathogens (*Armillaria*, *Hypoxylon*, and possibly *Phytophthora*). Subsequent to this site assessment, test results confirmed that the SOD pathogen was not present, though the presence of *Phytophthora nemorosa* was confirmed.
- **February 2012:** A consulting arborist conducted assessments in the Valley View 1 and Tanoak Campgrounds, and the Huckleberry, Hilltop and Deer Pen group areas. *Armillaria* mushrooms were observed in treated areas and clusters of affected trees were also documented. The arborist concluded that higher bole failures were not likely the result of *Armillaria* fungi. *Inonotus* or *Phellinus* (canker rot fungi) decay was suspected for bole breakage, but the arborist noted that this was difficult to confirm. The arborist noted that aerially infecting pathogens were likely affecting most or all tanoaks failing at mid-bole. The arborist recommended to minimize trunk wounds or conduct pruning in mid- to late-summer to minimize infection potential. Lab test results were negative for SOD after testing a tanoak tissue sample and the arborist concluded that at least one canker rot/trunk decay fungi was affecting trees. The arborist also stated that cutting can increase *Armillaria* levels which can affect redwood and noted that another *Phythopthora* species may be present on site. CAL FIRE conducted a site assessment in February 2012 as well, observing root and stem rot in cut stumps (Sampson 2012).

- **April 2014:** A consulting arborist conducted assessments in Upper Miller trail, Upper Miller hill, the Tanoak Access Trail and surrounding area, and the Valley View 2 campground. Redwood trees with dead tops and watersprouts were observed, and the construction of a paved access road was identified as a potential cause of the declining health of the trees, exacerbated by drought. A declining madrone tree was observed, and the arborist suspected madrone twig blight (*Botryosphaeria dothidea*) and recommended tree removal. Declining tanoak trees were also observed and samples taken from branch cankers. Oak root fungus mushroom clusters were also observed near affected tanoaks. Tall, poorly -tapered tanoak trees were also observed in redwood stands and the arborist recommend systematic removal of these trees over time. Watersprouts were also observed on redwood stumps and the arborist noted the potential for failure, although no targets were identified so a removal recommendation was not made.

In support of Plan development, field surveys were also conducted by Dudek in September and November 2017, and May 2018. The 2017 surveys included general assessments of trees and stands throughout the high-use areas of the Park in NRMZs 1 and 6. No access was available for NRMZ 7 and no pine stands were evaluated. The majority of oak woodlands were assessed through roadside reconnaissance. The survey in May 2018 included sample collection for Sudden Oak Death testing to confirm whether the pathogen was present in Park trees located in high-use areas (NRMZs 1 and 6) that exhibited symptoms of infestation (trunk cankers on tanoaks and oaks, leaf spots and shoot dieback on other species). Twelve samples were collected during this effort and submitted for testing, although test results are unavailable as of the date of this Plan. Dudek noted the following observations of tree or stand conditions within the high-use areas of the Park during 2017 field evaluations:

- Signs and symptoms of *Armillaria* in tanoak, madrone, and redwood trees. Various stages of crown dieback, uprooting, disease center distribution and progression of severity. *Armillaria mellea* mushrooms were discovered.
- Signs and symptoms of canker rots, suggesting *Phellinus/Inonotus*. Mid-bole breakage in trees with advanced decay. Bark cankers were rarely visible on standing trees. According to Park staff, failed trees often appeared to have healthy crowns. No fruiting bodies observed on standing trees. Observed fungus on felled trees suspected to be *Phellinus/Inonotus*.
- Cankers and dieback on madrone, but nearly all madrone failures caused by root rot.
- No observations of SOD symptoms, including leaf spotting and burned leaf tips on California bay trees, dead crowns on tanoak or coast live oak trees, and bleeding cankers on tanoak or coast live oak trees.

6.1.2 Potential Forest Pests

A significant number of pests may impact forests in the Santa Cruz Mountains, including the Park. This section summarizes host/agent associations for diseases and insects that have been observed in the Park or which have a high likelihood of affecting Park trees, given its location. Future Park forest monitoring efforts should document presence and relative levels of these pests, as well as others that may be introduced in the future.

The Park is located within the Pitch Canker Zone of Infestation (CAL FIRE 1998), although no observations of pitch canker have been documented in the Park. Presence of SOD has been suspected, but not confirmed, in the Park, but it is known to occur along the northern and central coast of California (Davidson et al. 2003). The Park is within the SOD Zone of Infestation (CAL FIRE 2005) and the "Regulated Area" for SOD as designated by the California Department of Food and Agriculture (CDFA), which covers the same area as the Zone of Infestation (CAL FIRE 2014). Section 8 of this Plan discusses best management practices to minimize pest/pathogen spread, and Section 9 discusses forest health monitoring recommendations for pest and disease presence.

The rest of the non-*Phytophthora* pathogenic fungi in Table 14 are considered secondary agents. In most cases, these pathogens act opportunistically on already weakened trees. The signs of *Armillaria* root rot and its effects, particularly devastating to the redwood/tanoak/madrone stands, are evident in many locations within the Park. Drought and competition are the two most influential factors predisposing the Park's forests to these opportunistic attacks. Pathogen-infected firewood brought into the Park from other areas is also a significant threat to the Park's forests.

Table 14
Potential Forest Pathogenic Fungi

Disease	Host Species											
	Redwood	*Tanoak*	*Madrone*	*Coast live oak*	*Black Oak*	*Blue oak*	*Valley oak*	*Shreve oak*	*Bigleaf maple*	*Bay*	*Knobcone pine*	*Douglas fir*
Root Diseases												
Armillaria root rot (*Armillaria mellea* or *A. gallica*)	x	x	x	x	x	x	x	x	x	x	x	x
Artist's conk (G. applanatum)		x	x	x	x	x	x	x	x	x		x
Phytophthora cinnamomi	x	x	x	x	x	x	x	x	x	x	x	x
Black stain root disease (Leptographium wageneri)												x
Annosus root disease *(Heterobasidion annosum)*												x

Table 14
Potential Forest Pathogenic Fungi

Disease	Host Species											
	Redwood	*Tanoak*	*Madrone*	*Coast live oak*	*Black Oak*	*Blue oak*	*Valley oak*	*Shreve oak*	*Bigleaf maple*	*Bay*	*Knobcone pine*	*Douglas fir*
Canker/Needle Disease												
Pitch canker (*Fusarium circinatum)*											x	
Foamy bark canker (*Geosmithia pallida)*				x				x				
Canker rots (*Inonotus andersonii, I. dryophilus)*		x		x	x	x	x	x				
Phellinus gilvus, P. robustus, P. weiri, P. pini		x		x	x	x	x	x				x
Sudden oak death (*Phytophthora ramorum)*	x	x	x	x	x	x	x	x	x	x		
Phytophthora nemorosa	x	x		x				x		x		
Decay												
Redwood cubical rot (*Poria sequoiae)*	x											
Hypoxylon thouarsianum		x		x		x	x	x				
Sulfur fungus (*Laetiporous* spp.*)*		x	x	x		x	x	x	x	x		x

Aggressive insect infestations are not commonly reported issues in the Park. Native insects are generally at endemic levels and therefore tend to not cause major damage in the Park's forests. Table 15 presents those invasive and damaging insects that have the potential to pose a threat to the health of the Park's forests in the event of an infestation. None of these aggressive insects have been detected in the Park to date, but their distribution is expanding to new regions every year and light brown apple moth has been detected in Santa Clara County. Observing the damage that these insects cause in other regions supports this Plan's recommendations for employing best management practices provided in Section 8 to minimize potential impacts from insect infestation. Park staff should monitor for signs of insect damage and seek to positively identify the insects, as recommended in Section 9.

Table 15
Potential Forest Insects

Insect	Host Species										
	Redwood	*Tanoak*	*Madrone*	*Coast live oak*	*Blue oak*	*Valley oak*	*Shreve oak*	*Bigleaf maple*	*Bay*	*Knobcone pine*	*Douglas fir*
Gypsy moth (*Lymantria dispar)*	Not currently found in California. Prefers conifers and hardwoods.										
Asian longhorned beetle (*Anoplophora glabripennis)*	Not currently found in California. Prefers deciduous trees and shrubs.										
Polyphagous and Kuroshio shot hole borers (*Euwallacea* spp.*)*	Currently only known in southern California. Prefers coast live oak and other hardwoods.										
Gold spotted oak borer (GSOB)*	Currently only known in southern California. Prefers coast live oak and black oak, and kills other oaks at lower levels.										
Light brown apple moth (*Epiphyas postvittana)*				x	x	x	x				
Douglas fir beetle (*Dendroctonus pseudotsugae*)											x
Flatheaded fir borer (*Melanophila drummondi*)											x

* Park is in the potential spread area of GSOB (Coleman et al. 2017)

Mistletoe (and dwarf mistletoe) infestations are not a commonly reported problem within the Park. The parasitic plants usually have little impact on healthy oak trees. Animal damage is also not a commonly reported problem within the Park, although is common in forests in the Santa Cruz Mountains. Deer browsing may contribute to losses of seedlings and saplings of various tree species. The dusky-footed woodrat is known for stripping bark from young redwood trees and pocket gophers feed voraciously on young tree roots. Wild boar can create excessive ground disturbance and consumes large quantities of acorn mast, competing with the native species for this important food source and limiting oak regeneration potential. Section 9 discusses forest health monitoring recommendations for pest and disease presence.

6.2 Invasive Plant Species

Invasive plants can threaten the health of the Park's forests by outcompeting native trees for light, water, and nutrients, thereby displacing them, inhibiting their growth, or reducing overall tree or stand vigor. Invasive plants can also increase fire hazard by increasing fuel loads or introducing more flammable and/or more readily-ignitable vegetative material into the forest ecosystem (Brooks et al. 2004). Invasive species in the Park may occur within any of the identified vegetation community/land cover types. Common invasive plants in the Santa Cruz Mountains are presented in Table 16.

Table 16
Common Invasive Species in the Santa Cruz Mountains

Common Name	Scientific Name
French broom	*Genista monspessulana*
Periwinkle	*Vinca major*
Poison hemlock	*Conium maculatum*
Jubata grass	*Cortaderia jubata*
English ivy	*Hedera helix*
Eupatory	*Ageratina adenophora*
Subterranean clover	*Triflorium subterraneum*
Italian thistle	*Carduus pycnocephalus*
Italian ryegrass	*Lolium multiflorum*
Forget me not	*Myosotis latifloria*
Bermuda buttercup	*Oxalis pes-capre*
Orchard grass	*Dactylis glomerata*
Bull thistle	*Circium vulgare*
Cutleaf geranium	*Geranium dissectum*
Rough cat's-ear	*Hypochaeris radicata*
Common chickweed	*Stellaria media*
Field bindweed	*Convovulus arvensis*
Broadleaf fleabane	*Conyza sumatrensis*
Spiny sowthistle	*Sonchus asper*
Soft chess	*Bromus hordeaceus*
Bur-chevril	*Anthriscus caucalis*
Sticky chickweed	*Cerastium viscosum*
Fiddle dock	*Rumex pulcher*
Blue gum	*Eucalyptus globulus*
Olive	*Olea europaea*

Source: CAL FIRE 2014

Blue gum trees are the primary invasive plant species observed in the Park (locations described in Section 3.1.4). French broom was also observed in the Park, although it is not widely distributed. Best management practices to reduce the spread of invasive species are provided in Section 8. As invasive species can be introduced and establish over the Plan timeframe, monitoring and adaptive management are recommended to address changes in species, locations, and populations in the Park (Section 9).

As noted, blue gum eucalyptus is identified as an invasive species by Cal-IPC (Cal-IPC 2017). Within groves, its presence reduces biological diversity as it displaces native trees and corresponding wildlife habitat. Understory plant and seedling development is inhibited by the tree's production of allelopathic chemicals, as well as the physical barrier formed by high volumes

of debris (leaves, bark strips, limbs, and branches) (Cal-IPC 2018a). Blue gum eucalyptus stands also increase wildfire hazard. Fuel buildup in eucalyptus stands is very rapid and its litter (dead leaves and debris) is especially flammable (Agee et al. 1973, Wolf and DiTomaso 2016). Given its growth characteristics, blue gum bark readily catches fire, and bark streamers can carry fire into the canopy, producing embers that can be carried by strong winds. Peeling bark contributes to ground-based fuels (litter) when it falls and is retained for a period of time on tree trunks, where it can facilitate ground to canopy fire transition (ladder fuel). Blue gum also has a higher content of volatile organic compounds (Gabbert 2014) and highly-combustible oil and flammable gasses may be released from trees at very high temperatures, further increasing fire hazard (Gross 2013).

Although not widespread in the Park, French broom was observed in small quantities, primarily in previously-disturbed soils and along unmaintained dirt roads, although it may occur in grasslands and redwood stands. It is identified as Cal-IPC invasive species (Cal-IPC 2017). French broom displaces native plant species, makes reforestation difficult, and is a strong competitor that can dominate a plant community, forming dense monospecific stands. Given its rapid growth rate, it can also shade out seedlings (Cal-IPC 2018b). French broom spreads by prodigious seed production and may also sprout from the root crown (Bossard 2000) or upper stem (Boyd 1995) when above-ground parts are removed by cutting, freezing, or fire. From a wildfire hazard perspective, dense broom stands can produce large amounts of dry matter and can serve as a highly flammable understory that increases crown fire potential in invaded areas (Bossard 2000).

6.3 Wildfire

Wildfire, like insects and disease, is an important disturbance in forests. Repeated low to moderate severity wildfires, like those that were more common prior to the onset of wildland fire suppression policies, can improve or maintain forest health by consuming surface fuels and small, understory trees, thereby reducing competition and reducing fuels loads that contribute to high-intensity, large-scale conflagrations. High-intensity fires typically result in significant mature tree mortality, pose a high risk to public safety, and often precede large-scale soil loss from subsequent landslides. Fire hazard in the Park is considered high and is influenced by several factors summarized below:

- **Fire History:** As noted in Section 2.2.6, the only recorded fire in the Park occurred in 2008, burning 256 acres in NRMZ 6. Large scale fires are not uncommon in the Santa Cruz Mountains, with numerous large wildfires occurring near the Park in the past 30 years. A fire history project in the Santa Cruz Mountains identified a regional fire return interval of 12 years, and a grand mean fire return interval for single trees in the sample equal to 16.3 years (Stephens and Fry 2005). The fire return interval for the Park well exceeds these numbers, with the exception of the 2008 burn area. There is no record of stand-replacing wildfires in the Park.

- **Stand Density and Fuel Loading:** Given the relative lack of fires and minimal forest and fuels management in the Park, current forest conditions are overly-dense, as exhibited in the high stocking levels (high number of trees), high fuel loading, and the presence of ladder fuels that can facilitate ground fire spread to tree canopies (crown fire). Buildup of vegetative debris along forest road shoulders from road clearing, minimal treatment of downed trees in remote Park areas, and numerous dead and dying trees also contribute to high fuel loading.
- **Invasive Species:** Several stands of blue gum are present in the Park. This species constitutes a risk for wildfire due to its high fuel load and contribution to fire propagation and spread, as discussed in the above section. One of the stands (near Inspiration Point) was noted by CAL FIRE as having high fire potential during a 2012 site inspection (Sampson 2012).
- **Drought:** Recent drought conditions in the region also exacerbate fire hazard in the Park by reducing fuel moisture. Drought stress is also a contributing factor to tree mortality. Droughts are cyclical and may pose a threat to the Park's forests in the future.
- **Ignition Potential:** The Park is subject to high ignition potential, as noted in Section 2.2.6. Potential ignition sources include, but are not limited to, campfires, powerlines, lightning, vehicles, discarded cigarettes, and sparks from equipment operations.

Recommendations for minimizing fire hazard at the project or operational level are presented in Section 7. Additionally, fire protection BMPs are provided in Section 8.

6.4 Other Abiotic Factors

Abiotic factors are caused by non-living, non-infectious agents that impact trees. They are results of stresses, either natural or man-induced, that occur in the environment. Other potential threats to the forestland in the Park are summarized below:

- **Windthrow:** Trees in the Park have the potential to be subject to windthrow (being blown down by wind), given the Parks location along the summit of the Santa Cruz Mountains. No significant observations or reports of windthrow have occurred, although one windthrown tree observed in field assessments conducted in support of this Plan. Windthrown trees contribute to fuel loads, but can also act as beneficial coarse woody debris, especially when incidents are low. Blown-out tree tops were also observed in the Park, which result in flattened structures that form complex canopy structures. Windthrow is currently not a primary driver of forest health degradation in the Park, but the potential for windthrow can increase following severe wildfires or management actions that expose previously wind sheltered trees.

- **Climate Change:** Climate change affects forests in several ways. Warmer temperatures may affect wildfire frequency and severity and increase tree mortality potential by decreasing soil moisture. Warmer temperatures also stress forests, making them more susceptible to air pollutants, pest and disease outbreaks and invasive plant infestation and spread (Marshall et al. 2017). Temperatures are anticipated to increase by an average of 2 degrees (Celsius) annually in the future period (2060-2069) as compared to the baseline period (1985-1994). Precipitation decreases are unknown, but, even with an increase in precipitation, the rate of evapotranspiration is expected to increase due to increased temperature. Additionally, increases in temperature and precipitation will likely increase the presence of SOD and other *Phytophthora* diseases. Fog inundation (a decline of 33% since the early 20th century) is also expected to decrease, thereby reducing water availability (Marshall et al. 2017).
- **High Temperatures and Drought:** High temperatures increase tree water demand and therefore increase tree stress, diminish vigor, and reduce productivity. Drought, caused by insufficient precipitation, can be problematic when trees are growing in soil with a low moisture holding capacity.. All of these factors increase tree stress, which increases susceptibility to pest/disease infestation. High temperatures and solar radiation can also result in redwood needle scorch, which only seriously affects sprout growth, as branches of mature trees will regrow needles in affected areas.
- **Landslides:** Steep slopes, thin soils, and heavy rains can result in landslides that can damage downslope forests. Earthquakes can also trigger landslides. Areas of known slope instability in the Park are more likely to be subject to landslides, although other areas may be affected. Landslides also have increased potential to occur following severe wildfires or management actions that remote protective vegetative cover or expose soil surfaces.
- **Mechanical Damage:** Trunk, limb, and root damage can occur as a result of equipment use near trees or via abuse in public areas resulting from firewood gathering, burl harvesting, power line clearance trimming, and underground utility installation. Injuries can serve as entry points for pests and pathogens.
- **Soil Compaction:** Soil compaction can result from heavy equipment use and through public use of the Park (foot traffic, vehicles parking off pavement, use of campsites). Compacted soil can impair root air exchange, causing impacts to tree health and increasing susceptibility to pests and pathogens.
- **Lightning:** Lightning can damage or kill trees. Damaged trees are often weakened, making them more susceptible to pest and disease infestation. Dead or weakened trees are also more susceptible to windthrow, although less likely with redwood trees. In some instances, trees are ignited, increasing fire risk. Lightning strikes in the Park are uncommon, but possible.

- **Air pollution:** Air pollution (e.g., ozone, sulfur dioxide, nitrogen oxide) can cause damage to hardwood leaves and conifer needles. Air pollution damage can increase tree stress, making them more susceptible to pest and disease infestation. The likelihood of air pollution impacts to Park forests is low due to prevailing on-shore winds.

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7 FOREST MANAGEMENT RECOMMENDATIONS

This section outlines forest management recommendations to reach identified goals and objectives for improving and maintaining forest health in the Park. This section identifies the Plan goals and objectives and provides recommendations for specific projects, general operations and maintenance practices affecting trees/forests, and for potential future development activity affecting trees/forests.

7.1 Project Recommendations

In this section, the Plan proposes specific forest health projects to meet the identified Plan goals and objectives. A description of the different project types and general treatment prescriptions are provided in the following sections, and a summary of recommended projects, by location and NRMZ, is presented in the table in Section 7.1.6.

The general treatment prescriptions identified in the following sections are intended to guide specific project planning efforts. Given the variability and dynamic nature of forestland conditions in the Park, the practices (Section 7.3) by which these recommendations are implemented may not be consistent from project to project. This Plan anticipates that the identification of specific forest management practices will be conducted at the project planning stage, along with identification of any necessary resource protection measures (Section 8). Section 9 outlines the necessary components of the appropriate project planning stage (e.g., plans, permits).

The following recommendations are based on current observations of forest health conditions. Additional projects may be necessary based on changing forest conditions over the Plan timeframe. It is anticipated that such projects would be identified during Park forest monitoring efforts, incorporated into annual forest health work plans, and conducted using one or more of the forest management practices presented in this Plan.

7.1.1 Fuel Breaks

Fuel breaks, including shaded fuel breaks, are areas of land where vegetation has been modified to minimize ignition potential, slow the spread of a wildfire, reduce potential fire intensity, and reduce the likelihood of crown fire transition. The locations of fuel breaks recommended in this Plan are around Park structures, along paved Park access roads, and along key roadways where the creation of fuel breaks compartmentalize fuels and contribute to regional wildfire prevention efforts (Section 7.1.6). Fuel breaks do not involve complete removal of vegetation. Rather, they increase the horizontal spacing between retained vegetation, increase the vertical separation between surface fuels and overstory tree canopies, and modify surface fuels (grasses, shrubs, debris) to reduce fire intensity and flame lengths. Recommended fuel breaks vary in total width

depending on terrain, vegetation, and proximity to developed uses, and may range between 20 and 400 feet.

Maintenance of shaded fuel breaks should be performed every 2-3 years, or more often if necessary. Annual forest health field evaluations should identify shaded fuel break maintenance needs. CCC or SJCC crews, CAL FIRE crews, Park staff, and/or private contractors can be utilized for fuel break construction and maintenance. In addition, County Parks engages with local FireSafe councils to actively implement fuel reduction projects. Funding and staff resources are typically provided by the FireSafe councils and County Parks provides CEQA review and issues permits for work on park lands. (Santa Clara County 2016). Fuel break creation and maintenance should be coordinated with CAL FIRE and FireSafe councils, to the extent practicable, to create an effective network of fuel breaks in the region.

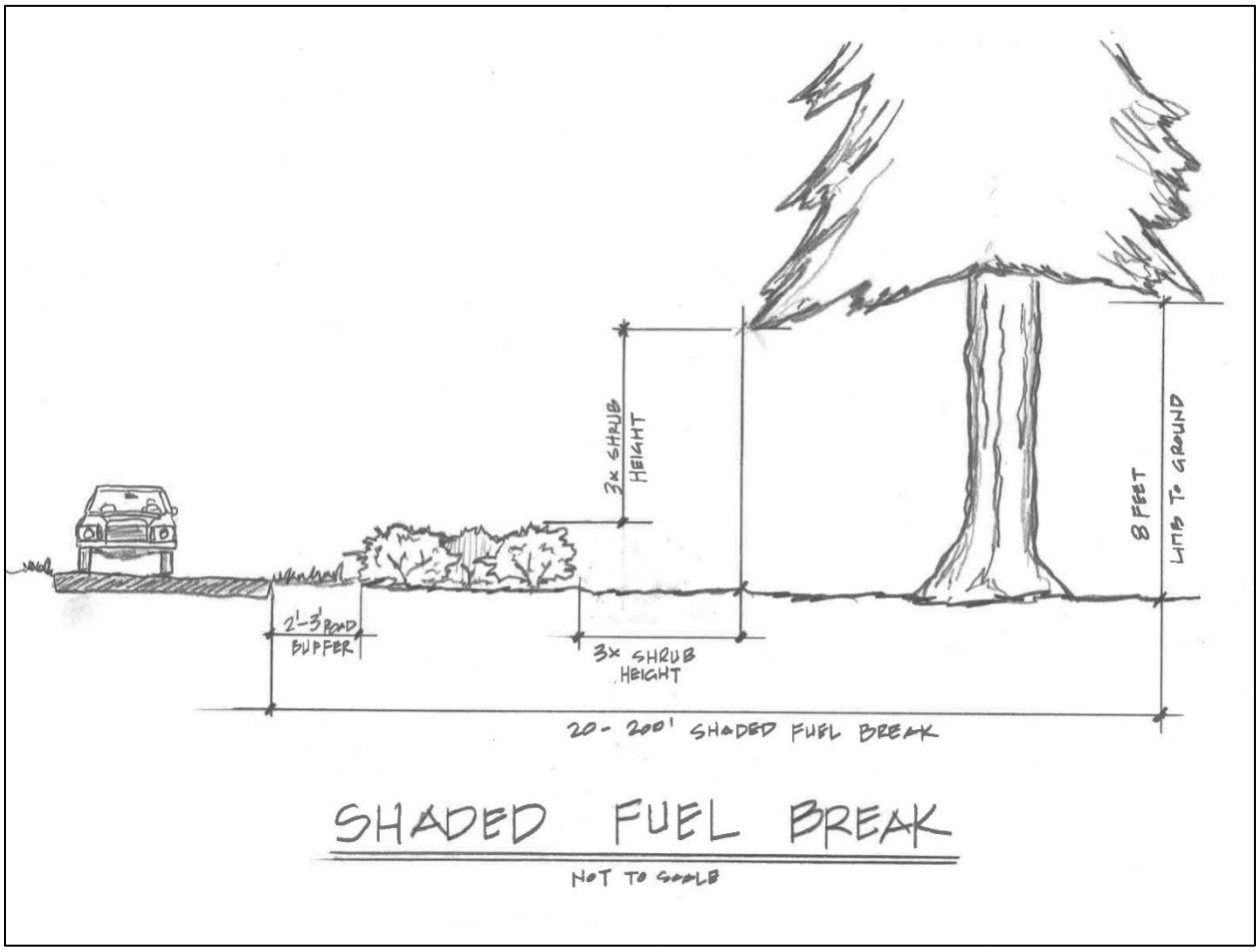
The following provides shaded fuel break management recommendations for the dominant land cover types within recommended treatment areas. A sample diagram of the spacing standards outlined below is provided in Figure 7. Specific locations of recommended fuel break projects are identified in Section 7.1.6 and Figure 8.

- **Redwood:** Redwood stands provide optimal conditions for shaded fuel breaks. Desired conditions are a closed-canopy stand of mature redwood trees with well-spaced tanoak and madrone trees. In mature, closed-canopy redwood stands with duff and leaf litter understories, the vertical separation between the top of surface fuels and the lowest tree branch should be at least eight (8) feet. Young redwood crown sprouts and sapling growth should be thinned to achieve this standard. Where such stands abut brush or chaparral, provide horizontal spacing between the outward canopy edge and the nearest shrub equal to three (3) times the adjacent shrub height. In more open redwood stands where small trees, shrubs, and grasses exist beneath tree canopies (surface fuels), the vertical separation between the top of surface fuels and the lowest tree branch should be at least three (3) times the height of the surface fuels. Encourage development of a dense tree canopy by prioritizing removal/treatment of understory shrubs, grass, or small trees rather than pruning tree canopies. Preserve saplings and/or shrubs in forest openings so they can contribute to future the forest canopy. Prioritize removal of invasive species, where present. Maintain duff layer at a depth no greater than four (4) inches.
- **Oak Woodland:** Oak stands are also excellent candidates for implementing shaded fuel breaks. Closed canopy mature oak stands with little to no surface vegetation (ladder fuels) are not typically conducive to extreme fire behavior. In mature, closed-canopy oak woodlands with duff/leaf litter understories, the vertical separation between the top of surface fuels and the lowest tree branch should be at least eight (8) feet. Where such stands

abut brush/chaparral, provide horizontal spacing between the outward oak canopy edge and the nearest shrub equal to three (3) times the adjacent shrub height. In more open oak woodlands where small trees, shrubs, and grasses exist beneath tree canopies (surface fuels), the vertical separation between the top of surface fuels and the lowest tree branch should be at least three (3) times the height of the surface fuels. Encourage development of a dense tree canopy by prioritizing removal/treatment of understory shrubs, grass, or small trees rather than pruning tree canopies. Prioritize removal of invasive species, where present. Maintain duff layer at a depth no greater than four (4) inches.

- **Brush/Chaparral:** Brush and chaparral vegetation types are the most hazardous fuels in the Park. Pure brush stands are not common near Park structures, though Ridge Road does traverse a large brush stand. Brush is typically intermixed with redwood and oak stands where gaps in the canopy allow more light to reach the forest floor. The priority in constructing fuel breaks in brush and chaparral is to break up horizontal continuity and to maintain surface fuels to a maximum depth of 4 inches in the open areas between retained shrubs. Retained shrub crowns should be horizontally separated from adjacent shrubs, shrub groupings, or trees by at least two times the height of the shrub crown. Groupings of shrubs may be retained such that the grouping does not exceed eight (8) feet in diameter. Shrub groupings should be horizontally separated from adjacent shrubs, shrub groupings, or trees by at least two times the height of the shrub crown. Sprouting species should be cut as low as possible to minimize regrowth from stumps. Prioritize removal of invasive species, where present.
- **Meadow:** Meadows serve a valuable function and act as natural fuel breaks where firefighters can often directly attack the fire front. Meadows near proposed fuel breaks are located near the main entrance to the archery range, the Park headquarters, the Tanoak Day Use area/old deer pen, the Blue Springs Trailhead on Pole Line Road, and along the south side of Summit Road just past the end of Pole Line Road. Some of these meadows are encountering encroachment by heavy brush and small trees, reducing their overall size. Without treatment or disturbance, they will eventually convert to shrubland or forest cover. For these areas, the priority is to remove encroaching brush and small trees to promote grass cover. Treatments such as hand removal, mowing, grazing, or broadcast burning can be used to prevent brush encroachment and retain the Park's meadow areas.

Figure 7. Sample Shaded Fuel Break Diagram



The following recommendations are provided to clarify fuel treatments in specific locations:

- Fuel breaks adjacent to structures (defensible space) should extend outward from the structure to a distance of up to 100 feet and should incorporate CAL FIRE's 30-foot and 100-foot defensible space standards[3];
- Portions of tree crowns near structures should be pruned back to maintain a minimum horizontal clearance of 10 feet;
- Fuel breaks along paved Park access roads (roadside fuel breaks) should extend outward from both sides of the road to a distance of up to 20 feet;

[3] https://calfire.ca.gov/communications/downloads/fact_sheets/DefensibleSpaceFlyer.pdf

- Fuel breaks around campsites and barbeque areas should extend outward from the developed area to a distance of up to 20 feet while accommodating the need for screening and privacy between sites;
- Designated fuel breaks (shaded fuel breaks) along interior Park roads and trails should extend outward from both sides of the road/trail to a distance of up to 200 feet, with outward edges feathered to minimize visual impacts, where appropriate. The designated fuel breaks will be coordinated with CAL FIRE to establish driving routes and effective firefighting positions;
- Portions of tree crowns above paved access roads should be pruned to maintain at least13.5 feet of vertical clearance above the road surface;
- Where soil erosion is a concern, stumps should be left intact, but cut low to minimize regrowth;
- All cut material should be removed or treated (e.g., chipped and spread on site or burned); logs no smaller than 8 inches in diameter (small end) may be retained on the soil surface); and
- All chipped material should be spread to a depth no greater than four (4) inches.

7.1.2 Invasive Species Removal

The primary invasive species recommended for removal in this Plan is blue gum (*E. globulus*). As identified in Section 6.2, blue gum reduces biological diversity by displacing and suppressing native tree growth and contributes to increased fire hazard due to its physical characteristics (e.g., peeling bark, volatile organic compounds, high fuel loading). This Plan recommends removal of eucalyptus trees within the three identified large stands (as discussed in Section 3.1.4, and summarized below in Section 7.1.6). Removal of the eucalyptus stand at Inspiration Point has also been identified as a view enhancement project in the Park's Master Plan (County of Santa Clara 2017c). The scattered, small stands and groupings of eucalyptus trees present in other areas of the Park along dirt access roads are also recommended for removal; however, *priority should be given to treating the three large stands*, as the observed small stands present lower fire hazard conditions (large-diameter trees, no ladder fuels) and existing within redwood stands with no evidence of suppressing native tree growth. Removal of scattered eucalyptus trees should be prioritized during implementation of redwood restoration (identified below).

Considering blue gum's ability to stump sprout after cutting, mechanical removal in combination with herbicide application is recommended. Cutting and removal of above-ground plant material can be conducted with chainsaws or other mechanized equipment. Large logs and wood chips generated from felled trees may be useful in Park improvements. Although not a suitable lumber species, the Park may consider utilizing blue gum wood for fence posts, marketing the wood to a pallet mill, or selling as firewood in the Park's campgrounds. Material that cannot otherwise be utilized, should be chipped, hauled off site and disposed, or piled and burned. Subsequent

application of herbicides should follow product guidelines for safe transport, storage, and application and a licensed pest control advisor should develop application recommendations. In general, herbicide use should applied in a manner that reduces the possibility of drift to neighboring retained vegetation. Stumps remaining on site after cutting and herbicide application are not recommended for removal or grinding, but should be left to decompose in place. All use of herbicide should be coordinated with the County's IPM program. Native trees existing within stands of eucalyptus, should be protected and retained to the extent feasible.

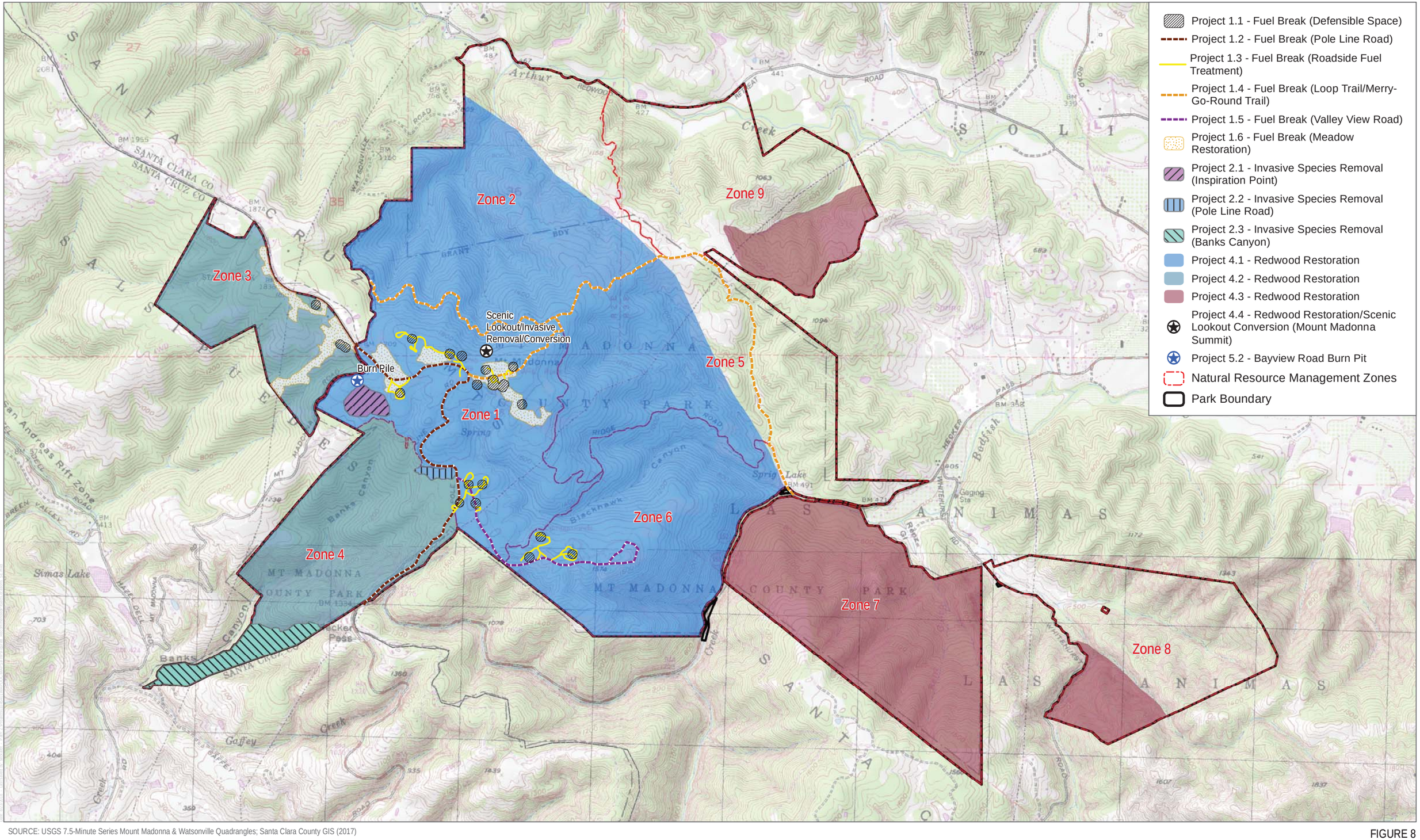
It is also recommended to remove French broom where it is observed in concentrations. Care must be taken in treating and removing French broom as it can propagate rapidly and colonize disturbed areas. Hand pulling can be effective for removing seedlings and small shrubs, but weed wrenches or other extraction tools are necessary for larger plants. It is best to remove the plant's entire root system, and best results are achieved when soil is moist. Cutting broom should be conducted in the spring months, prior to seed set. Re-sprouts from cutting are common, so herbicide treatment following cutting is recommended. Heavy equipment can also be used to remove plants, although it is not recommended in this Plan due to soil erosion concerns and the lack of significant broom cover in the Park. If broom populations in the Park grow and mechanical removal is necessary in the future, herbicide application is recommended to prevent re-sprouting. Prescribed burning of uncut broom may also be an effective treatment if conducted in late spring or early summer.

Specific locations of recommended eucalyptus removal projects are identified in Section 7.1.6 and Figure 8.

7.1.3 Treatment of Pathogen-Affected Areas

Increased pathogen activity has been observed in the Park within the redwood stands adjacent to high-use developed areas near the summit of Mount Madonna. New infestations of insects and pathogens remain a threat to the Park's forests and are discussed in detail in Section 6. To address this threat to forest health in the Park, treatment of insect and pathogen infestations should be approached proactively at the stand level to restore tree vigor and resilience, rather than simply removing affected trees at infestation sites. Targeted hazard tree removal is warranted and recommended, however, when life or property is threatened.

This Plan recommends continuation of County Park's Tree Safety Program to addresses targeted removal of hazard trees in public use areas to mitigate risks to the public or Park resources. Recommendations for improving redwood stands included in the next section are intended to address overall redwood stand health, which has the benefit of increasing tree vigor and reducing susceptibility to pests and pathogens.



SOURCE: USGS 7.5-Minute Series Mount Madonna & Watsonville Quadrangles; Santa Clara County GIS (2017)

DUDEK

0 1,100 2,200 Feet

FIGURE 8

Mount Madonna County Park Recommended Project Locations

Mount Madonna County Park Forest Health Plan

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7.1.4 Redwood Restoration

The Park's redwood forest is a "second-growth forest" defined as a "relatively young forest that has been regenerated naturally or artificially after some drastic interference such as extensive cutting, wildfire, insect or disease attack, or blowdown (SAF 2018))". Beginning in the 19th century, and continuing into the early 20th century, the Park's redwood forest was extensively cut to provide lumber for development in the region. In the time that has passed since cutting, disturbances (e.g., wildfire, insect or disease attack, blowdown) have not occurred at a level significant enough to alter the Park's redwood forest structure and composition. The result is a nearly homogenous, mid-seral stage redwood forest. A seral stage is a temporal and intermediate stage in the process of succession, the gradual supplanting of one community of plants by another (SAF 2018). As the redwoods in the Park have grown without significant disturbance, they are beginning to supplant the tanoak trees that aggressively established in the area following historic logging. This is a natural progression toward a climax redwood forest. However, the lack of significant disturbances in the Park's redwood forests have resulted in a forest structure that lacks diversity across different seral stages. Second-growth forests typically include unnaturally high densities of trees per acre, are comprised of younger, smaller trees of similar ages, and have a single canopy layer with few openings. Second-growth forests also typically lack an abundance of wildlife habitat elements, such as downed logs and a diversity of forest floor plants. High tree densities increase competition between trees for finite resources (e.g., water, soil nutrients), thereby increasing the potential for tree stress.

Healthy redwood forests are characterized by lower stand densities (fewer trees overall than unhealthy stands) and have a mosaic of successional stages and a greater diversity of tree structure. In turn, healthy stands have a greater diversity of wildlife habitats, and are comprised of vigorous trees that are more resistant to pest and disease outbreaks than those in overcrowded stands. In order to increase forest resilience to threats and stressors, this Plan recommends establishing a mosaic of successional stages within the Park's redwood stands through selective thinning. Selective thinning that removes only a portion of trees in a stand mimics small-scale forest disturbances allowing for a reduction in the number of trees per acre while promoting the growth of retained trees and their canopy. Selective thinning should be implemented to influence the mosaic of successional stages across the Park's redwood forests and should seek to include elements of early-, mid-, and late-seral stages. A variety of silvicultural prescriptions, or a planned series of stand thinning projects designed to change a current forest stand structure and composition, should be considered. Stand thinning projects would need to be planned, evaluated, and permitted under the California Forest Practice Rules, as described in Section 9.2.1.

A quantitative and qualitative analysis of redwood forest stand conditions and densities in the Santa Cruz Mountains was conducted by Papa (2011). This study also provides a review of

redwood silvicultural treatments, including the effects of silvicultural treatments in promoting late-seral stand types. Considering the topography, weather, forest policies, and land management history of the sites analyzed in the study, the Park's redwood forests most closely resemble those in the study termed the "Park/No Cut" and "Unknown Management Regime" (Papa 2011). These stand classifications describe stands that regenerated from early 20th century clearcutting and stands that regenerated from subsequent selective harvesting, a management history similar to that of the Park's redwood forests. Table 17 is derived from Papa's study and presents ranges of quantitative stand values for existing stand conditions and that for a target, late-seral stand condition. This table highlights the differences in second-growth redwood stands as compared to a late-seral stand condition. As shown in the table, total trees per acres (>2 inches) in second-growth stands are greater than a late-seral target stand. Basal area[4] and quadratic mean diameter (QMD)[5] values are lower in second-growth stands, indicating that while trees are fewer in number, they are larger in size. Finally, late-seral stands include more snags (standing dead trees) per acre, fewer clumps (growth pattern of younger, coppice-regenerated redwoods) per acre, and greater clump and overstory tree spacing. The target stand values presented in Table 17 should be considered when developing silvicultural prescriptions for redwood stand thinning projects conducted under this Plan.

Table 17
Existing Condition and Target Stand Characteristic Value Ranges

Forest Component	Existing Condition (Second-Growth Stand)		Target Stand (Late-Seral Stand)	
	Nominal Range	*Percent Range*	*Nominal Range*	*Percent Range*
Trees per Acre				
> 2 inches	230-290	100	185-215	100
Overstory	40-60	15-30	20-40	10-20
Conifer	135-165	50-65	80-100	40-60
Basal Area				
> 2 inches	350-43	100	>700	100
Overstory	220-305	55-75	550-650	80-95
Conifer	290-370	70-90	620-740	80-95
Quadratic Mean Diameter				
> 2 inches	15-19	--	26-30	--
Overstory	28-36	--	>50	--
Conifer	20-23	--	39-43	--
Snags per Acre	n/a	n/a	3-6	1.5-3.0
Clumps per Acre	18-24	--	<9	--

[4] The cross-sectional area of a single stem, including the bark, measured at 4.5 feet above the ground (SAF 2018)
[5] Diameter corresponding to a stand's mean basal area (SAF 2018)

Table 17
Existing Condition and Target Stand Characteristic Value Ranges

Forest Component	Existing Condition (Second-Growth Stand)		Target Stand (Late-Seral Stand)	
	Nominal Range	*Percent Range*	*Nominal Range*	*Percent Range*
Overstory Trees per Clump	1-2	--	1-3	--
Understory Trees per Clump	5-9	--	4-8	--
Clump Spacing (ft.)	40-50	--	65-75	--
Random Spacing (ft.)	n/a	--	30-40	--
Overstory Tree Spacing (ft.)	25-35	--	30-45	--

Source: Papa 2011

7.1.5 Burning Program

The reintroduction of prescribed fire into the Park is recommended. Prescribed fire is a highly-effective and inexpensive tool for reducing fuel loads and treating residual woody material generated during forest treatments. When used to reduce fuel loads or treat woody material, prescribed fire can help reduce the potential for catastrophic wildland fires. Other benefits of prescribed fire include accelerated nutrient cycling, reduction of brood material for pests and pathogens, reduced competition from underbrush, and reduced risk of pathogen spread via material transport. Prescribed fire treatments include pile burning and broadcast burning. Small burn piles can be created at or near the site of treatment while large burn piles are located in larger cleared areas. Piles are ignited when regulatory and weather conditions permit. Broadcast burning includes surface fire ignition within a treated, controlled forest area with a targeted management objective (e.g., fuels reduction, forage production, invasive species eradication).

Both types of prescribed burning are rarely employed as a standalone fuel or wood waste reduction measure, but rather compliment other management recommendations (e.g., invasive species removal, shaded fuel break construction, hazard tree removal). Preceding burning practices with mechanical or manual treatment alters the arrangement of fuels and provides managers with better control over fire behavior. Seasonally timing burning operations with regional weather patterns, such as burning in the late fall prior to rainfall, can allow managers to achieve a high level of fuel consumption with less risk of escape. Prescribed burns use existing fire breaks, roads, and trails as the boundaries for fire control. Weather is a critical variable in prescribed burning operations.

Pile burning is recommended as a management practice to be re-initiated in the Park to strategically reduce cut or treated woody material. Small pile burning at treatment areas is recommended where transport of cut or treated material is infeasible, would promote pest/pathogen spread, or would increase the risk of damage to other Park resources.,. Where removal of cut or treated material is

feasible and desirable (e.g., near developed uses), transport to a large burn area with appropriate defensible space buffers is recommended. A previously-used burn pit along Bayview Road is currently used to store and stage materials. This Plan recommends re-opening this burn pit for use in large pile burning efforts to facilitate wood waste disposal in the Park. Additionally, the use of air curtain burners (or similar) is recommended to dispose of wood waste. Air curtain burners allow for more complete combustion of waste and can be temporarily sited at different locations in the Park, depending on project needs. More detailed recommendations for implementation of burning in the Park is include in Section 7.3.4.

Broadcast burning is discussed in greater detail in Section 7.3.4 and should also be considered as a management tool during implementation or maintenance of other forest health projects. CAL FIRE's Vegetation Management Program (VMP) offers cost sharing for prescribed fire operations to support fuels reduction and other resource management objectives. CAL FIRE provides crews for implementation and can assist in project permitting and planning. This Plan recommends enrollment in the VMP program to maximize the benefits of prescribed fire in the Park.

7.1.6 Recommended Project Locations

A summary of recommended projects, by location, priority, and NRMZ, is presented in Table 18. Figure 8 also presents recommended project locations. This Plan provides only high-level descriptions of projects that will serve to meet the Park's goals and objectives over the life of the Plan. Priorities may change as a result of unforeseen events (e.g., wildfire, new pest outbreak) or policy changes (i.e., park management policies). The Plan provides adaptation strategies in Section 9.4 to guide this process. Finally, acreage, location, and description are anticipated to be adjusted during the project design phase. Recommended projects may be removed or modified, and new projects may be created within the life of the Plan.

Table 18
Recommended Forest Health Projects for Mount Madonna County Park

Priority	Project Number	Goal and Objective	NRMZ	Location	Project Type	Distance or Area*	Description
1	3.1	Goal: 1, 3 Objective: 1, 2, 4, 7	1, 6	High Use Areas	Tree Safety Program	n/a	Continue the Park's inspection, pruning and removal protocols outlined in the existing Tree Safety Program.
2	5.2	Goal: 2 Objective: 1, 3, 4	1	Bayview Road, Treatment Areas	Burn Pile	0.5 acres	Resume use of Bayview Road burn pit in support of vegetation treatments. Use air curtain burner and burn piles where material transport is infeasible.
3	1.1	Goal: 1, 3 Objective: 1, 3	1	Park Structures	Fuel Break - Defensible Space	20.4 acres	Create defensible space around the outward edge of all park buildings. Treatment prescription to follow the general standards outlined in Section 7.1.1.
4	1.2	Goal: 1, 3 Objective: 1, 3	1, 4	Pole Line Road	Fuel Break - Shaded Fuel Break	2.2 miles (106.7 acres)	Create shaded fuel break along both sides of Pole Line Road where the road traverses through the Park. Treatment prescription to follow the general standards outlined in Section 7.1.1.
5	2.2	Goal: 1, 2 Objective:1, 3, 4	4	Pole Line Road Eucalyptus Stand	Invasive Species Removal/Fuel Reduction	2.5 acres (in addition to shaded fuel break area)	Remove blue gum stand according to the treatment standards outlined in Section 7.1.2, and integrate into the Pole Line Road Shaded Fuel Break, according to the treatment standards outlined in Section 7.1.1.
6	1.3	Goal: 1, 3 Objective: 1, 3	1, 4, 6	Paved Park Access Road	Fuel Break - Roadside Fuel Treatment	2.8 mile (13.6 acres)s	Treat flashy fuels, dead and dying vegetation, and ladder fuels along both sides of all paved park access roads. Maintain annually. Treatment prescription to follow the general standards outlined in Section 7.1.1.

Table 18
Recommended Forest Health Projects for Mount Madonna County Park

Priority	Project Number	Goal and Objective	NRMZ	Location	Project Type	Distance or Area*	Description
7	1.4	Goal: 1, 3 Objective: 1, 3	1, 5, 6	Loop Trail/Merry-Go-Round Trail	Fuel Break - Shaded Fuel Break	4.2 miles (203.6 acres)	Create a shaded fuel break along both sides of Loop Trail and Merry-Go-Round Trail, extending along Loop Trail from Mt. Madonna Road to the intersection of Loop Trail/Merry-Go-Round Trail, then along Merry-Go-Round Trail to Sprig Trailhead. Also including an extension along the Lower Miller Trail connecting the Merry-Go-Round and Loop Trails to Pole Line Road. Treatment prescription to follow the general standards outlined in Section 7.1.1.
8	1.5	Goal: 1, 3 Objective:1, 3	1, 6	Valley View	Fuel Break - Shaded Fuel Break	1.4 miles (67.9 acres)	Create a shaded fuel break adjacent to Valley View Road, extending from the kiosk gate to the entrance to Valley View 3 campground to facilitate access/egress. The Park may consider extending the project along the full length of Valley View Road. Treatment prescription to follow the general standards outlined in Section 7.1.1.
9	1.6	Goal: 1, 3 Objective: 1, 3, 4	1, 3	Archery R, Park Headquarters, Tanoak Day Use Area, Der Pen, Summit Road, Pole Line Road	Fuel Break/Meadow Restoration	69.8 acres	Remove encroaching brush and small trees to restore meadows through hand work, mowing, grazing, or broadcast burning.
10	5.1	Goal: 2 Objective: 1, 3, 4	All	Redwood Stands, Oak Woodlands, Rangeland	Prescribed Burn	n/a	Explore VMP fuel treatment options with CAL FIRE.

Table 18
Recommended Forest Health Projects for Mount Madonna County Park

Priority	Project Number	Goal and Objective	NRMZ	Location	Project Type	Distance or Area*	Description
11	2.1	Goal: 1, 2 Objective: 1, 3, 4	1	Inspiration Point Eucalyptus Stand	Invasive Species Removal	14.9 acres	Remove blue gum stand according to the treatment standards outlined in Section 7.1.2 and as identified in the Master Plan. Convert area to lower growing species to re-create and maintain the scenic view toward the Pacific Ocean and Monterey Bay.
12	2.3	Goal: 1, 2 Objective: 1, 3, 4	4	Banks Canyon Eucalyptus Stand	Invasive Species Removal	47.8 acres	Remove blue gum stand according to the treatment standards outlined in Section 7.1.2 with natural regeneration of native forest as the primary objective.
13	4.4	Goal: 3 Objective: 4	1	Mount Madonna Summit	Redwood Restoration/Scenic Lookout Conversion	5.0 acres	Re-create and maintain the scenic view toward the Santa Clara Valley from Mount Madonna. Treatment prescription to follow the general standards outlines in Section 7.1.4 with converting to low growing species as the primary objective.
14	4.1	Goal: 1, 2 Objective: 4,	1, 2, 5, 6	Redwood Stands	Redwood Restoration	1,947.3 acres	Conduct inventory and achieve target stand conditions as defined in Section 7.1.4. Conduct first 2 entries in Park's redwood stands during the life of this Plan.
15	4.2	Goal: 1, 2 Objective: 4	3, 4	Redwood Stands	Redwood Restoration	638.2 acres	Conduct inventory and achieve target stand conditions as defined in Section 7.1.4. Conduct first 2 entries in Park's redwood stands during the life of this Plan.
16	4.3	Goal: 1, 2 Objective: 4	7, 8, 9	Redwood Stands	Redwood Restoration	752.4 acres	Conduct inventory and achieve target stand conditions as defined in Section 7.1.4. Conduct first 2 entries in Park's redwood stands during the life of this Plan.

* Fuel break area includes the length times the maximum width (400 feet for shaded fuel breaks, 40 feet for roadside fuel treatment areas).

7.2 General Practice Recommendations

The following provides management recommendations for actions that are conducted in forested areas of the Park or otherwise affect Park trees. These recommendations are provided in addition to the specific project recommendations in the previous section. The following management practices are also recommended for implementation during development activities conducted under the Park's Master Plan (County of Santa Clara 2017c), some of which have the potential to impact trees or other forest resources. These general practice management recommendations include:

- **Implement a forest health monitoring protocol.** Conduct routine monitoring of the Park forest to evaluate current stand conditions, presence and levels of pests and pathogens, maintenance needs for previously-treated areas (e.g., shaded fuel breaks), presence and levels of invasive species, and other forest damage that necessitates management action (e.g., windthrow, vandalism, illegal cutting). Monitoring results should drive annual forest health work plan development. A discussion of forest health monitoring recommendations and frequencies is presented in Section 9.3.
- **Plan and conduct operations to minimize negative effects on residual forest/trees**. Park maintenance and management operations conducted in forested areas should adhere to the tree protection recommendations included in Section 8.9. Avoidance of impacts helps minimize tree stress and potential entry points for pests/pathogens.
- **Treat downed trees and woody material**. During field assessments for this Plan, it was observed that treatment of downed trees and woody material was not a standard practice employed in clearing remote roads and trails (and on roads and trails near Park development in a few instances). Where downed trees or limbs/branches require clearing from developed Park areas (e.g., roads, trails, picnic areas), Park staff should remove and further treat the material to accelerate breakdown and decomposition, reduce brood material, and minimize fuel load buildup. Treatment should include lop and scatter, chipping, and/or burning. Where applicable, downed woody material can be salvaged or re-used for Park purposes (e.g., bumper logs).
- **Continue to implement County Parks' Tree Safety Program.** County Parks' Tree Safety Program has been successful in identifying hazard trees within or near high-use recreation areas. This Plan recommends continuation of this program. It is also recommended that this program be expanded into areas of the Park that are developed under the Master Plan. To support this effort, continued training and certification of responsible Park staff in tree risk assessment is also recommended. At least one Parks' Natural Resource Program staff should complete and maintain the International Society of Arboriculture (ISA) Tree Risk Assessment Qualification (TRAQ) certification. Alternatively, the County could contract with consulting arborists to assist in this role.

- **Minimize transport of infected material and implement quarantine and sanitation practices in order to reduce the potential for introducing pathogens and invasive species**. The practice of transporting material generated within the Park to disposal locations within the Park will need to be evaluated on a case-by-case basis. Generally, the threat of new infestations of pests and pathogens is low with intra-Park transport, but not always. For example, if transporting French broom from an infestation site to a burn pile, there is a high potential for seed dispersal along the transportation route if the load is not properly covered and secured. In contrast, intra-Park transport of downed tanoak material infected by a ubiquitous canker rot fungi would not threaten a new disease outbreak. Care should always be taken to consider the potential for the material to host a newly introduced pathogen. Should a newly introduced pathogen be suspected, a forest pathologist should be consulted to develop an appropriate treatment for quarantine and possible eradication.

  This Plan recommends that quarantine practices, particularly the 'Buy it Where You Burn It' program[6], be promoted with Park visitors to prevent the spread of invasive pests and diseases. If Park projects entail importing vegetative material, such as oak seedlings for restoration projects, only that material that has been produced in conformance with the latest horticultural standards in pest and disease avoidance and sanitation should be allowed. Sanitation of tools and equipment within the Park may be help to reduce the spread of pests and diseases following treatments of areas of known infestation. If soil is collected on the equipment, rinsing the equipment on site with a portable water tank or water truck, or at a designated rinsing station, can remove soil-borne pathogens and prevent transport to new sites. Equipment sanitation may not always be necessary for equipment that stays within Park boundaries, but it is always recommended for contracted or rented equipment arriving from outside the Park.

- **Treat invasive trees and shrubs while young and easy to manually remove or pull by Park staff, volunteers or contractors**. This practice is intended to prevent the spread and establishment of invasive plant species to new areas of the Park. Removal of invasive plants, when young and with shallow roots, can usually be accomplished with less effort or site disturbance. Park staff training is recommended to assist in identification of known invasive plants in the Park and the greater region. Further actions are recommended in Section 7.1.2 for the treatment of established invasive plant species.

- **Implement BMPs for forest pests and pathogens**. Pest and pathogen Best Management Practices, discussed further in Section 8.2, should be incorporated where applicable within the Park. These practices encompass both protection of the residual stand from mechanical damage, and quarantine and sanitation practices highlighted above. Outbreaks of known

[6] http://www.firewood.ca.gov/

invasive pathogens such as SOD, well known for its detrimental impacts to the tanoak and true oak populations along the west coast, and unknown pests and pathogens pose a significantly large threat to the Park's forests. Worldwide, pest and disease outbreaks are on the rise, creating large-scale changes in forest composition and degradation of forest health. Proactive management to restore forest resilience is a first step is mitigating these impacts and specific actions are recommended in Section 7.1.4 to help accomplish this goal.

- **Maintain partnership opportunities for fuel reduction work**. Maintain working relationships with the Santa Clara County FireSafe Council and CAL FIRE to implement strategic fuel reduction projects in the Park, where appropriate. Park staff have previously collaborated with the FireSafe Council to conduct fuel reduction work in the Park (County of Santa Clara 2016). The FireSafe Council is also a valuable teaming partner in obtaining grant funds for project work. In addition, where appropriate, work with neighboring landowners and other entities (e.g., Pacific Gas and Electric (PG&E), other County Departments) to facilitate fuel reduction work on or adjacent to Park boundaries.

7.3 Forest Management Practices

Forest management is the practice of thinning, pruning, removing or otherwise altering trees or other forestland vegetation in order to achieve desired results. Forest management practices are designed by RPFs and implemented by licensed timber operators (LTOs). Different forest management practices can be utilized, depending on forest type, location, condition, and management prescription. Given the dynamic nature of vegetation, a single treatment technique or management prescription may not be appropriate for one site over time and a combination of techniques is likely necessary for each project. Therefore, an adaptive approach that allows for selection of management practices is needed to achieve the Plan's goals and objectives. For recommended projects, forest management techniques will be identified during project planning efforts. For maintenance of treated areas and implementation of general practice recommendations, Park staff will identify forest management techniques on an as-needed basis and/or during annual forest health work planning efforts.

In general, forest management practices can be classified into five categories:

- Hand Labor (e.g., hand pulling, cutting, planting)
- Mechanical (e.g., mowing, masticating, felling, yarding)
- Biological (e.g., grazing)
- Prescribed Fire (e.g., burn piles, broadcast burning)
- Chemical (e.g., herbicide)

The following sections summarize the different types of forest management practices that may be implemented in the Park, including identification of BMPs. Selection of qualified and trained contractors, appropriate staff training, scheduling, and supervision to carry out forest management activities are also key components of an effective forest management program. Further, the standards and regulations of the California Forest Practice Rules apply to many of the practices outlined below. Preparation of the appropriate planning documents, obtaining necessary permits, and adherence to these standards will be necessary.

7.3.1 Hand Labor

Hand labor involves pruning, cutting or removal of trees or other forest vegetation by hand or using hand-held equipment. Other hand labor treatments involve removing dead wood, piling material, and spreading chips/mulch. Hand labor is most effective in small treatment areas or areas with difficult access where the use of heavy equipment is infeasible. Hand labor also allows for selective management or removal of targeted vegetation and is typically used in conjunction with other techniques. Proper training and supervision of hand labor forces is necessary to reduce the dangers to workers using sharp tools on steep and/or unstable terrain, or where other environmental hazards exist. Hand tools include, but are not limited to, shovels, Pulaski hoes, McLeod fire tools, line trimmers, weed wrenches, chain saws, pruning shears, and loppers. Personal protection equipment typically includes long pants and long- sleeved shirts, gloves, safety goggles, hard hats, chaps, and sturdy boots.

7.3.1.1 Best Management Practices for Hand Labor

The following BMPs should be implemented, where feasible, when utilizing hand labor. In all circumstances, tools and equipment should be utilized only for their intended use. Additional BMPs are provided in Section 8.

- Ensure equipment operators and project personnel have appropriate personal protective equipment and are properly trained in equipment use;
- Ensure that appropriate fire safety measures are implemented (see Section 8.1);
- For safety purposes, provide necessary signage alerting the public to active operations;
- Ensure that vehicles and equipment arrive at the treatment area clean and weed-free;
- Prune trees according to ISA and American National Standards Institute (ANSI) A300 standards;
- Protect retained trees and vegetation from tool and equipment damage;
- Sanitize tools between project areas to prevent the spread of pathogens;

- Service and fuel tools only in areas that will not allow grease, oil, fuel, or other hazardous materials to pass into streams or retained vegetation; and
- Remove from the treatment area and properly dispose of all refuse, litter, trash, and non-vegetative debris resulting from vegetation treatment operations, and other activity in connection with vegetation treatment operations.

7.3.2 Mechanical

Mechanical practices include all methods that employ motorized heavy equipment to remove or alter vegetation. Mechanical practices rearrange vegetation structures, compact or chip material, and move material to landings, staging areas, or burn piles. Mechanical equipment is usually equipped with either rubber tires or tracks, although skids and cables are also used. In some instances, two or more pieces of heavy equipment will work in concert to achieve a management standard. Mechanical equipment includes, but is not limited to, masticators, tractors, chippers, grinders, skidder, and cable yarding systems.

Constraints to mechanical equipment use include steep slopes, dense tree cover that prohibits travel, saturated soils, and dry, high fire hazard weather conditions where equipment use could result in ignition. Use of mechanical equipment may also result in damage to retained vegetation. Use of mechanical equipment should consider the terrain, access, forest type, and treatment recommendation to effectively treat vegetation and minimize impact potential. Supervision and specialized training are also necessary. The use of mechanical equipment is often done in conjunction with other treatment techniques, particularly hand labor (prior to mechanical treatment) and prescribed fire (following mechanical treatment.)

7.3.2.1 Best Management Practices for Mechanical Practices

The following BMPs should be implemented, where feasible, when utilizing mechanical practices. In all circumstances, equipment should be utilized only for its intended use. Additional BMPs are provided in Section 8.

- Utilize low ground-pressure equipment, to the extent feasible;
- Ensure equipment operators and project personnel are properly trained in equipment use;
- Ensure that appropriate fire safety measures are implemented (see Section 8.1);
- For safety purposes, provide necessary signage and patrol alerting the public to active operations and area closures;
- Ensure that vehicles and equipment arrive at the treatment area free of soil, weeds, and seeds;

- Control fugitive dust resulting from equipment use by watering disturbed areas;
- Protect retained trees and vegetation from potential damage resulting from heavy equipment use through the use of tree protection devices, training of equipment operators, and designing projects to reduce potential impacts, among other methods;
- Where soil stability is a concern, leave stumps from removed trees and shrubs intact. Where feasible, re-use existing roads, trails, skid trails, and predesignated routes for equipment travel;
- Limit the size and quantity of equipment to that which is necessary to meet the identified vegetation management standard;
- Re-grade or re-contour any areas subject to soil disturbance from heavy equipment, including dragging or skidding of trees or other material. Install soil stabilization structures and devices as needed;
- Avoid heavy equipment use on unstable slope areas, documented slope instability areas, and slopes with gradients exceeding 50%.
- Service and fuel heavy equipment only in areas that will not allow grease, oil, fuel, or other hazardous materials to pass into streams or riparian vegetation;
- Remove from the treatment area and properly dispose of all refuse, litter, trash, and non-vegetative debris resulting from vegetation treatment operations, and other activity in connection with vegetation treatment operations;
- Ensure that hazardous materials spill kits are available on all heavy equipment.
- For cable yarding, install, operate, and maintain cable lines so that retained trees will not incur unreasonable damage. Retained trees should not be used for rub trees, corner blocks, rigging or other cable ties unless effectively protected from damage.
- To the fullest extent possible and with due consideration given to topography, lean of trees, utility lines, local obstructions, and safety factors, trees should be felled away from streams, sensitive biological resources areas, and retained trees. Cabling, sectional removal, or other felling techniques should also be employed, where feasible, to minimize impacts to streams, sensitive biological resource areas, and retain trees.

7.3.3 Biological

Biological management includes using grazing as a method to treat grasses, shrubs, and small trees. County Parks currently uses goat and cattle grazing in other parks to strategically, efficiently, and cost-effectively treat vegetation. Grazing is an effective management tool for maintaining areas previously treated with hand labor or mechanical practices. It is also effective in preventing the expansion of brush and small trees into meadows. Livestock each have different grazing habits

and not all livestock are ideally suited for grazing treatments in all areas. Goats are an effective option as they will consume live or dead, tough, woody plant material.

Grazing within Santa Clara County Parks is governed by the County's Parkland Range Management Policy (County of Santa Clara 1992). Grazing is typically conducted in the late spring, when growth of annual grasses has slowed, and continues through the summer to reduce fine fuels prior to the onset of peak fire season. Development of site-specific grazing management plans should be completed for proposed grazing treatments in the Park and should be consistent with the requirements outlined in the Parkland Range Management Policy. Management plans should identify goals and implementation techniques to ensure that grazing treatments meet vegetation management standards and t minimize impacts to natural resources. Grazing management plans should also identify the optimal stocking rate and grazing duration, typically measured in pounds per acre of residual dry matter. Acceptable residual dry matter levels should be consistent with those identified in the Parkland Range Management Policy. Control of livestock movements and preventing overgrazing is also important for successful implementation.

7.3.3.1 Best Management Practices for Grazing

The following BMPs should be implemented, where feasible, when utilizing grazing as a forest management tool. Measures addressing the BMPs below should be incorporated into grazing plans. Additional BMPs are provided in Section 8.

- Identify and assess streams and watercourses in potential grazing areas prior to turn-out and install exclusionary fencing where necessary;
- Routinely monitor grazing activities in riparian areas to minimize the potential for stream bank damage, soil compaction, and soil deposition into streams and watercourses;
- Prior to grazing in riparian areas, identify thresholds that would trigger a cessation of grazing activity;
- Avoid grazing in unstable slope areas or implement measures to minimize impacts to slope stability (e.g., reducing herd size to retain vegetation, avoiding grazing where saturated soil conditions exist);
- Consider the timing and level of grazing practices to promote plant recruitment (e.g., timing prior to seed set of annual grasses to promote perennial species establishment);
- Minimize the spread of invasive plants and pathogens through the use of quarantine periods, holding areas, clean stock water, and personnel, equipment and vehicle sanitation.

7.3.4 Prescribed Fire

Prescribed fire can be used to burn piles of cut vegetation (pile burns), or over a designated prepared area (broadcast burn). Broadcast and pile burning are often implemented in conjunction with hand labor and mechanical treatment methods as a means of treating residual materials, or in advance of an herbicide treatment to enhance the effectiveness of the application. Prescribed burning also serves to rapidly break down vegetative material and convert it to soil nutrients, reduces brood material for pests and pathogens, controls invasive species, and reduces surface fuel buildup and the threat of severe wildfires. All burning activities should adhere to the standards outlined by the Bay Area Air Quality Management District (BAAQMD):

http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/Rules%20and%20Regs/reg%2005/rg0500.ashx

Small pile burning is conducted at or near the treatment area. Piles should be constructed by hand and should be free of dirt, debris, and stumps. Material should be piled soon after cutting with the butt end of branches and limbs toward the outside of the pile so that branches are overlapping and forming a series of dense layers. The top of the pile should be covered with a small sheet of heavy paper (e.g., butcher paper) to keep the pile interior dry. One or two limbs should be placed atop the paper to keep it in place. The dry interior portion of the pile should be ignited at the appropriate time using a weed burner or other igniting tool. Alternatively, tractors or hand crews can create piles of material on flat or gently-sloping ground that can be burned during wet conditions (pile burn), although the volume of fuel in the piles can produce localized heat which may impact adjacent retained vegetation.

Large pile burning is conducted at a cleared area or designated burn pit (e.g., along Bayview Road). Material should be collected during operations and piled in this location and burned when weather and air quality conditions allow. The size of the pile should be contained at a level where safe burning can be conducted. Another option is the use of an air curtain burner, which can be utilized to cleanly burn large piles. Air curtain burners can be moved to different areas of the Park to facilitate wood waste disposal and minimize the need to transport material. Clearance of up to 100 feet may be necessary around an air curtain burner. Benefits of air curtain burners include: lower smoke emissions compared to pile or broadcast burning, capability of burning a greater variety of materials, minimizes the need for transporting material, and fires are contained and more easily extinguished, if necessary. For burning conducted under an approved THP or exemption, burning of both small and large piles should be accomplished not later than April 1 of the year following their creation, or for piles created on or after September 1, not later than April 1 of the second year following creation.

Broadcast burns are usually done where a maximum amount of fuel treatment can take place and can be used to control invasive species and treat cut material (slash) on the ground surface, or reduce surface and/or ladder fuels beneath tree canopies in shaded fuel breaks. Treatment boundaries are often roads, trails, or other non-burnable features, reducing the number of firebreaks that need to be created. This approach reduces labor costs and preparation time, and minimizes soil disturbance and the potential for soil erosion. Broadcast burns can be used in all forest types, where conditions allow for effective control.

Broadcast burning may occur throughout the year; however, it is usually conducted during the late spring months when the ground is still wet or during fall or winter after plants have completed their yearly growth cycle and their moisture content has declined. Fall burns are more closely aligned with the natural fire cycle found in California. Piles of vegetation may be burned any time after the vegetation has dried. Hand held tools, such as drip torches, propane torches, and flares, may be used for igniting prescribed fires.

Broadcast burns must be conducted by trained fire protection personnel, or Parks staff with appropriate training for burns less than 10 acres. Utilizing personnel and equipment from CAL FIRE provides the added benefit of joint training under prescribed rather than emergency conditions. Timing is critical to the use of this treatment technique due to variances in weather conditions and the necessity to time treatments to minimize impacts to plant and animal species. Fuel moisture content must be determined to assess if the treatment area is safe to burn. There are typically more appropriate burn days in the spring and early summer months when there is a greater chance of atmospheric conditions conducive to smoke dilution and dispersion.

Prescribed burning requires proper planning and the development and approval of a prescription or burn plan, which is typically developed by the local fire protection district in consideration of forest management requirements, local weather conditions, and available resources for fire management. Utilizing prescribed fire as a management tool should consider the following:

- **Burn Plan/Prescription:** A site-specific prescription and burn plan is developed that establishes goals and procedures for the prescribed burn and considers unique site characteristics. The prescription identifies geographic burn units, limits of the burn area, locations of control lines, acceptable fuel moisture ranges and weather conditions, required personnel and equipment, and evaluates potential impacts to resources in compliance with CEQA. This may be prepared in coordination with CAL FIRE.
- **Smoke Management Plan:** The BAAQMD requires preparation of a smoke management plan detailing the location of sensitive receptors and measures to be implemented to maximize smoke dilution and minimize smoke production. Burning for management of forests receives special accommodation under BAAQMD Regulation 5 (BAAQMD 2013).

In addition to the preparation and approval of a smoke management plan, the BAAQMD requires notification of the burn and that burning is conducted on a permissive burn day.

- **Pre-Broadcast Burn Site Preparation:** Hand labor or mechanical treatment techniques are often required prior to initiation of a prescribed burn to remove and treat larger material (trees, shrubs, slash). Treatment of larger material is done to reduce its size and spatial arrangement and to remove ladder fuels that may allow for crown fire transition. Site preparation also includes the establishment of fire lines needed to control the fire if they do not already exist.
- **Burn Notification:** Notifying the local or surrounding communities, CAL FIRE, local fire departments, the media, and the BAAQMD or MBAQMD is recommended to avoid potential misinterpretation of the prescribed burn as a wildfire.
- **Post Burn Follow-up and Evaluation:** Following completion of the prescribed burn, the results are evaluated to determine if the need exists for additional treatment based on established prescriptions and whether erosion control BMPs are necessary. The burn plots should also be monitored and evaluated for invasive species establishment and long-term effectiveness in achieving the goals for each individual burn plot.

7.3.4.1 Best Management Practices for Prescribed Fire Practices

The following BMPs should be implemented, where feasible, when utilizing prescribed fire. In all circumstances, equipment should be utilized only for its intended use. Additional BMPs are provided in Section 8.

- Ensure equipment operators and project personnel are properly trained in equipment use;
- Ensure that appropriate fire safety measures are implemented (see Section 8.1);
- For safety purposes, provide necessary signage and patrol alerting the public to active operations and area closures;
- Protect retained trees and vegetation from potential damage by pre-treating adjacent fuels;

7.3.5 Chemical

Herbicides are used to kill vegetation or prevent growth and do not remove any vegetation from a treatment area; therefore, treated material remains unless otherwise managed. Application of herbicides is typically performed by hand and can include sponging, spraying, or dusting chemicals onto vegetation. Hand application provides flexibility and is ideally suited for small treatment areas. Roadside application of herbicides may employ equipment affixed to or towed behind a vehicle.

Herbicide application requires specific storage, training and licensing to ensure safety. Only personnel with the appropriate license are allowed to use chemicals to treat vegetation. Herbicide application is also only applied per a prescription prepared by a licensed Pest Control Advisor (PCA). Personal protection equipment is required to limit personnel exposure to chemicals, and includes long pants and long-sleeved shirts, gloves, safety goggles, hard hats, sturdy boots, face masks and, in some instances, respirators.

The application of herbicides may be used on its own or as a secondary vegetation treatment technique following hand labor or mechanical treatments. Herbicide use typically results in high kill rates, and can prevent treated plants from setting seed. Herbicides are broadly classified into two basic types: pre-emergent and post-emergent. Pre-emergent herbicides are sprayed directly onto the ground and prevent plants from germinating and/or growing. As such, they have a larger potential to impact native seeds remaining in the soil, and often have longer persistence times. Post-emergent herbicides are applied directly onto the plants, killing them. With proper equipment and training, herbicides can be applied selectively, minimizing impacts to native seeds in the soil. If target vegetation is intermixed with desired vegetation, the chance of affecting desired vegetation is increased. Systemic herbicides (as opposed to contact herbicides) are likely the most effective for control of invasive species due to their ability to spread via translocation into root tissue.

Herbicide application should be used following removal of all species that have the ability to regenerate from root fragments. Herbicide use should be limited to localized applications rather than foliar applications to eliminate the possibility of drift and impacts to neighboring desirable vegetation. A wide range of herbicides are available for such types of treatment. Herbicide labels and material safety data sheets (MSDS) list susceptible target plant species and provide proper direction in the use and handling of the products. Herbicides should be applied in accordance with state and federal law.

Another application technique, cut and daub, is recommended for larger invasive plants (e.g., blue gum eucalyptus) to control regrowth and kill the portion of the plant remaining belowground. Cut and daub involves the cutting of trunks and then the direct application of an appropriate systemic herbicide directly to the cambium layer of the freshly cut stump. Other related methods include drilling into the trunk of a tree and injecting herbicide, applying an herbicide-soaked rag directly to freshly cut stumps, or direct application to cuts in the trunk (frill injection, hypo-hatchet). It is important that the herbicide treatment occur immediately after the trees are cut so that the herbicide is carried into the plant tissue. If enough time elapses to allow the cut surface to dry out, a fresh cut should be made prior to herbicide application.

7.3.5.1 Best Management Practices for Chemical Application

The following BMPs should be implemented, where feasible, when applying herbicide. In all circumstances, equipment should be utilized only for its intended use. Additional BMPs are provided in Section 8.

- Use of chemical herbicides or pesticides should be conducted in accordance with the County's IPM Policy.
- Park staff should consult with a state-licensed Pest Control Advisor (PCA) to identify the appropriate site-specific herbicide application approach to meet vegetation management standards;
- Consider the timing of herbicide applications to minimize impacts to adjacent retained vegetation and nearby resources, and for maximum effectiveness (typically between June 15 and November 15, with a potential extension through December 31 or until local rainfall greater than 0.5 inch is forecasted within a 24-hour period from planned application);
- Only herbicides and surfactants that have been approved for aquatic use by the United States Environmental Protection Agency (EPA) and are registered for use by the California Department of Pesticide Regulation (CDPR) should be used for aquatic vegetation control work;
- Herbicide application should be consistent with Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) label instructions and use conditions issued by the United States EPA and CDPR;
- The lowest recommended rate to achieve vegetation management objectives of both herbicides and surfactants should be utilized to achieve desired control;
- An indicator dye should be added to the tank mix to help the applicator identify areas that have been treated and better monitor the overall application;
- No application to plants whose base is submerged in stream channels;
- Follow safe procedures for transporting, mixing, loading, and proper disposal of herbicides; and
- Minimize the use of foliar (spray) applications, prioritizing localized or direct applications.

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8 RESOURCE PROTECTION

In addition to the BMPs identified for the forest management practices identified in this Plan, this section outlines additional practices intended to avoid or minimize potential impacts associated with tree or vegetation treatment or removal.

8.1 Fire Protection

All operations conducted in the Park associated with recommended project implementation shall adhere to the fire protection standards outlined in Title 14, California Code of Regulations, Chapter 4, Subchapters 4, 5, and 6, Article 8 (Fire Protection). County Parks signed a Memorandum of Understanding (MOU) with CAL FIRE in 2012 to standardize procedures to be followed when Park staff are engaged in activities with potential to ignite wildfires. Based on this MOU, Park staff are required to take precautions to reduce the chance for ignitions, including checking fire forecast conditions, monitoring weather, maintaining spark arrestors, and having fire guards with appropriate suppression equipment on hand. Under particularly dangerous conditions, all activities with a risk of wildfire ignition are halted (County of Santa Clara 2016). The following fire protection BMPs are provided to augment current practices:

- During Park operations that involve the use of any vehicle, machine, tool or equipment powered by an internal combustion engine operated on hydrocarbon fuels, provide and maintain suitable and serviceable tools for firefighting purposes. Equipment should be located at a point accessible in the event of a fire and should include one backpack pump-type fire extinguisher filled with water, two axes, two McLeod fire tools, and a sufficient number of shovels so that each employee at the operation can be equipped to fight fire;
- Ensure that all equipment with an internal combustion engine using hydrocarbon fuels is equipped with a spark arrestor, as defined in California Public Resources Code Section 4442;
- Establish internal Park communication procedures for reporting fires, or call 911 in emergencies;
- Restrict the use or timing of use of tools or equipment with the potential to generate heat or sparks during Red Flag Warnings and High to Extreme Fire Danger days;
- Identify staging areas prior to initiating operations. Staging areas should be contained within already disturbed areas or non-vegetated areas (e.g., roads, parking lots) and should account for vehicle parking and tool/equipment storage;
- Existing dirt roads within the Park should be routinely monitored and maintained to allow for emergency vehicle access. Such roads should be closed to the public during extreme fire weather conditions.
- Park access gates should be equipped with a fire department or Knox lock;

- Utilize fire resistant building materials and implement defensible space for new Park buildings constructed under the Park's Master Plan.

8.2 Pest/Pathogen Management

Measures to reduce the potential for introducing pathogens and invasive species into the Park are identified in Section 7.2. Other measures the Park should consider to reduce the spread of pests and diseases include banning importing firewood, posting public information via posters and disseminating literature regarding the importance of such practices, and entering into MOUs with PG&E and other Park operators to minimize the potential for introducing pests/pathogens and invasive species into the Park. Additionally, certain pathogen-specific measures have also been developed to deal with regional pathogens, namely pitch canker and SOD. These measures should be implemented in the Park, where applicable:

- Pitch canker: http://ufei.calpoly.edu/pitch_canker/management.lasso
- SOD: http://ipm.ucanr.edu/PMG/PESTNOTES/pn74151.html

8.3 Slope Stability, Erosion Control, and Water Quality

Management practices identified in this Plan have the potential to affect soil stability. Soil stability may also be indirectly affected by the removal of overstory vegetative cover, which may reduce rainfall interception and thereby increase its surface erosion potential. This may result in the detachment and transportation of soil particles across the soil surface. Soil stability may also be directly affected by through the use of heavy equipment, tools, and hand crews, all of which can loosen, dislodge, or compact soils. This too can increase the potential for detachment and transportation of soil particles across the soil surface.

Equipment operation conducted when saturated soil conditions exist also have the potential to dislodge soil resulting in sediment transport. Saturated soil conditions are those where:

> *Soil and/or surface material pore spaces are filled with water to such an extent that runoff is likely to occur. Indicators of saturated soil conditions may include, but are not limited to: (1) areas of ponded water, (2) pumping of fines from the soil or road surfacing material during timber operations, (3) loss of bearing strength resulting in the deflection of soil or road surfaces under a load, such as the creation of wheel ruts, (4) spinning or churning of wheels or tracks that produces a wet slurry, or (5) inadequate traction without blading wet soil or surfacing materials (*California Code of Regulations, Title 14, Section 895.1*).*

A procedure has been developed by the California State Board of Forestry (California State Board of Forestry 1990) to estimate a surface soil erosion hazard rating (EHR) that considers soil characteristics (texture, depth to restrictive layer, percent of coarse surface fragments), slope, vegetative cover, and precipitation. The hazard rating is designed to evaluate the susceptibility of the soil within a given location to erosion. EHR should be determined and considered on a site-specific basis when determining the needs for erosion control BMPs associated with forest management activities identified in this Plan. In general, operations should not be conducted on saturated soils that may produce sediment in quantities sufficient to cause a visible increase in turbidity of downstream waters in receiving Class I, II, III or IV waters or that violate water quality requirements.

BMP Practices and Devices

There are various erosion control practices and devices available for slowing the rate of erosion. Recent research indicates that mechanical rehabilitation treatments, including straw mulch, hay bales, jute rolls, or rolled erosion control blankets are more predictable for reducing soil erosion and post-fire hydrological problems than seeding (Robichaud et al. 2010). Mulching may introduce exotic/invasive species seeds (Kruse et al. 2004) if brought in from offsite (as opposed to chipped on-site material), so erosion potential should be high before the decision to use this material is finalized.

Numerous BMPs have been developed for use in erosion and sediment control, as identified in the California Stormwater BMP Handbook (originally published by the California Stormwater Quality Association). This handbook presents detailed information regarding the implementation, maintenance, suitability, and limitations of different BMPs. The need for BMPs should be determined based on EHR, project implementation timing (season), project location, and the history of on-site erosion. County Parks staff should implement BMPs, as necessary, during typical operations and maintenance activities that impact soil stability. Project-specific plans prepared in support of the projects identified in this Plan (e.g., Timber Harvesting Plans) shall identify applicable BMPs to be installed and maintained for project purposes. Table 19 identifies the different BMP types for erosion and sediment control, as provided by the County of Santa Clara Clean Water Program (County of Santa Clara 2018). Detailed information can be found at the following address:

https://www.sccgov.org/sites/cwp/pages/construction.aspx

Table 19
Erosion and Sediment Control BMPs

Erosion Control		Sediment Control	
Hydraulic Mulch	Velocity Dissipation Devices	Silt Fence	Sandbag Barrier
Hydroseeding	Slope Drains	Sediment Basin	Straw Bale Barrier

Table 19
Erosion and Sediment Control BMPs

Erosion Control		Sediment Control	
Soil Binders	Streambank Stabilization	Sediment Trap	Storm Drain Inlet Protection
Straw Mulch	Compost Blankets	Check Dam	Active Treatment Systems
Geotextiles and Mats	Soil Roughening	Fiber Rolls	Temp Silt Dike
Wood Mulching	Non-Vegetation Stabilization	Gravel Bag Berm	Compost Socks and Berms
Earth Dikes and Drainage Swales		Street Sweeping and Vacuuming	Biofilter Bags

In the event that a wildfire event occurs in the Park, stabilization of soils in the burn area is a primary concern, especially in areas with steep slope gradients, moderate or high EHRs, or within identified slope instability areas. Erosion control BMPs should be installed as soon as possible and prior to the onset of the winter period (November 15 to April 1).

Un-Surfaced Access Roads

In areas where existing dirt access roads will be used and will be retained, waterbreaks and drainage structures should be constructed to minimize erosion potential. All waterbreaks and drainage structures should be installed no later than the beginning of the winter period (November 15 to April 1). Outside the winter period, waterbreaks and drainage structures should be installed prior to sunset if the National Weather Service forecast is a "chance" (30% or more) of rain within the next 24 hours. Waterbreaks should be constructed immediately upon conclusion of use of access roads that do not have permanent and adequate drainage structures. Distances between waterbreaks should adhere to the standards outlined in Table 20. Access roads should be closed to all public vehicle travel.

Table 20
Maximum Distance between Waterbreaks

Erosion Hazard Rating	Road Slope Gradient (percent)			
	≤10	*11-25*	*26-50*	*>50*
Extreme	100	75	50	50
High	150	100	75	50
Moderate	200	150	100	75
Low	300	200	150	100

Source: California Code of Regulations, Title 14, Section 923.5(f)

In addition to the BMPs and access road erosion control features identified above, project-specific planning and permitting efforts (e.g., Timber Harvesting Plan preparation) shall identify measures to minimize erosion and sediment transport potential resulting from forest management activities that utilize roads and skid trails or that otherwise impact soils.

8.4 Air Quality

The following BMPs should be implemented, where feasible, to minimize potential negative effects on air quality:

- Control fugitive dust resulting from equipment use by watering disturbed areas;
- Limit the size and quantity of equipment to that which is necessary to meet the identified vegetation management standard;
- Limit traffic speeds on dirt roads to 15 miles per hour;
- Clean construction vehicles and equipment to prevent dust, silt, mud and dirt from being tracked onto paved roadways;
- Limit vehicle idling time to a maximum of 5 minutes for vehicles and equipment, except where idling is required for the equipment to perform its task; and
- Develop and implement a burn plan and associated smoke management plan for prescribed burning activities, as identified in Section 7.3.4.

8.5 Reforestation/Revegetation

Reforestation or revegetation of areas subject to tree removal or other vegetation treatment can help re-establish native tree cover (e.g., in invasive species removal areas) and minimize the potential for erosion by stabilizing soils. Reforestation or revegetation is recommended only in areas where disturbed and/or bare soil exists following management operations as a measure to stabilize soils or if areas become subject to large-scale tree mortality during the Plan timeframe. In general, treatment areas and areas of disturbance in the Park should be allowed to regenerate on their own as long as endemic species, rather than invasive species, are regenerating. Reforestation/revegetation needs should be determined during project design, during annual forest health work plan development, or during monitoring efforts and should consider slope, soil type, access, maintenance needs, and other BMPs being implemented on site. County Parks should consult with qualified professionals (e.g., foresters, revegetation specialists) to develop site-specific reforestation/revegetation plans, as appropriate. Efforts include hydroseeding, direct seeding, or container plant installation. Plant species selection should be consistent with reforestation/revegetation goals and should consider erosion protection value. Container or bare

root stock used for reforestation/revegetation in the Park should be from nurseries with a SOD Compliance Agreement in place.

8.6 Special-status Plant and Wildlife Species

Management actions in the Park have the potential to impact special-status plant or wildlife species via ground disturbance, vegetation removal or management, the use of vegetation management tools and equipment, or by increasing human presence within or adjacent to occupied areas. The special status plant and wildlife species with the potential to occur in the Park are presented in Section 3.2. In order to minimize the potential for impacts to special-status plant and wildlife species, the measures identified below should be implemented. County Parks should use qualified biologist to facilitate implementation of these measures.

Special-status Plants:

- All vehicles and equipment should be inspected and cleaned of weed seed prior to entering project areas to reduce the spread of noxious weed seed.
- Conduct pre-operations surveys in the appropriate season for rare plants prior to tree or vegetation management activities. If no rare plants are noted in the project area during the survey, no further rare plant avoidance or minimization measures will be necessary. If rare plant populations are observed during the survey, all populations will be documented and flagged for avoidance (including appropriate buffers for herbicide application areas). Flagging may include high visibility pin flag or tape, or orange mesh construction fencing, will be temporary, and will include all individuals of the rare plant population observed. Crews will be educated on the purpose and need of avoidance of all habitat within exclusion zones.
- All rock outcroppings where the federally endangered Santa Clara Valley dudleya (*Dudleya setchellii*) may be present should be completely avoided by all tree or vegetation management activities, including equipment lay-down and storage, vehicular travel, and foot traffic.

Special-status Wildlife:

- For the protection of nesting birds, including raptors, limit tree or vegetation management to the non-nesting season for birds, generally September 1 through January 31. If tree or vegetation management must occur during the bird breeding season (February 1 through August 31), a qualified biologist will conduct pre-construction surveys for nesting birds no more than one week prior to the start of operations. If no nests are observed during the survey, no further measures will be necessary. If active nests are observed, avoidance buffers appropriate for the species of bird should be implemented. Typical avoidance buffers range from 250 to 1,000 feet for raptors, and 50 to 250 feet for passerine species.

Buffers should remain in place until operations are complete, the young have fledged, or if the qualified biologist determines that operations will not result in impacts to nesting, rearing, or breeding success.

- To the maximum extent feasible, a 100-foot avoidance buffer should be implemented around all wetlands, ponds, and watercourses. Any operations that could potentially impact the ponds and drainages (ground disturbance, tree cutting, vegetation treatment, etc.) within the 100-foot buffer areas will require pre-operations surveys and a biological monitor during operations even if protected species such as California red-legged frog, California giant salamander, and Western pond turtle are not observed within these aquatic habitats during the pre-operations. In any event, fencing must be installed around the work zone to prevent species from entering the work zone. If protected species are present within the buffer areas, work should be postponed until either 1) the species move away from that location on their own, or 2) the species are removed and relocated to a safe location by a qualified biologist with approval from USFWS (for federally-protected species).
- For the protection of upland habitat for Western pond turtle, ground-disturbing activities such as movement of heavy equipment or excavation should not occur within 100 meters of suitable aquatic habitat during the late spring through fall nesting period unless pre-operations surveys are conducted to locate any nesting or aestivation sites. If nesting and/or aestivation sites are identified, these areas should be avoided during operations. If avoidance is not possible, the nest and/or turtle should be removed by a qualified biologist and relocated to an appropriate location in consultation with CDFW.
- For the protection of wood rats, take should be avoided. If active woodrat nests are encountered in a project area, they should be protected with high visibility fencing set at a minimum of 50 feet from the nest. Work should not be permitted within the 50-foot avoidance buffer. If complete avoidance is not feasible, CDFW should be consulted to develop appropriate and feasible minimization and mitigation measures that may include, but are not limited to, trapping and relocation or removal of the nest outside of breeding season.

8.7 Cultural Resources

It is anticipated that cultural resources surveys will be conducted prior to implementation of recommended project activities. Artifacts or features identified during surveys should be flagged and equipment excluded. Should exclusion be infeasible, equipment limitations should be implemented (e.g., use of rubber-tired equipment to lift trees off the ground). Exclusion or limitation of equipment should be specified during the specific project planning and permitting stage. A qualified archaeologist should be consulted to approve work area boundaries and allowable work in the vicinity of cultural resources. As the Park is open to the public, any flagging

used for cultural resource site identification should be promptly removed at the completion of operations to minimize the potential for discovery and impact.

8.8 Recreation Resources

Temporary impacts to recreation resources in the Park may result from Plan implementation. This Plan does not recommend actions that would permanently close or prevent recreation activities, but temporary closures or use restrictions may be necessary for the safe operation of equipment and to ensure public safety. To minimize potential negative effects of Plan implementation on recreation resources, the following BMPs have been identified:

- Restore disturbed areas to pre-operation conditions (e.g., clear blocked trails, re-contour damaged trails to minimize the potential for erosion or the creation of unauthorized trails);
- Repair, replace, or reinstall damaged, removed, or relocated Park infrastructure (e.g., signs, bumper logs, gates, picnic tables);
- Minimize the extent or duration of closures by phasing work and/or conducting work outside of peak visitation periods, where feasible;
- Where feasible, conduct operations on weekdays during daytime hours (8 am to 5 pm);
- Control public access by posting detours, installing and maintaining appropriate and adequate signage, using flaggers/monitors where necessary, closing work areas via exclusionary fencing, and providing necessary monitoring/patrolling staff to ensure access control measures are maintained and effective;
- Coordinate with Park reservations staff and campground hosts so Park visitors are aware of planned project activities that may be conducted during their visit.
- Disseminate information regarding planned project activities on the Park website, social media, in-park signage, local newspaper, and via outreach to regular known user groups.

8.9 Protection of Retained Trees

Retained trees in the Park may be subject to impacts resulting from implementation of the management recommendations included in this Plan, development under the Park Master Plan, or from Park operations and maintenance activities. The following protection measures for are provided to minimize impacts to retained trees:

- For construction projects associated with Master Plan implementation or operations and maintenance that require construction activities within the canopy driplines of retained trees, implement the tree protection measures included in Appendix D;

- Where feasible, conduct tree removal operations in mid- to late-summer to minimize pathogen infection potential;
- Any necessary canopy or root pruning should be conducted according to ANSI A300 standards (ANSI 2017).
- For small pile burning activities, site piles a sufficient distance from retained trees to minimize crown and trunk scorching and heat damage to roots;
- For broadcast burning activities, treat surface fuels and/or prune lower limbs of trees such that flame lengths and fireline intensities are low enough to minimize crown and trunk scorching;
- Avoid "skin-ups" on the boles of retained trees caused by contact with equipment, falling trees, or vegetative material being yarded for removal from the site. "Skin-ups" often expose the inner bark and cambium of the residual tree. Such wounds deplete the energy reserves of the tree in order to isolate the injury and create an easy entry point for pests and pathogens.
- Avoid disturbance to tree root zones. Root damage and soil compaction can occur through improper operation of equipment while maneuvering over the root zone. Avoid operation in the root zone under saturated soil conditions and avoid contacting above-ground roots. Reuse old tractor roads or recreational trails where available to reduce soil compaction.
- Avoid piling chips, soil, or other materials against the trunk/bole of retained trees.
- Avoid disturbance to tree crowns during operations, expect where necessary for creation of old-growth characteristics or wildlife habitat. If limb removal is necessary for equipment operation, limbs should be pruned according to ANSI A300 standards.
- For tree removal operations, directionally fell trees away from the retained trees, or in a direction that would cause the least amount of damage to the surrounding tree crowns. Torn branches, like skin-ups, deplete the energy reserves of the tree in order isolate the injury, and create an easy entry point for pests and pathogens.
- Prior to excavation and grading for upgrades, repairs, or new developments near trees, a Tree Protection Plan should be prepared by a, ISA Certified Arborist or RPF and should include specific protection measures for the root zone, bole, and tree crowns.

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9 PLAN IMPLEMENTATION

The following sections outline the methods for implementing this Plan over its 20-year timeframe.

9.1 Roles and Responsibilities

Santa Clara County Parks staff, or their designee, will be responsible for implementing this Plan and will be responsible for the following (primary responsible staff identified in parentheses):

- Assessing field conditions on a routine basis to determine the need for management action implementation (Park Maintenance, Park Operations);
- Developing annual forest health work plans and budgets (Natural Resources Management);
- Conducting all necessary pre-project planning efforts, including conducting California Environmental Quality Act (CEQA) environmental review and obtaining necessary permits and authorizations (Natural Resources Management);
- Continuing to implement the Tree Safety Program and incorporating work needs into annual forest health work plans (Natural Resources Management, Park Maintenance);
- Providing appropriate training, materials, tools, and equipment to Park staff to implement identified general practice recommendations (Park Maintenance, Park Operations, Natural Resources Management);
- Screening, selecting, and hiring contractors, or directing Park staff, to conduct identified projects (Natural Resources Management);
- Monitoring the implementation phase of forest management actions to ensure that BMPs are being properly implemented (Natural Resources Management); and
- Monitoring project areas following completion of operations to ensure that management standards have been achieved (Natural Resources Management).

9.2 Planning and Scheduling

This Plan recommends development of annual forest health work plans to facilitate implementation of recommended projects and to track observations and implemented actions associated with the Park's Tree Safety Program. It is anticipated that some recommended projects may be completed in one calendar year, while others will need to be broken into phases that span multiple years. Factors affecting the duration of project implementation include, but are not limited to, project size, impact to Park recreational resources, funding, resource availability, and permit requirements. Annual forest health work plan development should include identification of new

project actions (projects that will be started that year), continuing project actions (project that are continuing from the previous year), and previous project areas that require maintenance.

Planning and scheduling of forest health projects is anticipated to be an on-going process conducted throughout most of the calendar year. Most planning and scheduling efforts will be conducted in the winter months for work to be conducted in the upcoming spring, summer, and fall months, although such efforts may occur at different times during the year, depending on project needs.

Concurrent planning and scheduling of different management activities in different areas of the Park is also anticipated, as some activities (e.g., pile burning or prescribed fire) may necessitate a longer planning and scheduling period than others. Planning and scheduling activities will also consider management timing priorities and constraints, available resources, BMPs, and funding. Planning and scheduling tasks will also include coordination with and scheduling of work crews (e.g., CAL FIRE crews, CCC crews, volunteers, etc.), private contractors (e.g., licensed timber operators), and/or Park staff. Where necessary, planning and scheduling activities will include preparation of bid specifications and bid packages, contractor screening, selection, and hiring, and developing direction for Park staff.

9.2.1 Plan and Permit Requirements

The projects recommended in this Plan may necessitate the preparation of additional planning documents or applications to obtain necessary permits or authorizations to conduct regulated work. County staff will be responsible for obtaining such permits or authorizations, which may necessitate hiring qualified consultants (e.g., biologists, Registered Professional Foresters, archaeologists). Based on the projects identified in this Plan, it is anticipated that the County may need one or more of the following permits/authorizations in order to proceed with operations:

- Timber Harvesting Plan (THP), THP Exemption, or Emergency Notice approved by CAL FIRE for timber operations. THPs are an environmental review document submitted by landowners to CAL FIRE outlining what timber is planned for harvest, how it will be harvested, and the steps that will be taken to prevent damage to the environment. THP exemptions cover specific activities that are exempt from THP preparation, although harvest practices must adhere to the standards outlined in the California Forest Practice Rules. Examples of THP exemptions include those for harvesting dead, dying, or diseased trees and removal of trees for eliminating flammable materials and ladder fuels in fuel breaks. Emergency Notices are applicable when emergency conditions exist, such as where dead/dying trees pose a fire hazard or when pathogen-infested trees pose a threat to forest health (e.g., SOD). Timber operations include cutting or removal of trees for commercial purposes (where

the resulting material would be sold, bartered exchanged, or traded). Timber operations would not include removal of smaller trees for fuel management or non-commercial purposes, with specific criteria outlined in California Public Resources Code Section 4527(b).

- Burn permits and associated smoke management plan approved by the BAAQMD.
- Agency permits necessary for impacts to regulated species, habitats, or watercourses.

9.2.2 Project Timing

The recommended projects identified in this Plan are anticipated to be conducted primarily during spring, summer, and fall months; however, project activities may be conducted at any time during the year if not otherwise restricted. Factors that may restrict project timing include, but are not limited to, recreation demands, biological resources constraints (e.g., nesting season), fire hazard conditions, and saturated soil conditions. Implementation of the recommendations in this Plan should seek to minimize potential negative effects of project activities by considering the timing of work. Emergency work (e.g., clearing down trees) may need to be conducted at any time of year.

9.2.3 Project Coordination

Park staff will prepare an annual forest health work plan based on identified projects, completed projects (or portions thereof), or other site-specific conditions observed during field evaluations. The annual work plans will identify projects to be implemented, implementation timing, resource needs and availability, permit needs or status, funding sources, and monitoring and documentation needs. This process may involve preparing bid specifications, advertising bids, and evaluating and selecting qualified contractors if identified tasks will not be completed by Park staff. Park staff will coordinate with other County departments, CAL FIRE, and other agencies or landowners, as appropriate, during annual forest health work plan development.

This Plan includes an adaptive management component, therefore, the annual forest health work plan is intended to be an internal document that may be modified throughout the year. Modifications to the annual forest health work plan may be necessary due to various factors, including field conditions, weather, staff or contractor project completion rates, staff and resource availability, permit acquisition needs, and emergency conditions, amongst others.

9.3 Monitoring and Reporting

This Plan recommends that forest health monitoring be conducted as identified below:

- **Routine Monitoring:** Park staff routinely patrol and monitor forested areas of the Park for maintenance purposes and should document forest health issues (e.g., dead trees, invasive

species presence) when observed. Documentation should be provided to Park management staff and should include information regarding observed condition, and size of identified area/issue. In addition, a routine monitoring of all areas of the Park should be conducted at least annually, with reporting as described. Monitoring in the spring is recommended so that any potential damage occurring over winter can be documented. Augmentation of this effort with aerial monitoring (e.g., helicopter, plane) is also recommended, where feasible. Documentation should include written observations and photographs of field conditions, with documentation provided to Natural Resource Management staff for inclusion in annual work plans and budgets. If necessary, further analysis of observed issues should be conducted by Park management staff or qualified professionals (e.g., Certified Arborists, RPFs).

- **Project Area Monitoring:** Park staff, or their designee, should conduct annual monitoring of Park forestland where project activities have been conducted within the previous 12 months. All shaded fuel break areas should be monitored annually. Annual monitoring should identify project status (complete, in-process), rate and type of regrowth, presence and coverage of invasive species, signs of new or intensified pathogen effects, and any necessary follow-up maintenance needs, including maintenance of BMPs. Any necessary management or maintenance activities should be included in annual forest health work plans.
- **Forest Health Monitoring:** Dedicated forest health monitoring surveys should be conducted at least every 5 years by an RPF. More frequent monitoring may be necessary and should be determined on a case-by-case basis (e.g., regional pest outbreaks affecting Park forestland). The intent of monitoring efforts should be to identify any emerging forest health issues in the Park and should be conducted in consultation with qualified professionals and CAL FIRE. Monitoring should include an assessment of aerial imagery and remotely sensed data as an initial step to identify potential forest health issues. CDFW maintains publicly-available, multi-year data sets derived from the National Agriculture Imagery Program (NAIP) that can be useful in evaluating plant stress (e.g., Normalized Difference Vegetation Index (NDVI) data and Color Infrared data) and canopy change. Other remotely-sensed data sets that may be useful in analyzing potential forest health issues include light detection and ranging (LiDAR) data sets, high-resolution aerial imagery, and unmanned aerial vehicle (UAV) imagery, Field monitoring should be conducted in identified areas to determine the cause and extent of issues observed via remotely sensed data. General forest health assessments should also be conducted by the RPF to identify the type and extent of other potential forest threats, including, but not limited to, dead/dying trees, pests/pathogens, slope failures, trespass areas, invasive species, and high fuel loads. It is anticipated that general forest health assessments would include windshield surveys and hiking throughout the Park to identify such issues and that the effort could be conducted in 7-10 days. Forest health monitoring could include cone

collection surveys, conducted in coordination with CAL FIRE. Cone collection in the Park is a good opportunity for storing a stock of seeds from trees within the Park for future use should reforestation efforts be needed. Finally, forest health monitoring can also be coordinated with inspections conducted under the Tree Safety Program.

Park staff should prepare an annual internal Park forest health status report summarizing the results project actions, monitoring efforts, identifying and quantifying treatment areas, documenting annual expenditures associated with Plan implementation, identifying any additional resource needs, and summarizing any pertinent issues identified and addressed during Plan implementation. Based on the results of monitoring efforts, the annual report should identify any proposed changes to forest health management activities conducted in the Park.

9.4 Adaptive Management

Adaptive management is an iterative process of implementation, monitoring, and adjustment of management actions based on monitoring results (McEachern et al. 2007). The critical component of the adaptive management process for this Plan is the monitoring effort described in the previous section. The results of monitoring efforts summarized in the annual forest health status reports should be used in annual forest health work plan development efforts and to determine which management activities or practices are effective or ineffective, if there is a need to change or modify management practices, if additional BMPs need to be employed, or if changes to BMPs are necessary. Monitoring will also allow for consideration of unplanned events (e.g., wildfire burning in the Park) that may have an effect on Plan implementation.

Park staff should document the results of monitoring efforts, as described in the previous section, noting recommended changes to management activities or BMPs. This documentation should then be used by Natural Resources Management staff during subsequent planning and scheduling efforts with recommended changes incorporated into annual forest health work plans.

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10 LIST OF PREPARERS

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APPENDIX A

Field Data Collection Forms and Photographs

Field Data Collection Forms and Photographs

Fuel Site #: 1	Surveyor Name: Scott Stephenson	Date: 9/26/17
Location name: Ridge Trail + Iron Springs Trail below Archery Range		NRMZ #: 6
Regional Fuel Break / Defensible Space / Safety Zone / Landscape Fuel Reduction / Localized Fuel Reduction Other:		

Description
Hiked out from Archery Parking lot to the west on Iron Springs down to Black Hawk Trail. Trail is a drivable, native surface forest road. The last approx. 500 feet before intersection with Black Hawk Trail is impassable for conventional 4wd vehicles and narrows to trail width. Stands of Redwood with mixed Tanoak and Madrone hardwoods all along the contouring portion of the road. Varying levels of severity in disease pockets were observed. Observed evidence of trail and road clearing along entire length. Parks has little means for removal or treatment of material. Mostly tanoak root crown failures, but also a significant number of root crown failed madrone. Surface fuels are predominantly leaf litter, light slash, and low growing tanoak regeneration. Recommend at a minimum to lop bole, and branches of fallen trees and scatter to specified depth as new trail and road clearance activities occur. Research future opportunities to treat already accumulated debris and standing snags, encouraging ingrowth of tanoak and redwood wherever possible. Tree health and vigor improve and fuels buildup significantly reduces as the trail descends to Black Hawk. Walk south on Ridge Trail from Archery Lot. Rocked access road. More exposed southerly ridge. Stands transition to oak, brush, scrub, and grasses. Varying levels of severity in disease pockets, although not as severe as Iron Springs. Known location of buried fiber optic cable and overhead power lines. Possible escape route? What are the existing fuels reduction activities/veg mgmt. policies along utility corridors and roadway outside Parks jurisdiction, but may still be impacted by Parks policies?

Field Data Collection Forms and Photographs

	
Fuel Site #: 1	Fuel Site #: 1

Field Data Collection Forms and Photographs

	
Fuel Site #: 1	Fuel Site #: 1

Field Data Collection Forms and Photographs

Fuel Site #: 2	Surveyor Name: Scott Stephenson	Date: 9/26/17
Location name: Archery Range		NRMZ #: 1
Regional Fuel Break / Defensible Space / Safety Zone / Landscape Fuel Reduction / Localized Fuel Reduction Other:		

Description
Stands of Redwood, tanoak, madrone, and coast live oak. Varying levels of severity in disease pockets. CLO appear healthy with little to no mortality or dieback. Fuels conditions very similar to that of Ridge Road and Iron Springs Trail only more dispersed concentrations of fuel/debris piles. Most concern is near main access road and the large native surface clearing which likely serves as a safety or landing zone during emergency response and possibly an evacuation route point along Ridge Road.

	
Fuel Site #: 2	

Field Data Collection Forms and Photographs

Fuel Site #: 3	Surveyor Name: Scott Stephenson	Date: 9/26/17
Location name: Henry Miller Site		NRMZ #: 1
Regional Fuel Break / Defensible Space / Safety Zone / Landscape Fuel Reduction / Localized Fuel Reduction Other:		

Description
Walk through for Forest Health evaluation on 9-25 did not illuminate many fuels concerns although continued mortality and dieback are contributing to fuel load. Fir or spruce (larch?) of unknown exotic species growing just inside the parking lot gate. Surface fuels are leaf litter and light slash with low growing tanoak regen. Increasing slash load from mortality. Slash concentrations are disbursed. Slash appears to break down readily where logs and branches are arranged at ground level or shortly above. North side is cool and shady with low fire hazard. South side is drier with more continuous fuel arrangement and combustible fuel types. No actual habitable or serviceable structures necessitating defensible space. Water storage tanks located near gate entrance. No defensible space established. Necessary? Observed some road clearing operations w front-end loader with a box scraper attachment. Down tree boles and slash were pushed off the road onto the shoulder. It did not appear that further lopping or spreading were conducted. Area near the pool or pond shaped structure has severe mortality and dieback.

	
Fuel Site #: 3	Fuel Site #: 3

Field Data Collection Forms and Photographs

Fuel Site #: 4	Surveyor Name: Scott Stephenson	Date: 9/26/17
Location name: Shop, HQ, and Visitor Center (All Tan Oak Road east)		NRMZ #: 1
Regional Fuel Break / Defensible Space / Safety Zone / Landscape Fuel Reduction / Localized Fuel Reduction Other:		

Description
Shop, HQ, and Visitor Center appear to have adequate defensible space. Recommend additional grass mowing, tree pruning, and slash/firewood removal from South and West sides of residence. Visitors Center needs tree pruning, grass mowing, leaf and branch litter raking, rooftop sweeping. Also recommend additional grass mowing along driveway on the amphitheater side. Brush field established on north side of deer pen as noted on health eval. Recommended clearing away from fence so that flame lengths would not reach the pen. Recommend mowing and weeding to the north and east of the amphitheater. Also, rake leaf litter and clear slash immediately around amphitheater structure. Room behind structure for small burn pile. Prune trees to maintain structure clearance around Group Picnic Shelter. A few of the closest trees may warrant whole tree removal. Shelter rooftop should be swept of leaf litter. Mow grasses further out along north edge of Tan Oak Road east. Fire direction likely to approach High Use Area from the south. Grasses are currently mown approximately 5 feet either side of road and parking area for Group Picnic. Know pockets of severe mortality in stand between Tan Oak Road and Hill Top View. Hazardous fuel conditions to the southeast in Archery area and to the southeast toward Bay View and to the north west surrounding Tan Oak Campground and day use.

	
Fuel Site #: 4	Fuel Site #: 4

	
Fuel Site #: 4	Fuel Site #: 4

	
Fuel Site #: 4	Fuel Site #: 4

	
Fuel Site #: 4	Fuel Site #: 4

	
Fuel Site #: 4	Fuel Site #: 4

Field Data Collection Forms and Photographs

Fuel Site #: 5	Surveyor Name: Scott Stephenson	Date: 9/26/17
Location name: Tan Oak Campground, Day Use, and Tan Oak Road west		NRMZ #: 1
Regional Fuel Break / Defensible Space / Safety Zone / Landscape Fuel Reduction / Localized Fuel Reduction Other:		

Description
Day use area has grasses mown along road and throughout many open areas. Trees are pruned and adequate defensible space provided for restroom. Rock barriers keep traffic inside designated areas. Transition from day use to campground area at gate. Grasses are not mown. Redwood canopy closes in on road. Fuels become leaf litter, blackberry, low growing RW suckers, and light to moderate slash. Old deer pen to the south of Tan Oak Road, north of Pole Line Road, is transitioning to baccharis. Power lines traverse Old (West) Deer Pen so probably not suited for LZ. Slash in and around campsites is thoroughly cleared either by visitors (firewood collection) or Parks staff. Recommend additional clearing/pruning near restroom and sweep restroom roof. Known severe pockets of mortality and dieback with hazardous fuels conditions to the north and downslope of campground area. Just west of the gate there is a low draw where numerous tanoaks have failed at the root crown. Heavy slash and surface fuels have accumulated here.

	
Fuel Site #: 5	Fuel Site #: 5

	
Fuel Site #: 5	Fuel Site #: 5

	
Fuel Site #: 5	Fuel Site #: 5

Field Data Collection Forms and Photographs

Fuel Site #: 6	Surveyor Name: Scott Stephenson	Date: 9/26/17
Location name: Summit Road Zone		NRMZ #: 3
Regional Fuel Break / Defensible Space / Safety Zone / Landscape Fuel Reduction / Localized Fuel Reduction Other:		

Description
Known CWPP grant proposal for Summit Rd Fuel Break. Large baccharis brush field at intersection of Summit/Mt Madonna/Pole Line. Rehab? No vehicle access.

	
Fuel Site #: 6	Fuel Site #: 6

Field Data Collection Forms and Photographs

Fuel Site #: 7	Surveyor Name: Scott Stephenson	Date: 9/26/17
Location name: Blue Springs		NRMZ #: 1
Regional Fuel Break / Defensible Space / Safety Zone / Landscape Fuel Reduction / Localized Fuel Reduction Other:		

Description
Eucalyptus stand increases fire hazard. Volatile fuels. Stockpile of slash in clearing along access road. Clearing not large enough for safety or lz, but could be suited for burning large piles. Typical bluegum fuel conditions ranging from dense small diameter stems to larger diameter clumps surrounded by redwood ingrowth. Stringy bark, leaf litter, and tanoak/redwood regen surface fuels Conversion of the Eucalyptus stand to a RW/TO/Madrone would help reduce the fire hazard to the use areas uphill and east of blue springs.

	
Fuel Site #: 7	Fuel Site #: 7

	
Fuel Site #: 7	Fuel Site #: 7

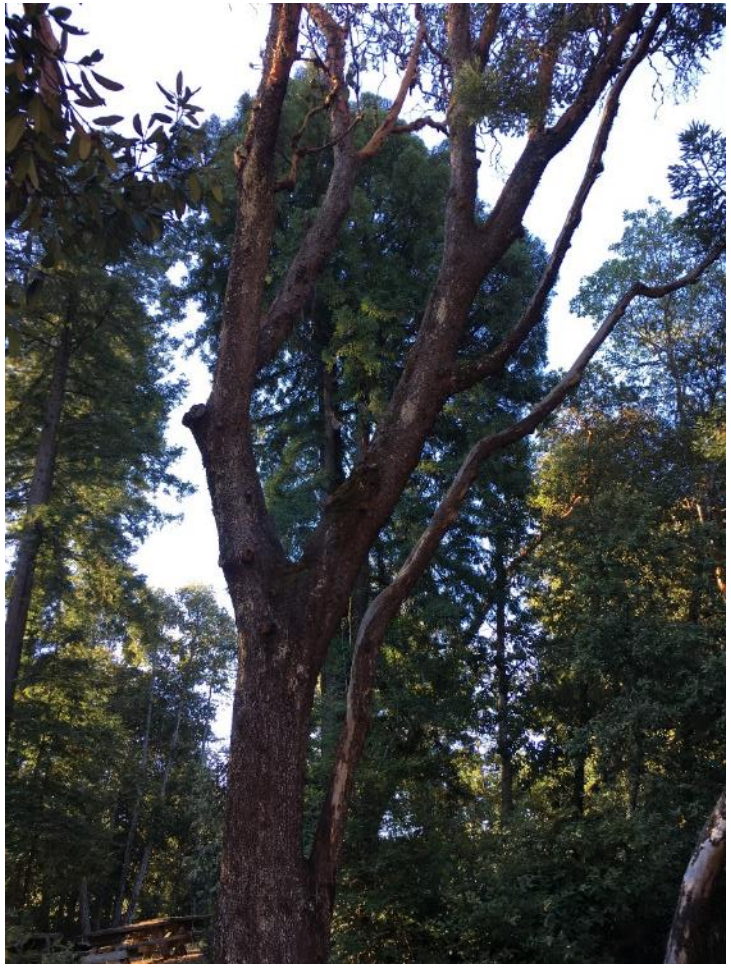
	
Fuel Site #: 7	

Field Data Collection Forms and Photographs

Pest Site #: 1	Surveyor Name: Scott Stephenson	Date: 9/25/2017
Location name: Archery Picnic Area		NRMZ #: 1

Description	Disease ID	Sample No's
Large clearing bordered by RW, madrone, tanoak. Observed several declining and dead madrone and tanoak. Many brown and yellowing leaves on perimeter RW. Also noted numerous blown out tops of RW. Stripped bark of one smaller RW. Wood rats? Squirrels? Health issues appear consistent around archery range perimeter. A few mid-bole TO snap outs are visible along the upper perimeter of archery range clearing. Health issues appear to affect pockets with the poorest health or dead trees located centrally within the cluster, indicative of root disease centers. Service road to Archery range had similar conditions adjacent with one noticeably bad pocket of TO/madrone mortality. Significant numbers of TO sprouts are regenerating in the site. Adjacent large native surface parking area shows less advanced issues around the perimeter with baccharis. Eucalyptus stand of undetermined size noticeable to the south of the parking area. Observed some branch dieback in adjacent madrones and observed high amounts of needle cast in adjacent RW. CLO was also observed near the lot perimeter. An overhead power line crosses through the area. A few bay laurel were observed without the burned leaf tips symptomatic of SOD A few fruit trees were observed suggesting the area was possibly once used as an orchard A leach field exists somewhere upslope of the archery range, between the range and the maintenance shop.	Armillaria and Phellinus? Mostly disease clusters indicative of root disease centers. A few mid bole snap outs also observed indicative of mid-bole heart rot.	1-1 1-2 1-3

Field Data Collection Forms and Photographs

	
Pest Site #: 1	Pest Site #: 1

Field Data Collection Forms and Photographs

	
Pest Site #: 1	Pest Site #: 1

	
Pest Site #: 1	Pest Site #: 1

Field Data Collection Forms and Photographs

Pest Site #: 2	Surveyor Name: Scott Stephenson	Date: 9/25/2017
Location name: Henry Miller Home Site		NRMZ #: 1

Description	Disease ID	Sample No's
Path from parking leads directly to RW/TO stand. RW appear vigorous although a high-level needle cast and yellowing/browning leaves were observed. Redwood cones were opening. Understory is mostly tanoak up to 10 feet. All tanoak crowns appear healthy and full except 1/8 acre grouping near site on north side of trail where leaf and branch dieback appeared moderate. However, multiple mid bole snap-outs were observed on mature large diameter tanoaks. Failures of tanoak often associated with included bark or old wounds. Good potential for resistograph demonstration.	Phellinus? Canker rot	2-1 2-2

	
Pest Site #: 2	Pest Site #: 2

	
Pest Site #: 2	Pest Site #: 2

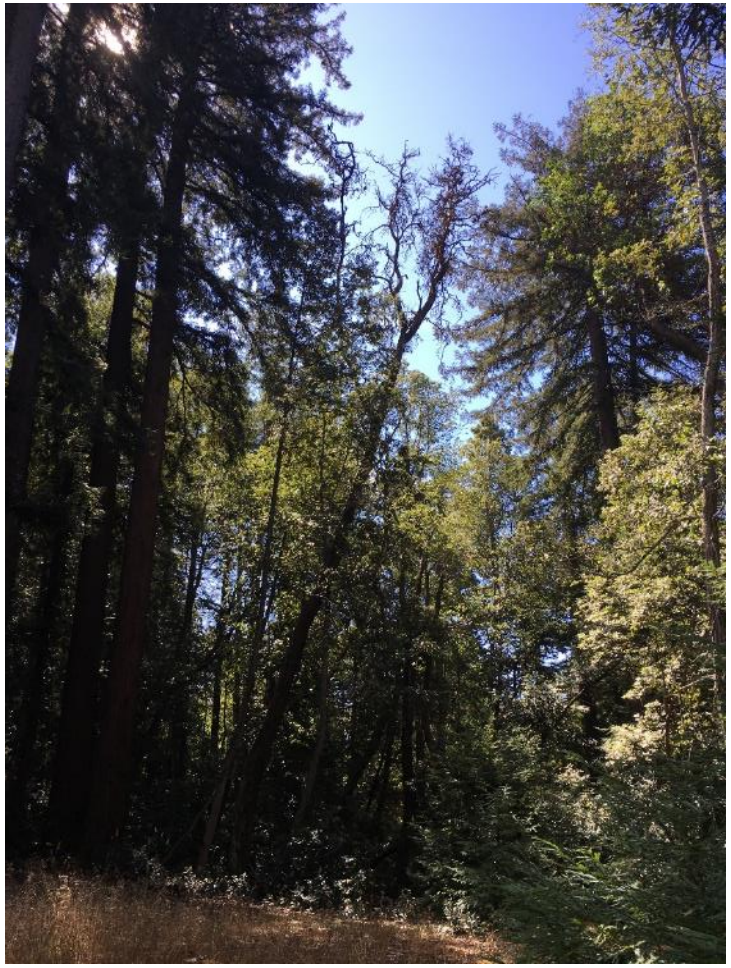
	
Pest Site #: 2	Pest Site #: 2

Field Data Collection Forms and Photographs

Pest Site #: 3	Surveyor Name: Scott Stephenson	Date: 9/25/2017
Location name: Hilltop Picnic Area and Deer Pen		NRMZ #: 1

Description	Disease ID	Sample No's
No obvious mortality or severe dieback observed upon arrival at parking area. Similar stand composition of RW/TO/Mad. Light to moderate dieback in hardwoods. Moderate yellowing/needlecast in RW. Small area north of deer pen has been cleared. Possibly an older disease pocket. Madrone and tanoak regenerating in the clearing with dense grasses, brush, blackberry, and pampas grass. <1/10th acre site south of Hilltop Picnic disease center with tanoak and madrone snags and uprooted trees.	Armillaria? Observed weeping cankers midbole of tanoak	No samples

	
Pest Site #: 3	Pest Site #: 3

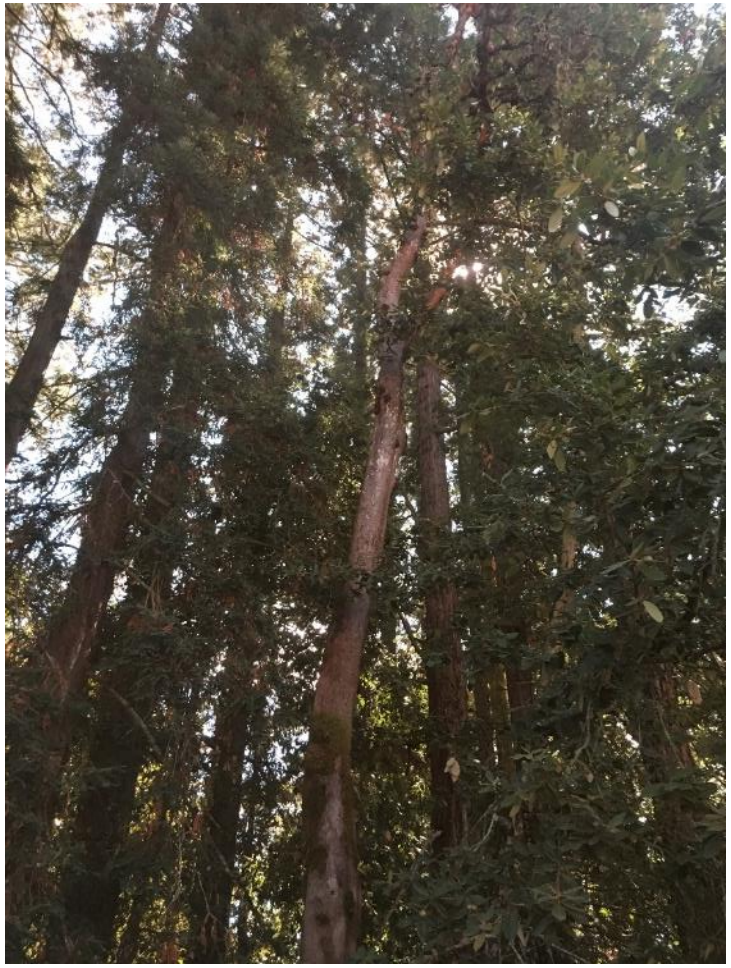
	
Pest Site #: 3	Pest Site #: 3

Field Data Collection Forms and Photographs

Pest Site #: 4	Surveyor Name: Scott Stephenson	Date: 9/25/2017
Location name: Amphitheatre and Group Picnic		NRMZ #: 1

Description	Disease ID	Sample No's
Madrones and tanoaks near small parking area show moderate branch dieback. Nearby redwood shows moderate yellowing/needlecast. Met with Will Howsman @ 11:30 am. Will observed many tanoak suddenly turning from full healthy crowns, to dead. Suggested that P. ramorum could be a culprit. My own observations found TO in various stages of dieback, suggesting a less aggressive pathogen, with effects exacerbated by drought stress. Also, drought conditions do not favor P. ramorum spread, whereas plants subject to prolonged drought are subject to root damage from Armillaria. Redwoods, exotics, madrones, and tanoak stand composition. Landscaped appearance surrounding amphitheater. Light branch/leaf dieback in hardwoods. Consistency of redwood needlecast suggests a heavy, yet normal, seasonal leaf drop rather than being symptoms of disease damage. A few mature Eucalyptus established near the gate on Tan Oak. Observed trees marked with blue dots and tagged with tree numbers throughout high use area in the park. Most likely related to a previous forest health inventory or survey of unknown origin.	Observed light silken webs on madrone causing minimal damage.	No samples

	
Pest Site #: 4	Pest Site #: 4

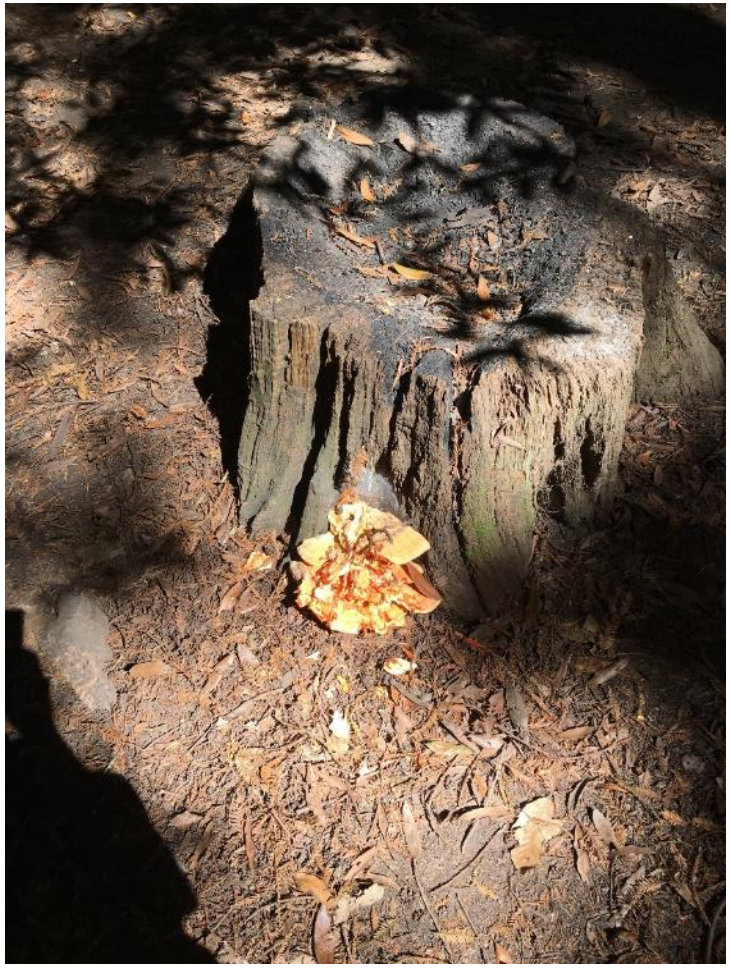
	
Pest Site #: 4	Pest Site #: 4

Field Data Collection Forms and Photographs

Pest Site #: 5	Surveyor Name: Scott Stephenson	Date: 9/25/2017
Location name: Tan Oak Day Use and Campground		NRMZ #: 1

Description	Disease ID	Sample No's
Redwood and tanoak. Site 404 has RW with grainery. TO with severe branch dieback behind Site 420. Other tanoaks appear healthy with only light to moderate leaf/branch dieback. Chips spread around base of tanoak behind Site 420. Same TO also shows long seam on fair side of trunk, indicating previous mechanical injury, with moderate to severe branch dieback. TO just downslope from this shows a large mechanical scar with severe dieback. Bay tree leaves lack the signature burned tips indicative of P. ramorum. Area appears generally clear of hazard trees with only light branch dieback in the tanoak. Branch dieback is usually associated with an old wound or previous tree removal within the same clump. No midbole snap-outs were observed. Substantial disease pocket observed northwest of the gate into the campsite area. Significant TO mortality and severe dieback affecting ¼+ acres. Adjacent RW have blown out tops and severe yellowing/needlecast. Site continues east from gate area. <u>This may be an important follow-up visit to explore the extent of this and other disease pockets this side of the Tan Oak Day Use area.</u> Continuing east from gate, one large uprooted madrone across trail. Redwood regenerating to occupy space. Neighboring madrone with lean over picnic tables shows moderate to severe dieback.	Possibly Armillaria noting the pockets of mortality, uprooting, various stages of dieback, and effect on RW trees.	5-1 5-2 5-3 (x2)

	
Pest Site #: 5	Pest Site #: 5

	
Pest Site #: 5	Pest Site #: 5

	
Pest Site #: 5	Pest Site #: 5

Field Data Collection Forms and Photographs

Pest Site #: 6	Surveyor Name: Scott Stephenson	Date: 9/25/2017
Location name: Closed upper portion of Mt. Madonna Road and Bay Ridge Trail		NRMZ #: 3

Description	Disease ID	Sample No's
Observations while traversing Mt. Madonna road from intersection. Conditions were much improved in this northeast aspect, predominantly redwood stand. Tanoak shared a small portion of the overstory. Tanoak, big leaf maple, and madrone understory. Very little dieback or mortality observed progressing away and downslope from the intersection and ridge. Following the Bay Ridge Trail from the intersection, observed numerous root failures of madrone and tanoak. Also present were numerous isolated clumps of mature Eucalyptus, usually in 2s or 3s. No eucalyptus regen was observed. Madrone failure occurred near trail, where tension roots appeared to be impacted by the trail. Observed one tanoak root crown failure. This failure was one of 5 trees sharing the same stump. Tree was the southerly most tree, established in a large opening, had a heavy lean, and a high amount of included bark, suggesting a pathogen may not have been the primary culprit. Madrone and tanoaks appear to be shaded out by maturing redwood.	Possibly Armillaria. But failures don't suggest pathogens as primary culprit.	None

	
Pest Site #: 6	Pest Site #: 6

Field Data Collection Forms and Photographs

Pest Site #: 7	Surveyor Name: Scott Stephenson	Date: 9/25/2017
Location name: Blue Springs Trail, Indian Rock and Arrowhead Group Camps		NRMZ #: 1

Description	Disease ID	Sample No's
Small stands of Eucalyptus at entry gate mark the outer perimeter of Eucalyptus stand. RW ingrowth. Traversing down the access road, observed a rock quarry and wood disposal site. Mortality and dieback in madrones and tanoaks appears low. Stands of Eucalyptus continue from entry gate all the way downslope to the campgrounds. Observed one standing dead madrone downhill from bathroom building at upper parking lot.	None ID'd	None

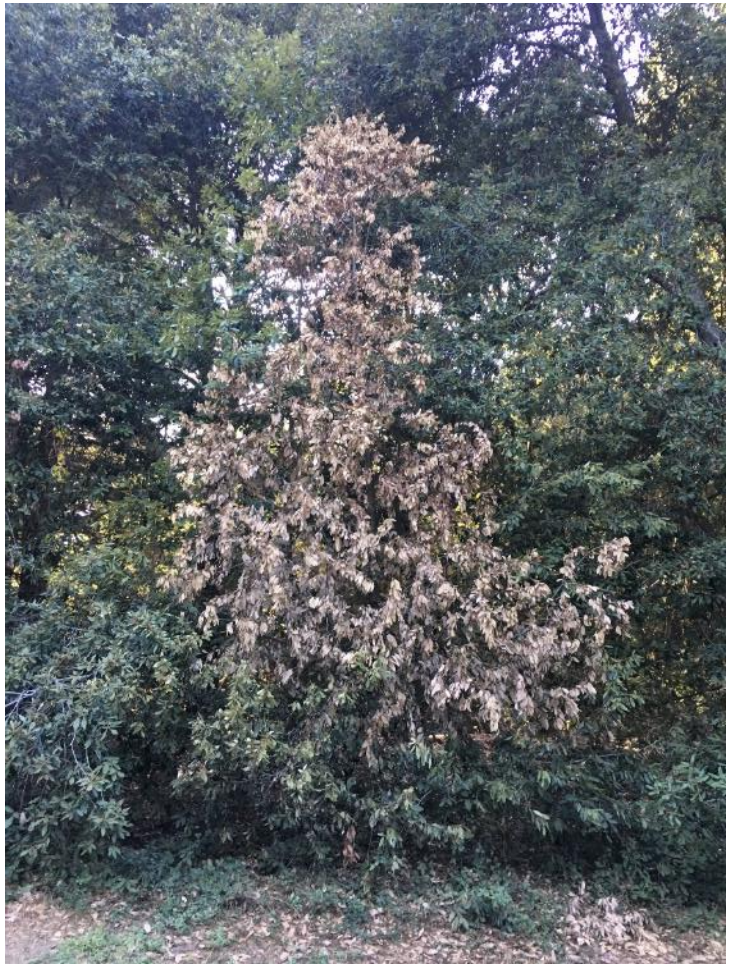
	
Pest Site #: 7	Pest Site #: 7

	
Pest Site #: 7	Pest Site #: 7

Field Data Collection Forms and Photographs

Pest Site #: 8	Surveyor Name: Scott Stephenson	Date: 9/25/2017
Location name: Valley View Campgrounds		NRMZ #: 6

Description	Disease ID	Sample No's
VV1 Upon entering the campground, the stands of RW and TO and Mad appeared healthy. Low mortality, low branch dieback, moderate needlecast in RW but no blown out RW tops. Observed one small diameter dead TO at Site 108 Tent camping loop of VV1 observed moderate branch dieback in madrone and tanoak, with a small number of blown out tops of redwood. VV2 Similar conditions to VV1. No areas observed with severe dieback or mortality. VV3 Observed <1/10 acre pocket of dieback and mortality in tanoak and madrone at intersection beginning the loop at "VV 4" (end of the road). Fire scars in the stands to the south of the intersection indicate recent fire history. A few midbole tanoak snap-outs observed along the north side of the loop. VV4 Proposed new campground area in Master Plan. Signs of recent fire damage visible in redwood stands. Also discovered CA bay laurel with burned leaf tips, commonly associated with presence of SOD.	Armillaria? SOD near VV 4?	None

	
Pest Site #: 8	Pest Site #: 8

	
Pest Site #: 8	Pest Site #: 8

	
Pest Site #: 8	Pest Site #: 8

APPENDIX B

Special Status Plant Species with Potential to Occur

Special Status Plant Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Arctostaphylos andersonii	Anderson's manzanita	None/None/1B.2	Broadleafed upland forest, chaparral, north coast coniferous forest; openings, edges/perennial evergreen shrub/Nov–May/197–2,493	**Present**. There are multiple documented occurrences of this species at Mt. Madonna County Park. All are presumed extant and the most recent was recorded in 2004 (CDFW 2017).
Arctostaphylos hookeri ssp. *hookeri*	Hooker's manzanita	None/None/1B.2	Closed-cone coniferous forest, chaparral, cismontane woodland, coastal scrub; sandy/perennial evergreen shrub/Jan–June/197–1,759	**Low potential to occur.** Although forest and chaparral habitat is present onsite, this species prefers sandy, coastal soils. The nearest documented occurrence for this species is located approximately 7 miles southwest of Mt. Madonna County Park (CDFW 2017).
Arctostaphylos pajaroensis	Pajaro manzanita	None/None/1B.1	Chaparral (sandy)/perennial evergreen shrub/Dec–Mar/98–2,493	**Low potential to occur.** Although chaparral habitat is present onsite, this species prefers sandy, coastal soils. The nearest documented occurrence for this species is located approximately 6 miles west of Mt. Madonna County Park (CDFW 2017).
Arctostaphylos regismontana	Kings Mountain manzanita	None/None/1B.2	Broadleafed upland forest, chaparral, north coast coniferous forest; granitic or sandstone/perennial evergreen shrub/Jan–Apr/1,001–2,395	**Not expected to occur**. Although there is potentially suitable forest and chaparral habitat, the nearest documented occurrence for this species is greater than 10 miles northwest of Mt. Madonna County Park (CDFW 2017).

Special Status Plant Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Balsamorhiza macrolepis	big-scale balsamroot	None/None/1B.2	Chaparral, cismontane woodland, valley and foothill grassland; sometimes serpentinite/perennial herb/Mar–June/295–5,102	**Not expected to occur**. Although there is potentially suitable forest and chaparral habitat, the nearest documented occurrence for this species is approximately 10 miles east of Mt. Madonna County Park (CDFW 2017).
Calyptridium parryi var. *hesseae*	Santa Cruz Mountains pussypaws	None/None/1B.1	Chaparral, cismontane woodland; sandy or gravelly, openings/annual herb/May–Aug/1,001–5,020	**Not expected to occur**. Although there is potentially suitable woodland and chaparral habitat, the nearest documented occurrence for this species is approximately 8 miles northwest of Mt. Madonna County Park (CDFW 2017).
Castilleja latifolia	Monterey Coast paintbrush	None/None/4.3	Closed-cone coniferous forest, cismontane woodland (openings), coastal dunes, coastal scrub; sandy/perennial herb (hemiparasitic)/Feb–Sep/0–607	**Not expected to occur**. Although there is potentially suitable forest habitat, the nearest documented occurrence for this species is greater than 10 miles northeast of Mt. Madonna County Park (CDFW 2017).
Castilleja rubicundula var. *rubicundula*	pink creamsacs	None/None/1B.2	Chaparral (openings), cismontane woodland, meadows and seeps, valley and foothill grassland; serpentinite/annual herb (hemiparasitic)/Apr–June/66–2,986	**Low potential to occur**. There is potentially suitable chaparral, woodland, and grassland habitat onsite; however, the nearest documented occurrence of this species is located approximately 5 miles southeast of Mt. Madonna County Park (CDFW 2017).

Special Status Plant Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Ceanothus ferrisiae	Coyote ceanothus	FE/None/1B.1	Chaparral, coastal scrub, valley and foothill grassland; serpentinite/perennial evergreen shrub/Jan–May/394–1,509	**Moderate potential to occur**. There is potentially suitable chaparral and grassland habitat onsite. The nearest documented occurrence of this species is located approximately 4 miles north of Mt. Madonna County Park (CDFW 2017).
Centromadia parryi ssp. *congdonii*	Congdon's tarplant	None/None/1B.1	Valley and foothill grassland (alkaline)/annual herb/May–Oct (Nov)/0–755	**Low potential to occur**. This species has been previously documented in 1989 approximately 3 miles south of Mt. Madonna County Park (CDFW 2017). Although there is suitable grassland onsite, the soils are not alkaline.
Chlorogalum pomeridianum var. *minus*	dwarf soaproot	None/None/1B.2	Chaparral (serpentinite)/perennial bulbiferous herb/May–Aug/1,001–3,281	**Not expected to occur**. Although there is potentially suitable chaparral habitat onsite, the nearest documented occurrence of this species is located greater than 10 miles north of Mt. Madonna County Park (CDFW 2017).
Chorizanthe pungens var. *pungens*	Monterey spineflower	FT/None/1B.2	Chaparral (maritime), cismontane woodland, coastal dunes, coastal scrub, valley and foothill grassland; sandy/annual herb/Apr–June (July) (Aug)/10–1,476	**Not expected to occur**. There is no suitable sandy soil at the site. The nearest documented occurrence of this species is located approximately 3.6 miles south of Mt. Madonna County Park (CDFW 2017).

Special Status Plant Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Chorizanthe robusta var. *robusta*	robust spineflower	FE/None/1B.1	Chaparral (maritime), cismontane woodland (openings), coastal dunes, coastal scrub; sandy or gravelly/annual herb/Apr–Sep/10–984	**Not expected to occur**. There are no suitable sandy soils or coastal habitat at the site. The nearest documented occurrence of this species is located approximately 5 miles west of Mt. Madonna County Park (CDFW 2017).
Cirsium fontinale var. *campylon*	Mt. Hamilton fountain thistle	None/None/1B.2	Chaparral, cismontane woodland, valley and foothill grassland; serpentinite seeps/perennial herb/(Feb) Apr–Oct/328–2,920	**Not expected to occur**. The site is outside the known geographic region for this species, which is located greater than 10 miles north of Mt. Madonna County park (CDFW 2017).
Clarkia concinna ssp. *automixa*	Santa Clara red ribbons	None/None/4.3	Chaparral, cismontane woodland/annual herb/(Apr) May–June (July)/295–4,921	**Not expected to occur**. Although there is potentially suitable chaparral and woodland onsite, the nearest documented occurrence of this species is located approximately 9 miles northwest of Mt. Madonna County Park (CDFW 2017).
Collinsia multicolor	San Francisco collinsia	None/None/1B.2	Closed-cone coniferous forest, coastal scrub; sometimes serpentinite/annual herb/Mar–May/98–820	**Not expected to occur**. There is no suitable coastal scrub habitat and the nearest documented occurrence for this species is located greater than 10 miles north of Mt. Madonna County Park (CDFW 2017).
Dudleya abramsii ssp. *setchellii*	Santa Clara Valley dudleya	FE/None/1B.1	Cismontane woodland, valley and foothill grassland; serpentinite, rocky/perennial herb/Apr–Oct/197–1,493	**Present**. This species has been most recently documented at Mt. Madonna County Park in 2013 (CDFW 2017).

Special Status Plant Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Eryngium aristulatum var. *hooveri*	Hoover's button-celery	None/None/1B.1	Vernal pools/annual / perennial herb/July (Aug)/10–148	**Not expected to occur**. The site is outside of the species' known elevation range and there is no suitable vernal pool habitat present.
Erysimum ammophilum	sand-loving wallflower	None/None/1B.2	Chaparral (maritime), coastal dunes, coastal scrub; sandy, openings/perennial herb/Feb–June/0–197	**Not expected to occur**. The site is outside of the species' known elevation range and there is no suitable coastal habitat present.
Fritillaria liliacea	fragrant fritillary	None/None/1B.2	Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland; often serpentinite/perennial bulbiferous herb/Feb–Apr/10–1,345	**Not expected to occur**. The site is outside the known geographic range of this species; the nearest documented occurrence is greater than 10 miles north of Mt. Madonna County Park (CDFW 2017).
Gilia tenuiflora ssp. *arenaria*	Monterey gilia	FE/CT/1B.2	Chaparral (maritime), cismontane woodland, coastal dunes, coastal scrub; sandy, openings/annual herb/Apr–June/0–148	**Not expected to occur**. The site is outside of the species' known elevation and geographic range.
Hoita strobilina	Loma Prieta hoita	None/None/1B.1	Chaparral, cismontane woodland, riparian woodland; usually serpentinite, mesic/perennial herb/May–July (Aug) (Oct)/98–2,822	**Moderate potential to occur**. Potentially suitable chaparral and woodland habitat occurs onsite. The nearest documented occurrence for this species is located approximately 0.4 mile north of Mt. Madonna County Park (CDFW 2017); however, this occurrence was recorded in 1922.

Special Status Plant Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Holocarpha macradenia	Santa Cruz tarplant	FT/CE/1B.1	Coastal prairie, coastal scrub, valley and foothill grassland; often clay, sandy/annual herb/June–Oct/33–722	**Moderate potential to occur**. This species was previously documented in 1990 approximately 2.4 miles east of Mt. Madonna County Park (CDFW 2017). Suitable habitat for this species occurs onsite.
Horkelia cuneata var. *sericea*	Kellogg's horkelia	None/None/1B.1	Closed-cone coniferous forest, chaparral (maritime), coastal dunes, coastal scrub; sandy or gravelly, openings/perennial herb/Apr–Sep/33–656	**Not expected to occur**. Suitable sandy or gravelly coastal soils do not occur onsite. The nearest documented occurrence for this species is located approximately 5 miles west of Mt. Madonna County Park (CDFW 2017).
Legenere limosa	legenere	None/None/1B.1	Vernal pools/annual herb/Apr–June/3–2,887	**Not expected to occur**. No suitable vernal pool habitat present.
Lessingia micradenia var. *glabrata*	smooth lessingia	None/None/1B.2	Chaparral, cismontane woodland; serpentinite, often roadsides/annual herb/July–Nov/394–1,378	**Present**. There are multiple documented occurrences of this species within Mt. Madonna County Park. All are presumed extant and the most recent was recorded in 2010 (CDFW 2017).
Malacothamnus arcuatus	arcuate bush-mallow	None/None/1B.2	Chaparral, cismontane woodland/perennial evergreen shrub/Apr–Sep/49–1,165	**Moderate potential to occur**. This species has been previously documented in 1981 approximately 2 miles east of Mt. Madonna County Park (CDFW 2017). Suitable habitat for this species occurs onsite.

Special Status Plant Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Malacothamnus hallii	Hall's bush-mallow	None/None/1B.2	Chaparral, coastal scrub/perennial evergreen shrub/May–Sep (Oct)/33–2,493	**Not expected to occur**. Although there is potentially suitable chaparral habitat onsite, the site is outside the known geographic region for this species. The nearest documented occurrence for this species is located greater than 10 miles north of Mt. Madonna County Park (CDFW 2017).
Monolopia gracilens	woodland woolythreads	None/None/1B.2	Broadleafed upland forest (openings), chaparral (openings), cismontane woodland, north coast coniferous forest (openings), valley and foothill grassland; serpentine/annual herb/(Feb) Mar–July/328–3,937	**High potential to occur**. This species was previously documented in Mt. Madonna County Park; however, the record is from 1951 and has not been updated since that time (CDFW 2017). Suitable habitat for this species occurs onsite.
Penstemon rattanii var. *kleei*	Santa Cruz Mountains beardtongue	None/None/1B.2	Chaparral, lower montane coniferous forest, north coast coniferous forest/perennial herb/May–June/1,312–3,609	**High Potential to occur**. This species was previously documented in Mt. Madonna County Park; however, the record is from 1937 and has not been updated since (CDFW 2017). Suitable habitat for this species occurs onsite.
Piperia yadonii	Yadon's rein orchid	FE/None/1B.1	Coastal bluff scrub, closed-cone coniferous forest, chaparral (maritime); sandy/perennial herb/(Feb) May–Aug/33–1,673	**Not expected to occur**. There are no suitable coastal habitats or sandy soils onsite. The site is outside the known geographic range for this species, which is located approximately 10 miles south of Mt. Madonna County Park (CDFW 2017).

Special Status Plant Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Plagiobothrys chorisianus var. *chorisianus*	Choris' popcornflower	None/None/1B.2	Chaparral, coastal prairie, coastal scrub; mesic/annual herb/Mar–June/10–525	**Not expected to occur**. No suitable coastal habitat present.
Puccinellia simplex	California alkali grass	None/None/1B.2	Chenopod scrub, meadows and seeps, valley and foothill grassland, vernal pools; alkaline, vernally mesic; sinks, flats, and lake margins/annual herb/Mar–May/7–3,051	**Not expected to occur**. No suitable mesic, alkaline habitat present.
Sanicula saxatilis	rock sanicle	None/CR/1B.2	Broadleafed upland forest, chaparral, valley and foothill grassland; rocky/perennial herb/Apr–May/2,034–3,855	**Not expected to occur**. The site is outside of the species' known geographic range, which is located greater than 10 miles north of Mt. Madonna County Park (CDFW 2017).
Streptanthus albidus ssp. *albidus*	Metcalf Canyon jewelflower	FE/None/1B.1	Valley and foothill grassland (serpentinite)/annual herb/Apr–July/148–2,625	**Not expected to occur**. The site is outside of the species' known geographic range, which is located greater than 10 miles north of Mt. Madonna County Park (CDFW 2017).
Streptanthus albidus ssp. *peramoenus*	most beautiful jewelflower	None/None/1B.2	Chaparral, cismontane woodland, valley and foothill grassland; serpentinite/annual herb/(Mar) Apr–Sep (Oct)/312–3,281	**Present**. This species was most recently documented in Mt. Madonna County park in 2010 (CDFW 2017).
Streptanthus callistus	Mt. Hamilton jewelflower	None/None/1B.3	Chaparral, cismontane woodland/annual herb/Apr–May/1,969–2,592	**Not expected to occur**. The site is outside of the species' known geographic range, which is located greater than 10 miles north of Mt. Madonna County Park (CDFW 2017).
Trifolium amoenum	two-fork clover	FE/None/1B.1	Coastal bluff scrub, valley and foothill grassland (sometimes serpentinite)/annual herb/Apr–June/16–1,362	**Not expected to occur**. The site is outside of the species' known geographic range, which is located greater than 10 miles north of Mt. Madonna County Park (CDFW 2017).

Special Status Plant Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Trifolium buckwestiorum	Santa Cruz clover	None/None/1B.1	Broadleafed upland forest, cismontane woodland, coastal prairie; gravelly, margins/annual herb/Apr–Oct/344–2,001	**Low potential to occur**. Although there is potentially suitable forest and woodland habitat onsite, the nearest documented occurrence for this species is located approximately 9 miles northwest of Mt. Madonna County Park (CDFW 2017).
Trifolium hydrophilum	saline clover	None/None/1B.2	Marshes and swamps, valley and foothill grassland (mesic, alkaline), vernal pools/annual herb/Apr–June/0–984	**Not expected to occur**. No suitable mesic, alkaline habitat present.

APPENDIX C

Special Status Wildlife Species with Potential to Occur

Special Status Wildlife Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Amphibians				
Ambystoma californiense	California tiger salamander	FT/ST, WL	Annual grassland, valley–foothill hardwood, and valley–foothill riparian habitats; vernal pools, other ephemeral pools, and (uncommonly) along stream courses and man-made pools if predatory fishes are absent	**Low potential to occur**. Suitable breeding habitat for this species does not occur; however, suitable breeding ponds occur directly adjacent to the site to the north. The nearest documented occurrence for this species is located approximately 2.7 miles east of Mt. Madonna County Park (CDFW 2017).
Ambystoma macrodactylum croceum	Santa Cruz long-toed salamander	FE/SE, FP	Dense riparian vegetation, thick coastal scrub, and oak woodland	**Moderate potential to occur**. Riparian corridors and oak woodland onsite may provide potentially suitable habitat for this species. The nearest documented occurrence for this species is located approximately 4.5 miles southwest of Mt. Madonna County Park (CDFW 2017).
Aneides flavipunctatus niger	Santa Cruz black salamander	None/SSC	Restricted to mesic forests in the fog belt of the outer Coast Range of San Mateo, Santa Cruz, and Santa Clara counties. Mixed deciduous and coniferous woodlands and coastal grasslands. Occurs in moist streamside microhabitats and is found under rocks, talus, and damp woody debris.	**High potential to occur**. This species has been previously documented along Bodfish Creek at Mt. Madonna County Park in 1946, and just west of the park in 2014 (CDFW 2017). Streams onsite may provide suitable habitat for this species

Special Status Wildlife Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Dicamptodon ensatus	California giant salamander	None/SSC	Known from wet coastal forests and chaparral near streams and seeps from Mendocino Co. south to Monterey Co. and east to Napa Co. Aquatic larvae found in cold, clear streams, occasionally in lakes and ponds. Adults known from wet forests under rocks and logs near streams and lakes.	**Present**. This species has been previously documented along Blackhawk Canyon at Mt. Madonna County Park in 2013 (CDFW 2017). Streams onsite provide suitable habitat for this species.
Rana boylii	foothill yellow-legged frog	None/PST, SSC	Rocky streams and rivers with open banks in forest, chaparral, and woodland	**Low potential to occur**. Although streams onsite may provide potentially suitable habitat, the nearest documented occurrence for this species is located greater than 7 miles north of Mt. Madonna County Park (CDFW 2017).
Rana draytonii	California red-legged frog	FT/SSC	Lowland streams, wetlands, riparian woodlands, livestock ponds; dense, shrubby or emergent vegetation associated with deep, still or slow-moving water; uses adjacent uplands	**High potential to occur**. Streams onsite may provide potentially suitable habitat for this species. The nearest documented occurrence for this species is located approximately 0.6 mile south of Mt. Madonna County Park (CDFW 2017).
Reptiles				
Actinemys marmorata	western pond turtle	None/SSC	Slow-moving permanent or intermittent streams, ponds, small lakes, and reservoirs with emergent basking sites; adjacent uplands used for nesting and during winter	**Present**. This species has been previously documented along Bodfish Creek in Mt. Madonna County Park in 2000 (CDFW 2017). Stream onsite provide suitable habitat for this species.

Special Status Wildlife Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Anniella pulchra	northern California legless lizard	None/SSC	Coastal dunes, stabilized dunes, beaches, dry washes, valley–foothill, chaparral, and scrubs; pine, oak, and riparian woodlands; associated with sparse vegetation and sandy or loose, loamy soils	**Not expected to occur**. Sandy soil substrates preferred by this species are not present within the site and the nearest documented occurrence for this species is greater than 10 miles southwest of Mt. Madonna County Park along the coast (CDFW 2017).
Phrynosoma blainvillii	Blainville's horned lizard	None/SSC	Open areas of sandy soil in valleys, foothills, and semi-arid mountains including coastal scrub, chaparral, valley–foothill hardwood, conifer, riparian, pine–cypress, juniper, and annual grassland habitats	**Not expected to occur**. Although there may be potentially suitable habitat for this species within the site, and the nearest documented occurrence for this species is greater than 10 miles northeast of Mt. Madonna County Park (CDFW 2017).
Birds				
Accipiter cooperii (nesting)	Cooper's hawk	None/WL	Nests and forages in dense stands of live oak, riparian woodlands, or other woodland habitats often near water	**Moderate potential to occur**. Potentially suitable nesting habitat for this species occurs onsite.
Agelaius tricolor (nesting colony)	tricolored blackbird	BCC/PSE, SSC	Nests near freshwater, emergent wetland with cattails or tules, but also in Himalayan blackberrry; forages in grasslands, woodland, and agriculture	**Not expected to occur**. Suitable breeding habitat for this species does not appear to be present onsite. The nearest documented occurrence for this species is located approximately 5.6 miles southwest of Mt. Madonna County Park (CDFW 2017).
Aquila chrysaetos (nesting & wintering)	golden eagle	BCC/FP, WL	Nests and winters in hilly, open/semi-open areas, including shrublands, grasslands, pastures, riparian areas, mountainous canyon land, open desert rimrock terrain; nests in large trees and on cliffs in open areas and forages in open habitats	**Low potential to occur**. There is limited habitat for this species onsite. The nearest documented occurrence for this species is located greater than 20 miles east of Mt. Madonna County Park (CDFW 2017).

Special Status Wildlife Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Athene cunicularia (burrow sites & some wintering sites)	burrowing owl	BCC/SSC	Nests and forages in grassland, open scrub, and agriculture, particularly with ground squirrel burrows	**Low potential to occur**. There is very limited grassland habitat at the project site. The nearest documented occurrence of this species is located approximately 3 miles east of Mt. Madonna County Park near Gilroy (CDFW 2017).
Buteo swainsoni (nesting)	Swainson's hawk	BCC/ST	Nests in open woodland and savanna, riparian, and in isolated large trees; forages in nearby grasslands and agricultural areas such as wheat and alfalfa fields and pasture	**Not expected to occur**. The site is outside the known geographic range for this species.
Charadrius alexandrinus nivosus (nesting)	western snowy plover	FT, BCC/SSC	On coasts nests on sandy marine and estuarine shores; in the interior nests on sandy, barren or sparsely vegetated flats near saline or alkaline lakes, reservoirs, and ponds	**Not expected to occur**. There is no suitable habitat present, and the nearest documented occurrences of this species are located greater than 10 miles west of Mt. Madonna County Park along the coast (CDFW 2017).
Cypseloides niger (nesting)	black swift	BCC/SSC	Nests in moist crevices, caves, and cliffs behind or adjacent to waterfalls in deep canyons; forages over a wide range of habitats	**Not expected to occur**. There is no suitable nesting habitat present, and the nearest documented occurrences of this species are located greater than 10 miles northwest of Mt. Madonna County Park along the coast (CDFW 2017).
Elanus leucurus (nesting)	white-tailed kite	None/FP	Nests in woodland, riparian, and individual trees near open lands; forages opportunistically in grassland, meadows, scrubs, agriculture, emergent wetland, savanna, and disturbed lands	**Low potential to occur**. There is limited foraging habitat for this species onsite. The nearest documented occurrence for this species is located approximately 4 miles east of Mt. Madonna County Park, near Gilroy (CDFW 2017).

Special Status Wildlife Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Riparia riparia (nesting)	bank swallow	None/ST	Nests in riparian, lacustrine, and coastal areas with vertical banks, bluffs, and cliffs with sandy soils; open country and water during migration	**Not expected to occur**. There is no suitable nesting habitat present, and the nearest documented occurrences of this species are located greater than 9 miles south of Mt. Madonna County Park (CDFW 2017).
Vireo bellii pusillus (nesting)	least Bell's vireo	FE/SE	Nests and forages in low, dense riparian thickets along water or along dry parts of intermittent streams; forages in riparian and adjacent shrubland late in nesting season	**Not expected to occur**. There is no suitable nesting habitat present, and the nearest documented occurrences of this species are located greater than 8 miles southeast of Mt. Madonna County Park (CDFW 2017).
Fishes				
Eucyclogobius newberryi	tidewater goby	FE/SSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County, to the mouth of the Smith River	**Not expected to occur**. No suitable habitat present and the site is outside the known geographic range for this species.
Oncorhynchus mykiss irideus	steelhead - central California coast DPS	FE/None	Coastal basins from Russian River in the north to Aptos Creek in the south, inclusive; does not include summer-run steelhead	**Not expected to occur.** The site is outside the known geographic region for this DPS.
	steelhead - Central Valley DPS	FE/None	Coastal basins from Redwood Creek south to the Gualala River, inclusive; does not include summer-run steelhead	**Not expected to occur.** The site is outside the known geographic region for this DPS.

Special Status Wildlife Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
	steelhead - south/central California coast DPS	FE/None	Coastal basins from Pajaro River south to the Santa Maria River, inclusive; does not include summer-run steelhead	**Not expected to occur.** Although Bodfish Creek and its tributaries within Mt. Madonna County Park are designated by the National Marine Fisheries Service as Critical Habitat for this DPS (NMFS 2017), fish passage barriers downstream of the project site cut off migration. Thus, any resident rainbow trout in the streams onsite are not the anadromous federally listed steelhead (NMFS 2013).
	summer-run steelhead trout	FE/None	Coastal basins from Redwood Creek south to the Gualala River, inclusive.	**Not expected to occur**. No suitable habitat present.
Mammals				
Antrozous pallidus	pallid bat	None/SSC	Grasslands, shrublands, woodlands, forests; most common in open, dry habitats with rocky outcrops for roosting, but also roosts in man-made structures and trees	**Low potential to occur**. Although there is potentially suitable foraging habitat onsite, roosting habitat for this species is limited onsite. The nearest documented occurrence for this species is located approximately 4 miles east of Mt. Madonna County Park (CDFW 2017).
Corynorhinus townsendii	Townsend's big-eared bat	None/SSC	Mesic habitats characterized by coniferous and deciduous forests and riparian habitat, but also xeric areas; roosts in limestone caves and lava tubes, man-made structures, and tunnels	**Not expected to occur**. Suitable roosting habitat for this species does not occur onsite. The nearest documented occurrence for this species is located greater than 10 miles east of Mt. Madonna County Park (CDFW 2017).
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat	None/SSC	Forest habitats with a moderate canopy and moderate to dense understory	**Not expected to occur**. The site is outside the known geographic range for this species.

Special Status Wildlife Species with Potential to Occur

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Taxidea taxus	American badger	None/SSC	Dry, open, treeless areas; grasslands, coastal scrub, agriculture, and pastures, especially with friable soils	**Low potential to occur**. Suitable habitat for this species is very limited onsite. The nearest documented occurrence for this species is located approximately 3 miles east of Mt. Madonna County Park, near Gilroy (CDFW 2017).
Vulpes macrotis mutica	San Joaquin kit fox	FE/ST	Grasslands and scrublands, including those that have been modified; oak woodland, alkali sink scrubland, vernal pool, and alkali meadow	**Not expected to occur**. The site is outside the known geographic range for this species.
Invertebrates				
Euphydryas editha bayensis	Bay checkerspot butterfly	FT/None	Serpentine or serpentine-like grasslands	**Not expected to occur**. No suitable habitat present and the site is outside the known geographic range for this species.

APPENDIX D

Tree Protection Measures

Tree Protection Measures

The following sections are included as general guidelines for tree protection from construction impacts. The measures presented should be monitored by arborists and enforced by contractors and developers for maximum benefit to the trees.

Tree Protection Measures Prior to Construction

Prior to any grading activity, preserved trees with canopies that fall within 30 feet of construction activity shall be protected by fencing and signage. All contractors shall be made aware of the tree protection measures. A project arborist shall be assigned to monitor tree health and construction activity near retained trees on site. The project arborist shall be an International Society of Arboriculture (ISA) Certified Arborist.

Inspection: Any large tree proposed for preservation on site should be thoroughly inspected for internal or subterranean decay by a qualified arborist prior to construction activity to determine if retention/protection on site is a viable management option.

Site Preparation: Tree removal, pruning, and inspection should be conducted during site preparation activities. Where permitted by the City, tree removal and pruning activity should be conducted according to industry standards (ANSI A300).

Fencing and Signage: A 6-foot high, chain link fence with tree protection signs shall be erected around all trees (or tree groups) to be preserved. The protective fence should be installed at a distance from the trunk that is equal to the dripline radius, or a distance approved by the City Arborist. This will delineate the tree protection zone and prevent unwanted activity in and around the trees in order to reduce soil compaction in the root zones of the trees and other damage from heavy equipment. Fences are to be mounted on two-inch diameter galvanized iron posts, driven into the ground to a depth of at least 2-feet at no more than 10-foot spacing. In areas where fencing is located on paving or concrete that will not be demolished, then the posts may be supported by an appropriate grade level concrete base. Tree protection signs should be attached to every fourth post. The contractor shall maintain the fence to keep it upright, taut, and aligned at all times. Fencing shall be removed only after all construction activities are complete.

Pre-Construction Meeting: A pre-construction meeting shall be held between all contractors (including grading, tree removal/pruning, builders, etc.) and the arborist. The arborist will instruct the contractors on tree protection practices and answer any questions. All equipment operators and spotters, assistants, or those directing operators from the ground, shall provide written acknowledgement of their receiving tree protection training. This training shall include information on the location and marking of protected trees, the necessity of preventing damage, and the discussion of work practices that will accomplish such.

Protection and Maintenance during Construction

Once construction activities have begun the following measures shall be adhered to:

Avoidance: Signs, ropes, cables, or any other items shall not be attached to any preserved tree.

Equipment Operation and Storage: Operating heavy machinery around the root zones of trees will increase soil compaction, which decreases soil aeration and subsequently reduces water penetration in the soil. All heavy equipment and vehicles shall stay out of the fenced tree protection zone, unless where specifically approved in writing by the City Arborist and under the supervision of an ISA Certified Arborist.

Tree Protection Measures

Storage and Disposal: Do not store or discard any supply or material, including paint, lumber, concrete overflow, etc. within the fenced tree protection zone. Remove all foreign debris within the fenced tree protection zone; it is important to leave the duff, mulch, chips, and leaves around the retained trees for water retention and nutrients. Avoid draining or leakage of equipment fluids near retained trees. Fluids such as: gasoline, diesel, oils, hydraulics, brake and transmission fluids, paint, paint thinners, and glycol (anti-freeze) should be disposed of properly. Keep equipment parked outside of the fenced tree protection zone of retained trees to avoid the possibility of leakage of equipment fluids into the soil. The effect of toxic equipment fluids on the retained trees could lead to decline and death.

Grade Changes: Grade changes of more than 2 feet, including adding fill, are not permitted within 30 feet of a tree's drip line, without special written authorization and under supervision by an ISA Certified Arborist. Lowering the grade within 30 feet of a tree's dripline will necessitate cutting main support and feeder roots, jeopardizing the health and structural integrity of the tree(s). Adding soil, even temporarily, on top of the existing grade will compact the soil further, and decrease both water and air availability to the trees' roots.

Moving Construction Materials: Care will be taken when moving equipment or supplies near the trees, especially overhead. Avoid damaging the tree(s) when transporting or moving construction materials and working around retained trees (even outside of the fenced tree protection zone). Above ground tree parts that could be damaged (e.g., low limbs, trunks) should be flagged with red flagging. If contact with the tree crown is unavoidable, prune the conflicting branch(es) using ISA or ANSI A300 standards.

Trenching: All trenching shall be outside of the fenced tree protection zone. Roots primarily extend in a horizontal direction forming a support base to the tree similar to the base of a wineglass. Where trenching is necessary in areas that contain tree roots, prune the roots using a root pruner. All cuts should be clean and sharp, to minimize ripping, tearing, and fracturing of the root system. The trench should be made no deeper than necessary.

Irrigation: Trees that have been substantially root pruned (30% or more of their root zone) will require irrigation for the first twelve months. The first irrigation should be within 48 hours of root pruning. They should be deep watered every two to four weeks during the summer and once a month during the winter (adjust accordingly with rainfall). One irrigation cycle should thoroughly soak the root zones of the trees to a depth of 3 feet. The soil should dry out between watering; avoid keeping a consistently wet soil. Designate one person to be responsible for irrigating (deep watering) the trees. Check soil moisture with a soil probe before irrigating. Irrigation is best accomplished by installing a temporary above ground micro-spray system that will distribute water slowly (to avoid runoff) and evenly throughout the fenced tree protection zone ***but never soaking the area located within 6- feet of the tree trunk, especially during warmer months***. For trees not subject to root pruning activity, the amount of irrigation provided shall not be changed from that which was provided prior to the commencement of construction activity.

Canopy Pruning: All pruning shall be completed under the direction of an ISA Certified Arborist and using ISA guidelines. Only conflicting limbs and dead wood shall be removed from tree canopies.

Washing: Periodic washing of the foliage is recommended during construction but no more than once every two weeks. Washing should include the upper and lower leaf surfaces and the tree bark. This should continue beyond the construction period at a less frequent rate with a high-powered hose only

in the early morning hours. Washing will help control dirt/dust buildup that can lead to mite and insect infestations.

Maintenance after Construction

Once construction is complete the tree protection fencing may be removed and the following measures performed to sustain and enhance the vigor of the preserved trees.

Mulch: Provide a 4-inch mulch layer under the canopy of trees. Mulch should include clean, organic mulch that will provide long-term soil conditioning, soil moisture retention, and soil temperature control.

Pruning: Pruning should *only* be done to maintain clearance and remove broken, dead or diseased branches. Pruning shall only take place following a recommendation by an ISA Certified Arborist and performed under the supervision of an ISA Certified Arborist. No more than 15% of the canopy shall be removed at any one time. All pruning shall conform to ISA or ANSI A300 standards.

Watering: Retained trees on site shall be watered as they were prior to the commencement of construction activity. Supplemental irrigation may be necessary for twelve months following substantial root pruning.

Watering Adjacent Plant Material: All plants near the trees shall be compatible with water requirements of said trees. Watering regime included in the site's landscape plan shall be developed with consideration for the water needs of retained trees.

Spraying: If the trees are maintained in a healthy state, regular spraying for insect or disease control should not be necessary. If a problem does develop, an ISA Certified Arborist should be consulted; the trees may require application of insecticides to prevent the intrusion of bark-boring beetles and other invading pests. All chemical spraying should be performed by a licensed applicator under the direction of a licensed pest control advisor.