Palo Corona Regional Park Fire Management Plan

Prepared by:
Joe Larson and Zeke Lunder
NorthTree Fire International
for the Monterey Peninsula Regional Park District
2007

Table of Contents

The Wildfire Environment

Palo Corona Regional Park (the Park) covers 4,300 diverse acres just south of Carmel in Monterey County, on the central coast of California. The land experiences a coastal, Mediterranean climate – characterized by warm, dry summers and mild/cool, wet winters. Rainfall season is typically November-April, with summer drought June-September. The major wildfire fuel types present are Grasslands, Maritime Chaparral, Coastal Scrub, Redwood Forest, Oak-hardwood Forest, Monterey Pine Forest, and riparian vegetation. While coastal fog reaches portions of the Park – raising average humidities and supporting unique plant communities such as Maritime Chaparral – there are areas of the park in which this effect does not occur, either because of the elevation or distance inland from the ocean. The resulting high diversity of vegetation creates a landscape in which wildfires will burn with a variety of intensities and ecological effects.

Although the park contains many shaded Oak-hardwood Forests, moist riparian corridors and streams, it does sit between two areas that have been identified as high fire hazard "target areas" by the California Department of Forestry and Fire Protection (CAL FIRE); Carmel Valley, Carmel Valley Village/Carmel Highlands and Palo Colorado Canyon (Mazza 2005). There are also areas within the Santa Lucia Preserve and The Big Sur Land Trust's Mitteldorf Preserve to the south and east in which vegetation and climate create high fire hazard conditions.

Departures from Historic Condition

Historically, the Park has been grazed, and future management of the Park will include grazing under the 2007 Palo Corona Regional Park Grassland Management Plan. Historical grazing activities on the property limited the rate of grassland to brushfield/forest conversion that has been widespread in other areas on the central coast. Conversions have occurred mainly in the steep canyons located in the center and southern portion of the Park which are avoided by cattle (McGraw 2007). This plan incorporates cattle grazing activities to meet both fire management and grassland management objectives. These objectives are discussed in greater detail in the fire management environment section.

Another activity which has influenced the vegetative fuels of the Palo Corona property is fire exclusion. The exclusion of fire from the landscape has allowed encroachment by brush and tree species into areas once dominated by grasses and forbs. Removing fire from ecosystems which have traditionally experienced it on a frequent basis can change the types of vegetation

present and leads to an increase in overall fuel/biomass. When fires do occur in an area which has experienced fire exclusion they may burn with greater severity than they have in the past, requiring greater suppression efforts, and with amplified ecological effects which may include increased cover by weed species, and increased post-fire erosion.

While departures from historic condition may affect postfire changes in vegetation cover or erosion, the greatest ecological impacts of wildfire will likely be damage to the Park by fire suppression actions. These may include new bulldozer lines, weeds spread by fire vehicles and bulldozers, and damage to aquatic ecosystems by fire retardant chemicals. Development of fire suppression strategies which reduce the potential impacts of wildfire suppression is a major emphasis of this plan, and postfire restoration activities (with an emphasis on weed management and erosion control) must be a high priority for the park district.

Vegetation management/fuel reduction – utilizing mowing, pruning, brush cutting, grazing, and pile burning – should be undertaken in several key areas. This report develops a program of hazard reduction activities in places where modifications to the vegetation buy the greatest advantages for firefighters suppressing fires in the Park. These target areas were identified after an assessment of potential fire behavior across the Palo Corona landscape (Coast to Santa Lucia Preserve, Carmel River to Palo Colorado Canyon).

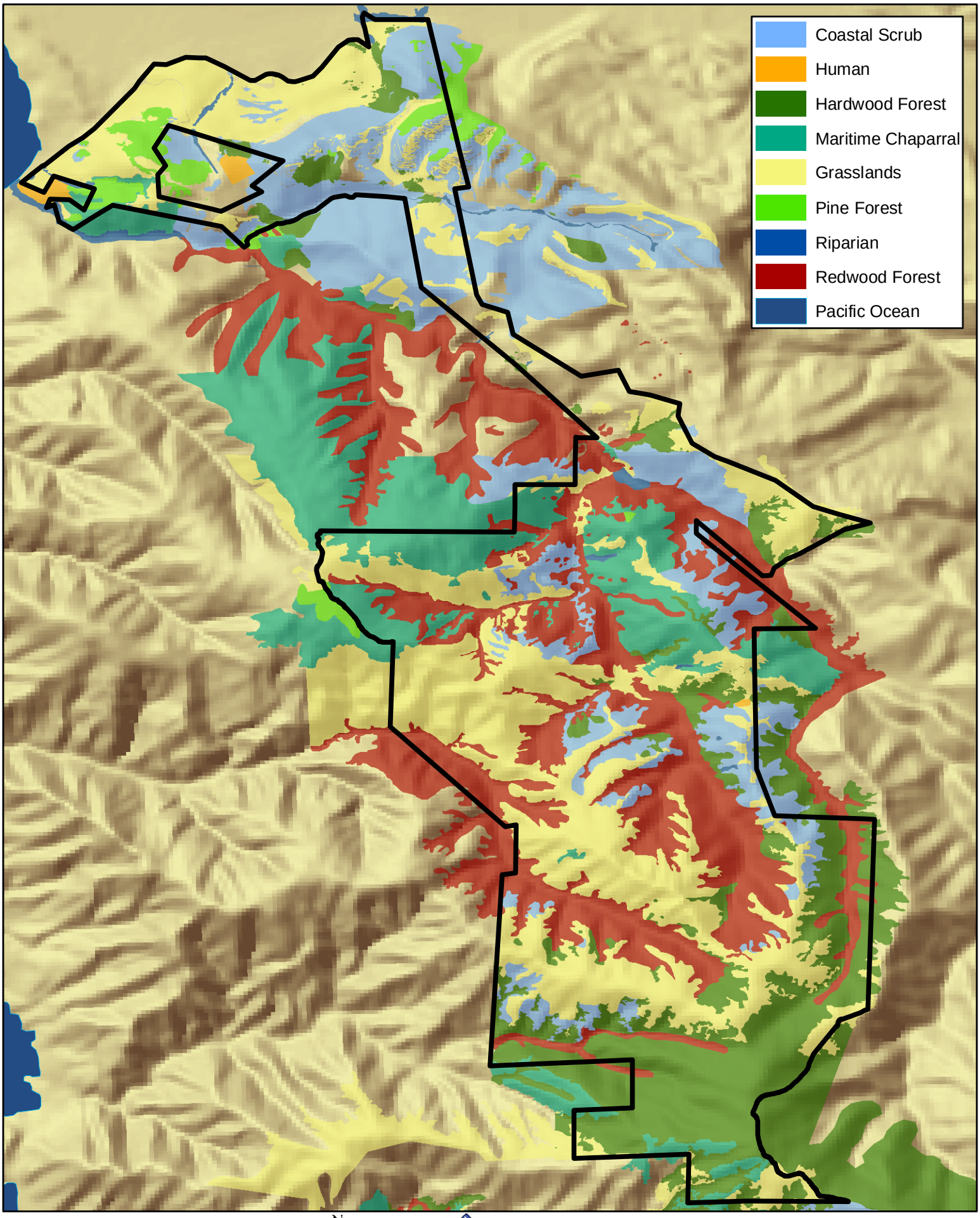
Characterizing Potential Fire Behavior

In order to assess the likelihood of a large fire burning on the property, potential difficulty of control if a fire occurred, and to determine the most appropriate locations in which to conduct fuel reduction projects, we assessed fuel loading at the plot and park-wide scale.

We conducted field surveys of surface fuel loading conditions in each major vegetation type on the property (as mapped by Lynn Overtree using aerial photographs.) For each major vegetation type, we took photographs which we compared to established photoseries plots developed by the US Forest Service and Missoula Fire Lab. The photoseries reference provides estimates of potential fire intensity resulting from different amounts and types of vegetation. *Appendix E* shows representative photos of vegetation types on the property, with estimates of potential fire behavior in each fuel/vegetation type.

Once we had characterized surface fuels types, we created a computer model of the landscape within the park which used fuel type mapping, canopy information, topography

Palo Corona Regional Park - Vegetation Map



Miles
0 0.25 0.5 1
1:40,000 scale

N

Prepared for Monterey Peninsula Regional Park District
Prepared by NorthTree Fire International

and weather information to predict potential fire behavior. For this assessment, we used fuels and weather data compiled by Dave Sapsis of CALFIRE's Fire and Resources Assessment Program (FRAP) in Sacramento, and used fire weather and fuel moisture data from prescribed fire planning modeling conducted by Barry Callenberger for the US Army on Fort Ord. We used these weather data as we felt that they were representative of typical high-hazard fire weather indices that the Park experiences when there is a late-fall offshore flow.

Modeling Assumptions

The two graphics below illustrate the largest plausible fire scenario for the Palo Corona property that we were able to generate using a predictive wildfire spread model (FlamMap, 2004.) The model simulates burning conditions for a fire starting midday and burning until sunset in late August. The model run does not take into account the fire suppression activities that would most likely be taking place.

The model simplifies the landscape into 5 basic fuel types: grass, chamise, scrub, oak woodland, and closed canopy forest, which includes the Monterey Pine Forest (and is also used to represent riparian areas.) The model is intended only to provide a rough sketch of potential fire behavior, but it does a good job of identifying large contiguous areas of fine fuels (grass) that would allow a fire to quickly become large.

Fire Behavior Discussion

Note that the modeled fires burn mainly in grass fuels. Elsewhere in the Park, the steep canyons and closed-canopy riparian and redwood forests moderate surface winds, and surface fuels here tend to be moister. These influences decrease rates of fire spread. This is an important point – the relatively wind-sheltered strips of redwood and riparian forest falling in the bottoms of the Park's canyons will slow the spread of fires burning across the area. While deep layers of duff will make fire suppression time-consuming, the fires burning in these forests will likely be burning at relatively low intensities, and firefighters should be able to make a direct attack on the fire.

The midslope, closed-canopy evergreen oak forests will also generally experience low rates of fire spread. Fires in these forests are carried by leaf litter, and will burn at a high intensity only in areas where large accumulations of heavy dead and down material exist. Over time, areas with heavy infestations of Sudden Oak Death may increase potential fire intensities in

the evergreen oak communities, but this is not currently an issue of major concern for the Park.

Fire Hazard in Monterey Pine Forests

Fire hazard in Monterey Pine is highest in mixed-age pine stands where surface fires can climb thru the canopies of smaller to intermediate sized trees and get cause torching in the crowns of the larger trees. Hazard is lowest in shady areas dominated by larger trees.

As torching (and resulting spotting) is most likely to occur in areas of mixed age, any projects which increase the amount of understory 'ladder fuels' will increase potential fire intensities. Closed-canopy stands dominated by tall, larger trees should experience surface fires which can be controlled by firefighters with engines.

In stands with opening and mixed-age understory, ladder fuels which carry surface fire into the crowns of the larger trees cause torching of taller trees, which increases difficulty of fire suppression significantly. Hazard reduction activities in the Monterey Pine communities should be undertaken with the objective of reducing surface and ladder fuels - concentrate on removing weed species in the understory (such as Broom) that could act to spread a surface fire into the crowns. Activities that have the effect of encouraging the establishment of young Pine should be minimized (such as opening the canopy thru thinning, or leaving thinning slash on the ground) . Avoid creating soil disturbance in the understory of the stand, avoid removing larger trees (maximize shade).

Model runs showing potential fire spread under extreme east-wind event. This scenario assumes a fire ignition near Rancho San Carlos Road burning unabated for one afternoon.

Wildfire Environment Summary

Overall fuel loadings and resulting fire hazard across the property tend to be moderate. Field observations taken in the winter/spring of 2006/2007 and interviews of land caretakers Lynn Overtree and Gerry Paddock note an increase in vegetative fuel throughout the entire property since a reduction of cattle grazing from 2001 - 2006. More specific sites of fuel loading concern are the San Jose Creek drainage between Seneca and San Jose Ridges, in the upper portions of the creek, and the DFG and White Rock Club lands neighboring the Palo Corona property to the south and east, which are primed for a wildfire occurrence. For the most part, Palo Corona has breaks in fuel continuity – though the Grasslands, Pine Forests, and Chaparral areas will feature higher rates of wildfire spread, these areas tend to be bisected by the moist redwood drainages and low-hazard oak woodland areas. This heterogeneity of fuel will tend to slow the spread of large fires.

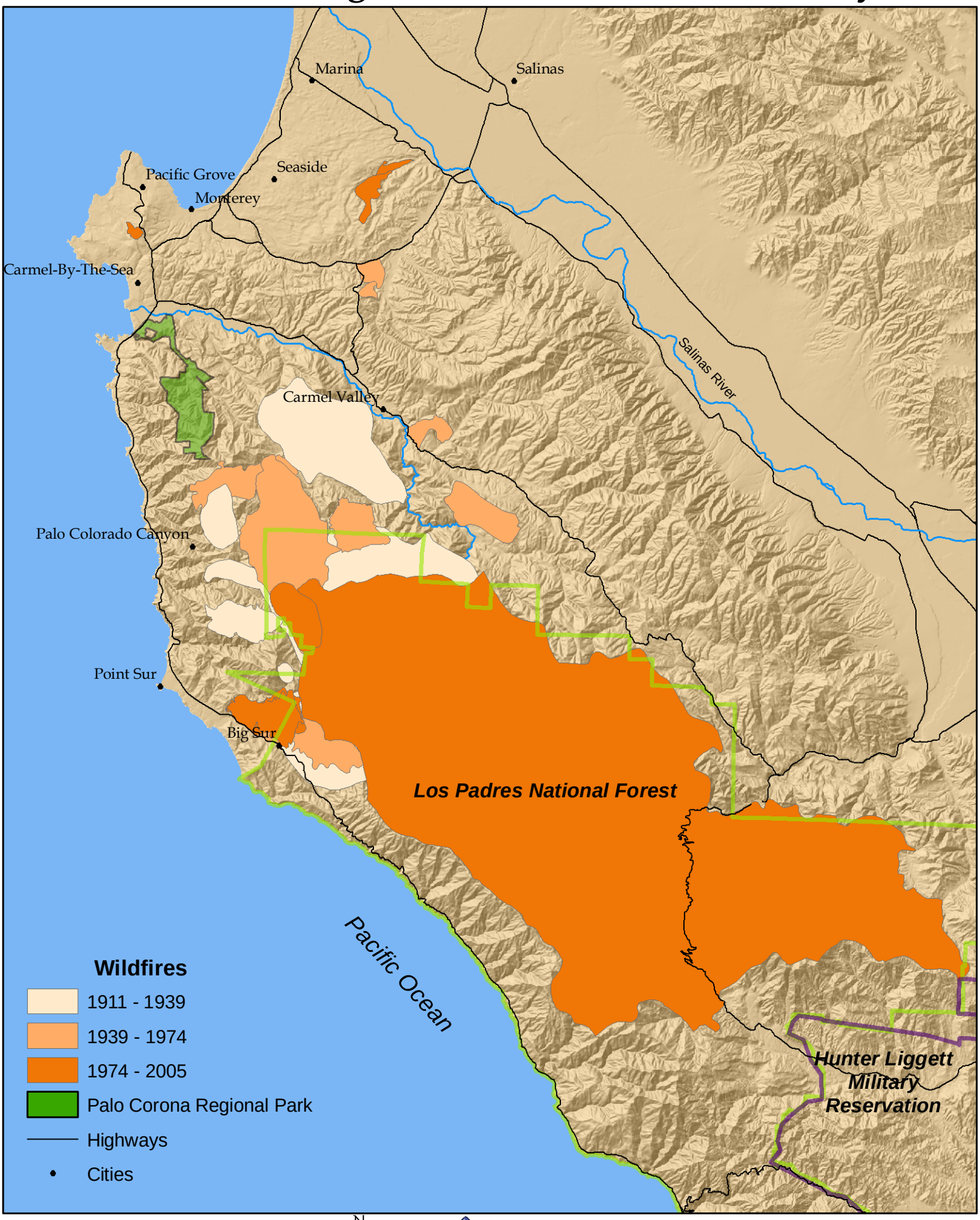
Fire suppression has affected changes in Monterey Pine regeneration, with ecological implications including the loss of younger age classes of Pine, and a general decrease in the diversity of plants in the Monterey Pine understory. Thinning and pile burning may be useful tools in the restoration of early seral habitats in this vegetation community, but over time, projects of this type are likely to have the unwanted effect of creating more hazardous fuels conditions. This need not be a 'show-stopper' for restoration projects which aim to establish younger age classes in the Monterey Pine forests, it just means that these types of projects should be undertaken in places that are not immediately adjacent (within about 1/4 mile) of assets identified for fire hazard mitigation.

Clusters of dead trees resulting from outbreaks of Sudden Oak Death (SOD) are evident on the neighboring Santa Lucia Preserve property along Flint Ranch Road in Van Winkley's Canyon and along Williams Canyon Drive in Williams Canyon. SOD is not as prevalent in the Palo Corona Regional Park, but present and obvious in portions of the park around the Palo Corona Peak. While the disease does not seem to affect as many trees along the Flint Ranch Road route, the route through Williams Canyon that leads into the southern portion of the park was notably affected – with moderate amounts of dead and down, dead standing, and dying trees.

In general, surface fuel loading tends to be light in the closed-canopy oak woodlands where SOD outbreaks are occurring. The resulting opening of the canopy in these areas will cause increases in herbaceous fuels such as grasses and ferns. However, if mortality remains patchy, these 'jackpots' of fuel are not likely to significantly increase rates of fire spread at the landscape scale.

A wide variety of wildland fuel types occur within Palo Corona Regional Park. In general, moister, closed canopy forest types like coast redwood and mixed evergreen oak fragment the continuity of fuel types, reducing the likelihood of a small fire quickly becoming large.

Palo Corona Regional Park - Local Fire History



Miles
0 5 10
1:330,000 scale

N

Prepared for Monterey Peninsula Regional Park District
NorthTree Fire International

The Fire Management Environment

Overview

While fires starting in Palo Corona Regional Park are a potential threat to the Wildland Urban Interface (WUI) within the surrounding communities of Carmel, the Carmel Highlands, Carmel Valley, and the Santa Lucia Preserve, fires starting in these locations also pose a potential threat to the Park.

Increased overall fire suppression activities in recent history have led to a significant increase in vegetative fuel within the Palo Corona property and most of the lands neighboring it. Cattle grazing was reduced on the property for 6 years (2001-2006), further contributing to the increase of vegetative fuels. As grazing reduces vegetative density and reduces continuity of combustible fuel, it will be the most effective fire/vegetation management tool available for use in the project area.

Many strategic resources already exist that would aid in an incident response in the Palo Corona Regional Park. There is vehicular access into the Park from all directions, and roads, trails, and old bulldozer tracks (features crucial to conduct strategic "burnout" tactics) are scattered throughout the property. Also, the grassland nature of most of the ridgetops means that aerial retardant drops will be very effective in containing fires within the Park to individual drainages.

Water Sources

There are currently no acceptable water sources for fire engine or helicopter bucket drafting on the property. The nearest acceptable helicopter dip sites are on a few ponds on the Santa Lucia Preserve (to the east). The ponds in the Palo Corona Regional Park are generally not large enough for water drafting during wildfire suppression efforts and most of them also serve as habitat for California newts (*Taricha torosa*), California red-legged frogs (*Rana aurora*), California tiger salamanders (*Ambystoma californiense*), Pacific tree frogs (*Pseudacris regilla*), and other species of interest/and or special concern. Aerial retardant drops should not be used in areas adjacent to existing ponds, as retardant is toxic to aquatic organisms.

Fire and Evacuation Access and Road Management

There is road access into the Palo Corona Regional Park at each of the four cardinal directions. These dirt roads, while often impassable during the wet season, are accessible during fire season. While a significant network of historic roads exists on the property, many of these roads are of little utility to firefighters, and should be converted to trails or closed. Specific recommendations can be found at the end of this section.

Detailed fire access and evacuation information, grouped by cardinal direction follows:

NORTH: The northern access into the park is the Palo Corona Road (the Road).

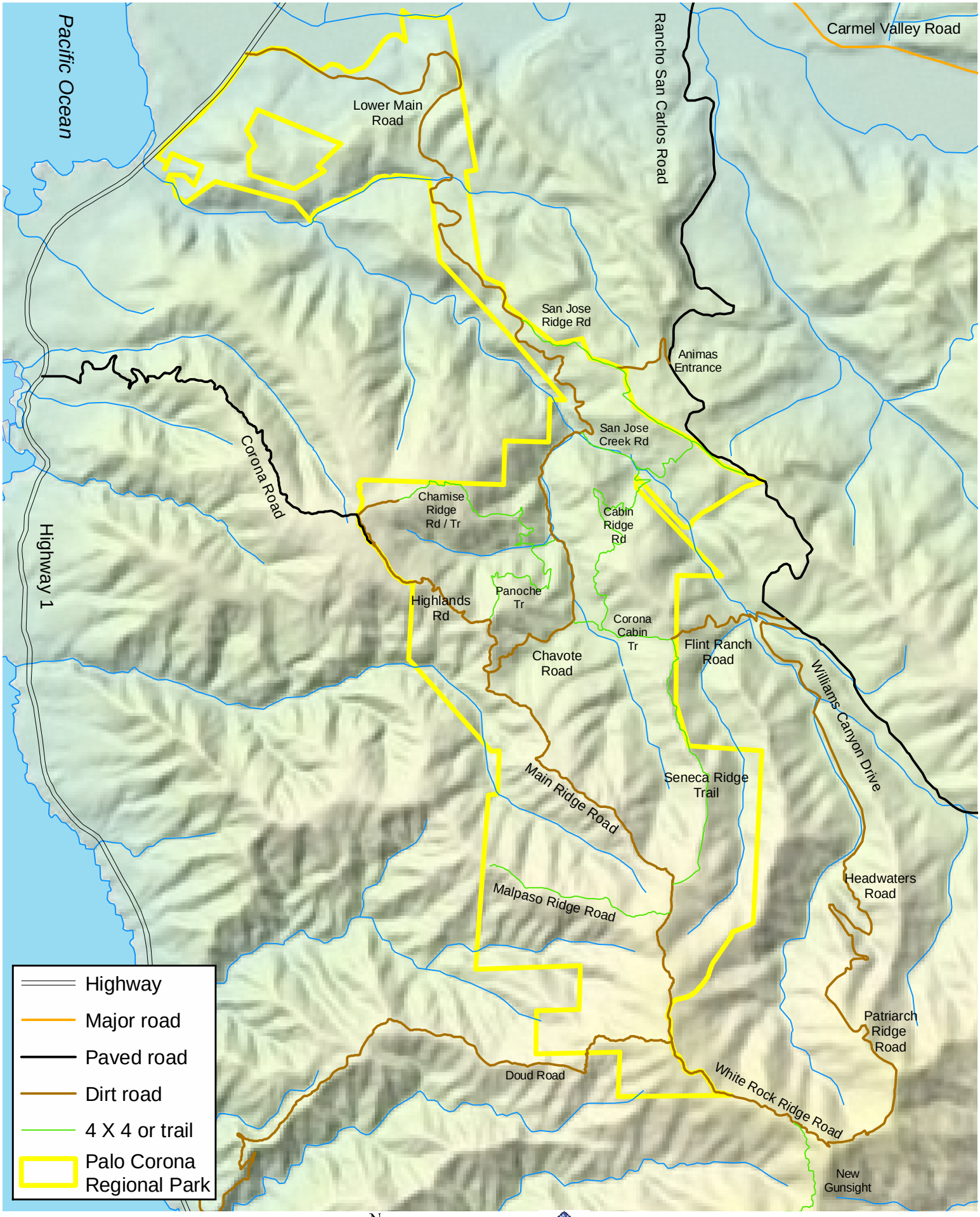
For the most part, the Palo Corona roadbed is in good condition, but vegetation clearance work needs to be performed along most of it. Also, dense patches of invasive weeds along the Road increase the likelihood of those weeds being spread by vehicles, especially when traveled to access areas which have recently burned (and are therefore highly susceptible to colonization by weeds). The road is currently passable by dozer, and marginally passable to pickup or Type 3 wildland engines, as dense vegetation directly adjacent to the road makes turning a vehicle around difficult.

The Road is accessed through a locked gate at Highway 1 about ½ mile south of the Carmel River. After passing through the gate, the road continues past the large white barn, along an agricultural area with some livestock corrals and wraps up/around a hill to Inspiration Point. Traveling south through Animas Meadow, the Palo Corona Road reaches Animas Pond, and a gate. At this point the road continues south, uphill through dense stands of French broom (*Genista monspessulana)* and toward the top of San Jose Ridge. After crossing the ridge, the Road descends downslope to San Jose Creek, where it eventually converges with the Seneca Creek and San Jose Creek Roads.

Soils to the south of San Jose Creek have more clay than the majority of the property –which increases the difficulty of vehicular travel during the wet seasons.

SOUTH: In the southeastern corner of Palo Corona, the Palo Corona Road borders both the Big Sur Land Trust's Mitteldorf Preserve and California Department of Fish and Game's Joshua Creek Canyon Ecological Preserve. At the southern property line of the Park, the road name changes from Palo Corona Road to White Rock Ridge Road. White Rock Ridge Road

Palo Corona Regional Park - Access and Evacuation



Prepared for Monterey Peninsula Regional Park District
NorthTree Fire International

continues south/southeast through the DFG lands to the White Rock Club. Patriarch Ridge Road drops north off of White Rock Ridge Road onto the Mitteldorf property at its southeast corner.

Shortly south of Palo Corona Peak, Doud Road heads in a southwest direction from the Palo Corona Road. This road is very well hidden and is currently unsigned, as the landowner does not wish to draw attention to it. This road requires 4X4 capability and is too narrow for Type 3 wildland engines. CDF fire bosses might want to use this road as a dozer line if a fire were burning in the wildlands to the south or north of it.

EAST: A footbridge is all that exists at the Flint Ranch Road crossing of San Jose Creek. An easement across the Santa Lucia Preserve gives Monterey Peninsula Regional Park District the option of using Flint Ranch Road as an access. While a bridge allowing heavy equipment access and emergency response vehicles would make this eastern access the most efficient route to the Corona Cabin and adjoining areas, the current road is poorly aligned and needs almost reconstruction. We feel that the fire management benefits of building a new road DO NOT justify the impacts of building a new road in a steelhead watershed.

An alternative to this eastern access is to take the Animas Entrance off of Rancho San Carlos Road. The Animas Entrance Road continues up to San Jose Ridge and accesses the Palo Corona property near Salamander Pond. From here San Jose Ridge Road heads northwest for approximately 0.5 mile to the Palo Corona Road. The San Jose Ridge Road is in an important tactical location to fight fires burning toward the park from the North, and it should be cleared/maintained at the same time as Palo Corona.

WEST: No public access exists from the western side of the park, which is the same for all entries except the main entrance. Official traffic may access the western side of the park from Highway 1 via Corona Road at Carmel Highlands. Once the road enters the park, it is known as Highlands Road.

Highlands Road is slick during wet conditions, but overall road condition and clearance is good. Brush along Highlands Road should be pruned back to the width of the roadway every 3-5 years to allow better access for fire personnel and equipment. In brushy areas this will require chainsaw use. Seacliff buckwheat (which provides habitat for the endangered Smith's blue butterfly) occurs in Maritime Chaparral along Highlands road. As any activity which damages seacliff buckwheat is considered a "take" under the Endangered Species Act, a botanist should walk the road and flag seacliff buckwheat for avoidance before any road

brushing occurs; this should take place any time vegetation management activities are to take place in the Maritime Chaparral community.

Recommendations

Access to the Park is minimal, but sufficient for firefighting and evacuation. Most of the Park is within ½ mile of a driveable road, and any new roadbuilding will not decrease fire response times by a significant amount of time. Rather than build new roads into the Park, we recommend working with local emergency response staff to identify good locations for ridgetop helicopter access.

Many of the historic roads in the Park are in poor condition, and should be removed or converted to trails.

Panoche Road and Chamise Ridge Road (beyond the first mile) serve little purpose for fire control. Both are poorly located to be of tactical value to firefighters, and during extreme fire weather (which is when large fires occur) they would be dangerous places to attempt firefighting. We recommend that both **Panoche Road** and **Chamise Ridge Road** (beyond the first mile) be downgraded to walking trails.

San Jose Creek Road and the northern-most portions of **Cabin Ridge Road** fall either in riparian areas at the toe of a north-facing slope, or on dense north slopes. Projected fire intensities are low in the riparian, and the alignment of the **Cabin Ridge Road** on the steep slopes makes it a poor place to fight fire. These factors, coupled with the proximity of both these roads to the steelhead-bearing San Jose Creek lead us to recommend that **San Jose Creek Road** and **Cabin Ridge Road** be downgraded to trails. **San Jose Creek Road** on the east side of San Jose Creek should be obliterated.

Flint Ranch Road is lacking a bridge over San Jose Creek, and the portions of it which fall on the western side of Cabin Ridge have been destroyed**.** We feel that **Flint Ranch Road** should also be obliterated, and **Corona Cabin Road** should be abandoned and a new trail alignment be cleared which connects the Seneca Ridge Trail to the Cabin Ridge Road (trail).

After these roads are removed or downgraded, the primary emergency access to the center of the Park will be via the Animas Entrance, past Salamander Pond, to the Palo Corona Road at Dead Pig Pond.

Avoiding Suppression-Related Resource Damage

Primary concerns for suppression-related resource damage in the Park include:

- **Keeping fire retardant chemicals out of creeks and ponds**
- **Avoiding bulldozing on undisturbed slopes**
- **Avoiding the spread of weeds by bulldozers and fire vehicles**
- **If bulldozers *are* used, keep them on existing or old roadbeds**

Telling a fire boss what to do during an emergency situation can be difficult. In most cases, local fire staff will be directing operations during a fire. The Park District should begin a dialogue with local CAL FIRE Battalion Chiefs before a fire starts.

The Park District should maintain a current cellphone list for local Battalion Chiefs at the office. When a fire starts in or near the Park, a Park representative should immediately make contact with the Incident Commander, and communicate the Park's resource needs (emphasizing the bulleted items above) to them.

For the most part, airtankers will be effective on the grassland ridgetops and bulldozers should not be necessary in these locations. All ridges all have current or old roads on them. If bulldozers are to be used on ridgetops, they should always be encouraged to remain on existing and old roadbeds.

Seneca Ridge Trail should be kept maintained with a weed-eater at the beginning of each summer to clear 3-4' of grass on either side of the trail. **Bulldozers should not be used on Seneca Ridge.**

Wildfire scenarios

Late summer or early fall offshore winds, which occur when the vegetation is driest, could aggressively drive a fire started in specific areas of Carmel Valley or Santa Lucia Preserve toward the Park. As many fire suppression resources are located close to the park, fires burning under anything but extreme conditions will likely be extinguished rapidly; as the most likely 'extreme' scenario is represented by strong, dry east winds, we chose to focus on ignitions starting north and east of the Park (see Fire Modeling section above).

Fires starting in WUI areas to the south in Palo Colorado Canyon pose less of a threat to the Park, as prevailing fire-season offshore winds (from the north or northeast) will tend to carry fires starting here away from the Park.

The following section describes scenarios in which a wildfire escapes initial attack on or near the Park property and requires suppression within the Park boundary. Scenarios have been constructed for fires coming from northeast and southeast directions.

Northeastern Scenario – Carmel Valley

While there are a few places along Schulte Road in Carmel Valley in which a north-wind-driven fire could escape initial attack, such a fire will likely be contained atop Saddle Mountain or by firing Chamisal Pass Road – this road and the Rancho San Carlos Roads are identified as priority vegetation management projects in the Fuel Management Plan for the Santa Lucia Preserve (RMI, 2006, p. 69). West of Schulte Road, golf courses, the Carmel River, and agricultural fields act as fuelbreaks, reducing the likelihood of a human caused fire from the north side of the river reaching the slopes to the south.

Northeastern scenario – Rancho San Carlos Road

A fire starting off of Quail Meadows Drive or Rancho San Carlos Road could burn into the area north of San Jose Creek. If a wildfire approaches the Park from northeast, firefighters have their best shot at stopping it before it reaches San Jose Canyon. Aerial firefighting resources like airtankers and helicopters will likely be very effective in the open areas north of the Park, though long-range spotting from burning French broom may increase the difficulty of fire control. While higher fuel moistures exist in the shaded creek bottom, heavy fuel loading on

the steep southfacing slopes, and poor access to the canyon bottom west of the confluence of San Jose and Seneca Creeks would make suppression difficult here. Rates of fire spread, however, will likely be low in these sheltered canyons.

The area north of Chamise Ridge Road is covered with decadent, overgrown chamise (*Adenostoma fasciculatum*) which is in a very high hazard condition and is due for a burn. If a fire starts low on the slope below the chamise area, fire activity in this area will be extreme, and will likely cause spotting over the top of Highlands Ridge. This will increase the difficulty of fire control substantially. Fires backing downhill through the chamise fields will likely experience more moderate fire behavior than a fire moving uphill through the same fuelbed. Though a fuel reduction thinning project which cleared Maritime Chaparral along Highlands Road might increase the safety of firefighters attempting to stop a fire burning under this scenario, this ridgetop is an excellent place for aerial retardant drops – which would achieve the same effect. If conditions were too windy for air tankers to fly, a fuelbreak here would not stop the fire under these conditions either. *We recommend that no major fuel modification projects be conducted in Maritime Chaparral.*

Southeastern scenario

In the 'Big Picture,' a large wilderness fire burning out of the Ventana Wilderness could work its way north toward the Park. Its northward spread would not likely be driven by continuous slope or winds, and it would likely be fought along the Big Pines Trail, Palo Colorado Road, the Turner Creek Trail, White Rock Ridge Road, or on the ridge between Garrapata Creek and Wildcat Canyon. It is unlikely that a Ventana Wilderness fire will threaten the Park. Extensive brush and tree clearing has been done recently on the east end of White Rock Ridge between Robinson Canyon Road at White Rock Club and the area where the powerlines drop into Garrapata Creek. This fuelbreak would also likely be used to fight a fire burning north out of the Ventana.

Lands directly to the south and east of the Park are comprised of the California Department of Fish and Game's Joshua Creek Canyon Ecological Preserve, The Big Sur Land Trust's Mitteldorf Preserve, the White Rock Club, and the Santa Lucia Preserve.

While the DFG land is closed to public access and the Mitteldorf Preserve is only open to recreational hikers, the White Rock Club lands present an increased risk for fire starts as activities such as hunting, woodcutting, and OHV vehicle use are permitted. The Santa Lucia

Preserve to the east has developed and maintains highly protective measures against carelessness with wildfire on their lands, but the general presence of humans increases the risk of wildfire starts.

While all of these properties feature some areas with heavy fuel loadings, the dominant vegetation on most of the higher elevation slopes is forest of Mixed hardwood or Mixed Evergreen Forest of tan oak (*Litho carpus densiflorus)*, madrone (*Arbutus menziesii)*, and canyon live oak (*Quercus chrysolepsis)*. Fires here will be carried primarily by leaf litter, and rates of fire spread will be low. Fires will spread much faster in areas of chaparral and coastal scrub, but these fuel types are fairly minor components of the landscape south of Palo Corona Regional Park.

The advantages that low rates of fire spread afford firefighters in the Mixed Evergreen Forest are offset somewhat by lengthy access times and difficult terrain. There are few places in which fires will be able to make an uphill run into the Palo Corona Regional Park – in general fires approaching from the south or east will be backing downhill or across a slope. The incidence of Sudden Oak Death will impact fuel loads over time.

There are several key topographical features and areas of favorable fuel loading for slowing or stopping a wildfire coming from the southeast direction within the Park boundary. Seneca Ridge is a key topographical feature in the south and east part of the Park. It stretches over half of the property, containing old dozer paths, trails, and old roads throughout most of the ridgeline. Only a small section of the ridgeline is populated by dense chaparral, while the majority of the ridgeline is dominated by sparse, low grasses. There is access to the south, central, and eastern portions of the ridgeline making it ideal in almost all respects to be utilized as a tool for the suppression of a potential wildfire coming from the south or east. This feature along with the Malpaso and Main ridgelines, which are both covered with light, grass fuel types, and the Seneca Creek drainage, all being west of Seneca Ridge, are strategic places to carry out wildfire suppression tactics in the scenario of a wildfire coming from the southeast.

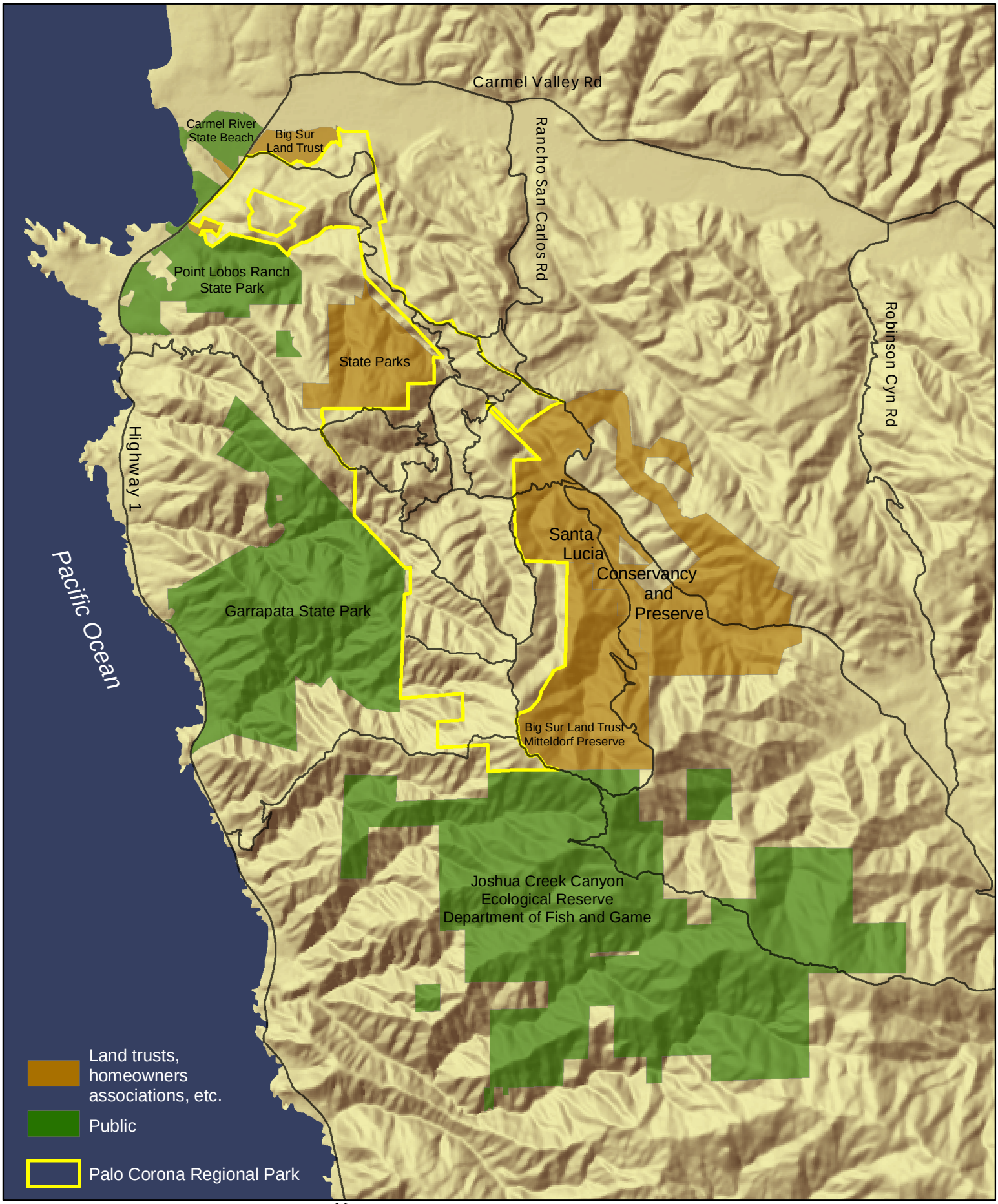
It is important to remember that many major fires in California occur in the very late summer and fall periods during offshore wind conditions. Fires starting to the south of the Park during these types of events will have to spread against or across the wind to reach the Palo Corona area. This decreases rates of fire spread, and lowers the hazard posed by wildlands to the south of the Park.

Wildland Urban Interface Issues

While Palo Corona Regional Park is surrounded by Wildland Urban Interface (WUI), the density of homes and condition of wildland fuels around them varies considerably. The permanent presence of people on neighboring lands increases the risk for fire starts which could lead to an active wildfire. As the majority of suppression resources arriving on a fire in the WUI are often assigned to structure protection, the presence of structures in an area increases the likelihood of a fire escaping control and spreading into adjacent wildlands.

Palo Corona Regional Park - Adjoining Conservation Properties

Directly Adjoining Parcels



Miles
0 1 2
1:75,000 scale

N

Prepared for Monterey Peninsula Regional Park District
Prepared by NorthTree Fire International

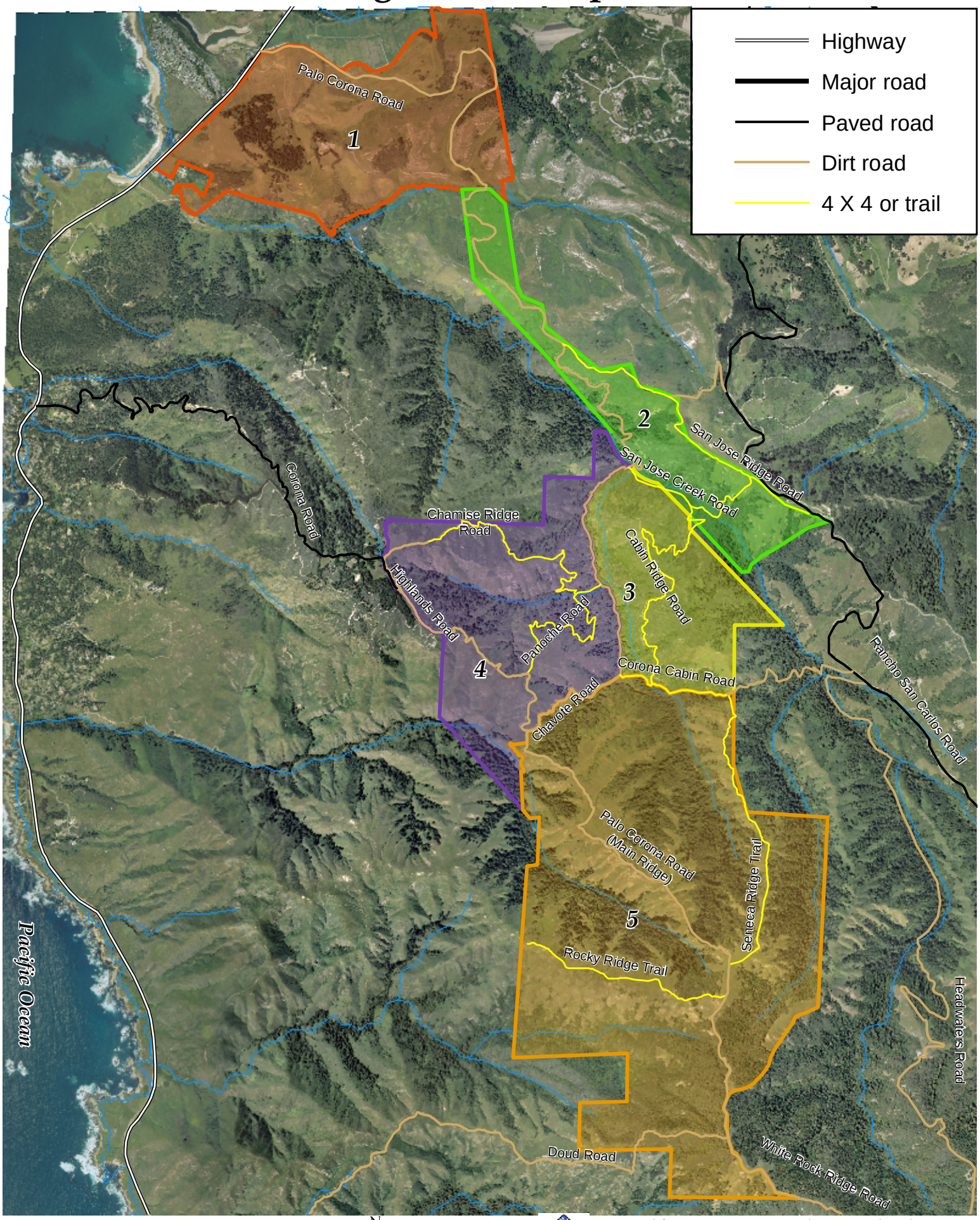
Fire Management Environment Summary

Wildfires are part of California's ecosystems. It is not a matter of "if" a fire is going to occur in the Palo Corona Regional Park, but "when". With this in mind, park managers should start an ongoing discussion between CALFIRE, neighboring landowners, and other stakeholders. The Monterey/San Benito Firesafe Council is an existing forum that deals with coastal wildfire issues. We recommend that the Park District continuew to participate in the Firesafe Council.

It is important to recognize that wildfire preparedness cannot solely address or pertain to wildfire management or strategies, but must also incorporate the grazing, overall vegetation management, and recreation activities on the Park along with the caretaking, maintenance, management of Palo Corona as well.

Effective planning measures to incorporate grazing activities with vegetation management objectives are strongly suggested. In the time period between cattle's recent reintroduction to the property and their removal approximately 6 years ago, a significant increase in vegetative density and continuity of combustible fuel has taken place. What is important, now that a responsible and well-formed grassland plan has been proposed, is to utilize the grazing activities to achieve vegetation management goals that correspond to those areas which are then being grazed. Integrating grasslands and fuels management activities with general park maintenance is one of the goals of this document. The following sections address the manifold ways in which wildfire management can integrate with general land management.

Fire Management Compartments



Miles
0 0.25 0.5 1
1:40,000 scale

N

Prepared for Monterey Peninsula Regional Park District
NorthTree Fire International

Integrating Wildfire Management with Other Park Management Objectives

Fire Management Compartments

Five fire management compartments were developed using grazing pasture, fence line, vegetation, and road maps to delineate polygons which share common fire management challenges and opportunities within the Palo Corona Regional Park:

Compart-ment #	Access	Tactics	Strategies
1	Palo Corona Road from Hwy 1	Structural and Wildland engines	Engines and crews
2	Same access As #1 *OR* from Rancl San Carlos Road	Structural and Wildland engines, hand crews, dozers, air support	Dozer line from Rancho San Carlos Road west along San Jose Ridge Road, airtankers
3	Via Corona Road from Hwy 1 *OR* from north on Palo Corona Road	Air support, hand crews	Airtankers and crews Along Seneca Ridge Trail
4	Via Corona Road from Hwy 1	Wildland engines, air support, hand crews	Airtankers on Highlands Road
5	Corona/Highlands Road to Main Ridge Road	Wildland engines, air support, hand crews	Dozers on existing ridgetop roads, airtankers

Compart-Ment #	Vegetation Management Objectives	Road/Trail maintenance
1		Maintain Palo Corona Road clearance and condition
2	Reduce roadside French broom invasion	
3	Connect Seneca Ridge Trail, serves as fire break	
4	None	Maintain Highlands Road clearance, brush road
5	Possible SOD vegetation management activities near Palo Corona Peak, thin road	Fix road erosion below San Jose Ridge, brush White Rock Ridge Road

Integrating Fire and Grasslands Management

Fire hazard reduction is only one of many reasons that vegetation management must be conducted within Palo Corona Regional Park. The Park represents a place in which innovative grassland management research can occur. Researchers are currently examining the effects of grassland management techniques (including fire and grazing) on native plant diversity and abundance in grasslands. Also, they are studying factors influencing successful control of non-native invasive weeds, such as French broom (McGraw, 2007). In general, grassland management should prioritize the restoration of areas that have already been degraded by the introduction of weeds, fire exclusion, and inappropriate grazing practices (Ibid).

Jody McGraw's Grasslands Management Plan for the Park strikes an inspiring chord: "PCRP is poised to be at the forefront of innovative research involving burning and grazing in grassland management with the current and potential adaptive management activities. Potential management activities which include prescribed burning, grazing, and fuels management to mimic disturbance may become the models for other restoration projects" (Ibid).

The coastal communities of the Park are adapted to recurring fires which remove established vegetation, alter nutrient cycling, and create opportunities for the establishment of early succession species. In the grasslands, surface fires remove undecomposed biomass on the soil surface (i.e. litter or residual dry matter), and kill woody plants. In doing so, fires create open conditions required by many grassland species, including annual forbs and many birds, and prevent grassland succession to Shrubland and Woodland (McBride 1974).

Changes in grassland composition resulting from fire exclusion include:

- Invasion of grasslands by shrubs and trees. For example, fire exclusion and the removal of grazing can increase abundance of coyote brush (*Baccharis pilularis)*, converting Coastal Grasslands to Coastal Scrub (McBride and Heady 1968).
- Increase in accumulation of thatch and litter on the soil surface increases potential fire intensity and severity (McBride 1974).

Successful grassland management requires mitigating the negative impacts of fire exclusion. While tightening air-quality regulations, difficulty in aligning permissive burn days with desired weather conditions, and increasing urbanization in areas surrounding the Park make

prescribed burning difficult, the re-introduction of fire into Palo Corona's grasslands is a worthy goal, and the Park District should work closely with grassland managers and CAL FIRE's Vegetation Management Program staff at the San Benito / Monterey Unit to identify opportunities for prescribed burning within the Park. Any burning projects carried out in the park should be based upon well-defined ecological restoration objectives.

Some areas in the Park have ecological management objectives which cannot be met with cattle grazing, but which may be met with prescribed fire. Examples include areas where coastal scrub has encroached into areas which were historically grasslands and portions of the Monterey Pine Forest where recruitment of young trees has been prevented by older age classes, dense canopies, and thick needle litter.

In other areas, prescribed burning can be used in concert with grazing to meet biological objectives. An example might be the reduction of vegetative fuel density with a prescribed burn followed by post-burn cattle grazing to maintain lower shrub densities.

While the grazing plan suggests burning small pockets every 1-15 years to simulate the historic mean fire return interval, mobilization costs for burning crews, equipment rental costs, and the costs of environmental documents may be similar whether a project burns 5 or 200 acres. Prescribed burning units should be large enough to take advantage of 'economies of scale'. Fires in larger units may actually be easier to control, especially if burns are laid out with boundaries that take advantage of slope and fuel-type changes (for example, grassland burns may be laid out in such a way that control lines are located adjacent to cooler, moister redwood or riparian areas where higher fuel moistures will make fire easier to control.)

If burning activities cannot occur, other forms of management including mowing, brush-removal, or adaptive grazing should be utilized to address the biological objectives established by the grasslands management plan, and to mitigate the negative effects of fire exclusion.

Fire and Invasive/Noxious Weed Interaction

The following section provides an overview of interactions between wildfire and the major known weed species occurring on the Park.

French broom - *Genista monspessulana*

General: French broom occurs mainly as individual groupings versus widespread, monospecific stands in Palo Corona. It forms both dense stands aboveground and abundant seed banks belowground.

Broom is well established throughout many areas of the Park, especially in the northern half and throughout San Jose Creek Canyon – with at least 50 individual grouping occurrences mapped between 1998 - 2007. French broom invades native vegetation, displaces native plant and forage species, and dominates the invaded community, sometimes forming dense, monospecific, almost impenetrable stands. French broom invasion may cause changes in plant community composition by displacing vegetation and decreasing local native plant alpha diversity (FEIS 2007). French broom along roadsides obstructs views, requiring expensive ongoing road maintenance. This species establishes a dense, long-lived seedbank, making it difficult to eradicate (Cal-IPC 2007). In Monterey Pine areas, broom may contribute significantly to surface fuel loading, which increases the likelihood of surface fires carrying into the crowns of the overstory trees.

Livestock and Wildlife: French broom foliage and seeds are toxic, containing a variety of quinolizidine alkaloids, especially in young leaves (Montlor et al. 1990). In some livestock, ingestion of plant parts can cause staggering followed by paralysis (McClintock 1985). Foliage can cause digestive disorders in horses (Parsons 1992). Infestations of broom degrade the quality of habitat for wildlife by displacing native forage species and changing microclimate conditions at soil levels. French broom is believed to be responsible for reducing arthropod populations by one-third in Golden Gate National Recreation Area (Lanford and Nelson 1992). Heavy grazing by goats for four or five years during the growing season has been reported as effective in New Zealand and has been tried at a few sites in Marin County in California (Archbald, pers. comm.). The disadvantage is that goats are not selective, and native species that may start to revegetate the area are also eaten (Cal-IPC 2007).

Fire Ecology/Fire Behavior: Alexander and Antonio (2003) found that the soil seed bank of stands that were burned had fewer broom seeds than unburned areas but that repeated burning did not reduce the seed bank beyond what was observed after one fire. They also examined the relationship between broom stand age and seed bank size but did not find a strong relationship between them. They suggest that fire does reduce the size of the broom seed bank and that control of broom need not be limited to only the youngest stands. However, they also found that the abundance of non broom species declines as broom stands age, and Swezy and Odion (1997) report that non-native annual grasses tend to dominate areas burned for broom control.

Under severe fire-weather conditions, the presence of dense stands of French broom may significantly increase fire hazard in the park, as the plant tends to be colonizing areas that were formerly grasslands. Under dry, windy conditions, French broom burns readily and causes spotting (which can significantly increase the difficulty of control).

Fire for Control: Broadcast prescribed burning of French broom on the property is not practical, as the plant is difficult to burn under conditions which allow control of the fire. (FEIS 2007), (Cal-IPC 2007).

Using fire to control Scotch and French brooms has had varied results. Some researchers suggest frequent prescribed fires to encourage regeneration and deplete the seed bank over time. Cooler fires can encourage seed germination, followed by prescribed fires that kill the young seedlings before they generate seed (Swezy and Odion 1997). Soil temperatures from 130°F to 300°F (54°C to 149°C) in moist conditions have been shown to stimulate seed germination (Bossard 1990).

A hot fire produced by hand-cutting mature plants, allowing the cut material to dry, and then burning in spring effectively controlled French broom re-spouts but had little effect on germination (Boyd 1995). Hot fires that generate soil temperatures over 300°F (149°C) killed Scotch broom seed (Bossard 1990). Obtaining soil temperatures at this high temperature and deep enough to effectively deplete the seed bank is difficult to achieve safely.

Mechanical Control: Only about 10 percent of Scotch broom stems will re-sprout when lopped near the base during the driest period of the season, which generally extends from the end of July until the first rains in October. Lopping at other times can lead to vigorous sprouting. For the most effective results, lop within 3 inches (7.5 cm) of the soil surface (Bossard 1990).

Mowing is also more effective when Scotch broom is under drought stress. Since drought stress and high fire danger occur together, care should be taken to avoid causing sparks with the equipment. Mowing close to the ground results in the least amount of sprouting.

To maximize reduction of the seedbed, follow-up burning after mechanical treatment (using chainsaws, weed-eaters, or mowers) is most successful if there are either naturally occurring or seeded grasses to carry the fire.

Ken Moore, Coordinator of the Wildlands Restoration Team, has noted that California State Parks have been very successful (100% mortality) using a propane torch to remove French broom seedlings, up to 8 inches (20 cm) tall, that emerge from the seed bank after removal of adult brooms. This is done at the end of the rainy season when seedlings have emerged and fire danger is low. The hot torch is passed over the French broom seedlings. The heat does not burn the seedlings, but within a day the seedlings are wilted and dead (Bossard 2000.) A combination of this management tool with mechanical or other treatments may assist in the control of French broom on the Palo Corona property. More information on weed flaming is available in *Appendix D*.

Bull thistle - *Cirsium vulgare* and other thistles.

General: At least 25 occurrences of bull thistle have been mapped in Palo Corona between 1998 - 2007. The disturbances that inappropriate grazing activities may produce could increase the prevalence of bull thistle, milk thistle (*sulybom marianum)*, and Italian thistle (*cardous pycnocephalus*). The following section is generally applicable to all noxious and invasive thistles found on the property.

Livestock and Wildlife: In California, bull thistle is widespread and most common in coastal grasslands. It is most troublesome in recently or repeatedly disturbed areas such as pastures, overgrazed rangelands, recently burned forests and forest clearcuts, and along roads, ditches, and fences. Bull thistle is a problem in pastures because it competes with and decreases desirable forage and has no significant nutritive value for livestock. Good grazing management will stimulate grass growth and keep pastures and rangelands healthy. Bare spots caused by overgrazing are prime habitable sites for biennial thistles (FEIS 2007).

Fire Ecology: Fire creates conditions that are favorable for any general plant establishment (i.e. open canopy, reduced competition, areas of bare soil), so if bull thistle seeds are present and competition minimal, bull thistle may be favored in the postfire community. Its colonization may be enhanced or depressed by fire, however, as the literature includes conflicting reports showing both situations of increased and decreased bull thistle populations after prescribed burning treatments (FEIS 2007).

Summary: The key to successful management of bull thistle is to prevent seed production. Even if bull thistle plants resprout after mechanical control, populations may be reduced by limiting seed production. Removal of adult bull thistle plants must be repeated annually for 4 years or more, since some plants will stay in the rosette form for up to 5 years. Slicing off the root crown of bull thistle plants is time consuming, but very effective in attempts to manage it (FEIS 2007). Four Simple steps to getting rid of bull thistle are (NPS 2007):

1. The plants are cut off at ground level before the flower heads turn purple to stop seed production.
2. If heads have turned purple, they are cut off and placed in bags. Once heads are purple, the seeds continue to develop. If not bagged, these seeds would mature and blow free. Some would germinate, spreading the plants.
3. Dead plants can be left on site, but any purple flower heads must be removed in bags and burned.
4. Prevention is the most cost effective approach to managing weed infestations. Once a new weed species becomes well established, control ranges from difficult to impossible. After any type of ground disturbance, quickly seed with desirable species to minimize the opportunity for bull thistle to become established.

Jubata Grass - *Cortaderia jubata*

General: Highly invasive, jubata or 'Pampas' grass can spread rapidly in favorable habitats such as those found in coastal preserves. The chief reason for its success as an invader is its prolific production of seed. Even a few plants have a large potential impact because the seeds are light and wind dispersed. Because it is a perennial plant, existing plants as well as new seedlings pose a threat to native species (TNC, 1988).

Livestock and Wildlife: There are no known interactions of jubata grass with wildlife or livestock which are applicable at this time. It is not considered palatable for livestock.

Fire Ecology: Jubata grass increases fire hazard because of the large amount of dry matter it produces (PPC 1998).

Summary: Jubata grass has been found in about 20 locations on the Palo Corona property between 1998 - 2007. Although jubata grass is visually appealing to some, it is an extremely invasive and noxious weed due to the difficulty of removal and its aggressive seed dispersal. Pulling or digging out the plants while small is best, although effective, this is labor intensive. Small ones are easily pulled by hand when the soil is moist in winter and spring. A Pulaski and shovel are useful when a plant is too large to pull safely by hand. Cutting the plumes off

and placing them in bags helps to prevent further seed dispersal. The plumes cannot be cut and left on bare ground, since the seeds will sprout.

Poison hemlock - *Conium maculatum*

General: Poison hemlock evolved in Europe and was introduced to North America in the 1800's as an ornamental. Since then, it has been extremely successful in distributing itself throughout most of North America. It is usually a biennial, with first-year plants producing ground-level rosettes. During the second year plants grow from two to ten feet tall with a stem that is ribbed, hollow, and has purplish streaks or splotches (Pitcher 1986). Poison hemlock reproduces only by seed.

Livestock and Wildlife: All classes of livestock and wildlife are susceptible to poisoning, with cattle, goats, and horses being the most sensitive. Animals tend to avoid this plant when other forage is available, but they will consume it when not much other vegetation is present, or when greenchop, silage, or hay is contaminated with it (Graham and Johnson).

Control: Spring mowing has proven effective in killing mature plants, yet regrowth may occur and new seedlings may continue to establish (Amme 1988). A second mow in late summer is recommended to eliminate remaining or subsequent growth (GGNRA 1989). Because poison hemlock seed has been shown to germinate up to three years after dispersal, a third year of mowing may be necessary (Baskin and Baskin 1993). Mowing mixes the poison hemlock in with other herbaceous material, and may increase the likelihood of cattle poisoning.

Hand pulling of poison hemlock is effective, especially prior to seed set, and easiest when the soil is wet. Because of the biennial nature of the plant, the primary tap root system needs to be pulled or it will resprout. Its seeds are viable for over three years so pulling before seed set is important and elimination from an area will require at least a four year commitment (Shelterbelt INC, 2004).

Fire Ecology: Hemlock stalks are resilient and can persist for several years as standing dead material. They significantly increase 1 hour fuels loading, contributing to increased rates of fire spread. Many of the locations with poison hemlock within the Park are near roads, and on other disturbed sites. Like most invasives, it flourishes in areas cleared by fire. Joseph

DiTomaso, with the University of California, Davis, Weed Science Group, states that prescribed burning is probably not a good control option, as hemlock tends to grow in moist areas and it is difficult to generate sufficient heat during burning to consume poison hemlock before fruit maturation (Graham and Johnson).

Summary: Poison hemlock has been identified in about 30 locations within the Palo Corona property between 1998 - 2007.

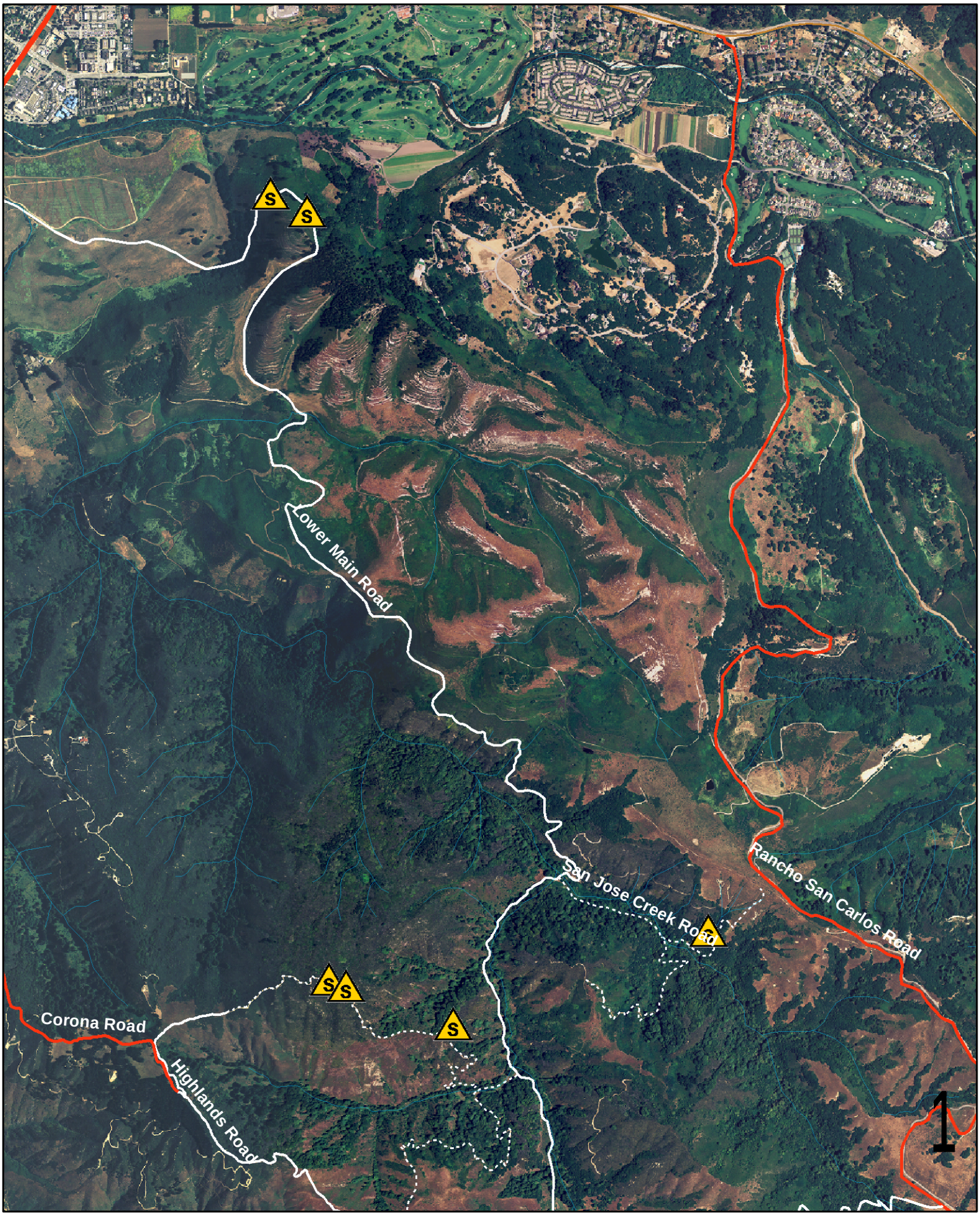
Critical Areas for Postfire Erosion Control

In general, areas of decomposed granite which are covered with Coastal Scrub or Maritime Chaparral have an increased hazard of postfire erosion. In these areas, special attention should be given after a fire event to grade ridgetop roads and remove firelines which have the potential to concentrate runoff onto recently burned slopes.

Park staff should be in the field during the first large storm events of a season following major fire activity within the Park to observe runoff, and be prepared to perform simple pick and shovel work as necessary to redirect road runoff and keep it from impacting recently burned areas.

The attached map shows existing road erosion sites which have a high potential for post-fire erosion.

Palo Corona Regional Park - Potential Postfire Erosion Hazard Sites



Miles

0 0.25 0.5 1

Prepared for Monterey Peninsula Regional Park District
Prepared by NorthTree Fire International

Wildland Fuels Management Objectives

Wildland fuels management projects are generally designed and undertaken with a specific purpose in mind – to reduce wildfire intensity at a site to a level that firefighters can safely engage and suppress.

As noted above, a wide variety of wildfire fuel types are present in Palo Corona Regional Park. Our analysis of potential fire behavior within the Park leads us to the conclusion that fuel types such as grass and chamise, which spread fire quickly, tend to be fragmented by lower hazard fuel types, such as Redwood and Mixed Evergreen forests, which already function as fuelbreaks. We recommend that, rather than creating new fuelbreaks on the landscape, that the Park District engage in a program of targeted grazing, and prune brush along the major access routes in and out of the Park. This work will serve several purposes including:

- Decreased threat of fire ignition in high-use areas.
- Improved aesthetics along major travel routes.
- Improved access and response times for Park staff and emergency responders.
- Increased safety for firefighters attempting to control fires in the Park.

Roadside Fuels Management

Most of the current roads will be maintained for use by Park staff and contractors, including the cattle operator, for management. Roads will also provide trails for Park visitors as well as movement of cattle (McGraw, 2007). We recommend that brush pruning be conducted along the entire length of the main park road. The main purpose of this work will be to improve emergency access, and to decrease the likelihood of fire ignition along the road by park visitors. This work should be seen as general maintenance, and conducted as regularly as needed to maintain an opening through the vegetation which is at least as wide as the roadbed. This may be accomplished by tractor-mounted mower or by hand, but to avoid impacts on sensitive plants, mowing should not occur much outside of the actual roadbed width, and a botanist should survey and flag the route for rare plants before work commences.

At this time, we recommend roadside tree thinning only in areas where it is necessary to improve vehicle access along the park road, and on a ridgetop portion of White Rock Road which is actually on CDF&G's Joshua Creek Canyon Ecological Preserve. Here, we

recommend that the CDF&G thin understory branches and small trees (less than 4" in diameter) in the area along White Rock Road shown on the following "Fuel Treatment Recommendations Map". As this strategic areas would likely be place in which a major fire burning in or toward the Park from the southwest would be suppressed, it should be maintained in a condition of reduced fuel loading.

Additionally, thinning here will ease foot access for firefighters attempting to light 'backfires' during a wildfire. Often, backfires are set by a crew on foot, lighting strips of fire with drip-torches. The deeper the strip burned, the more likely its effectiveness as a fireline.

Brushing work may be accomplished using crews with chainsaws. Where possible, cut material should be stacked in piles no larger than 6' in diameter and covered for burning after fall rains (please reference more detailed information in the Fuel Treatment Recommendations section).

Grass along major ridgetop trails should be mowed/weed whipped at the beginning of the dry season to maintain a 4' wide clearance. Cattle grazing in areas (along roads) with recent vegetative-fuel reduction may assist in the maintenance of that treatment.

Suitability of Different Fuels Management Techniques

Grazing

Grazing is the single most appropriate tool for fuels management within the Park. A well managed program of grazing will do more to reduce large fire threat than any other single management tool. In areas of high visitor use (especially around camping areas) fencing should be designed to facilitate targeted grazing of the area early in the season.

Herbicide Application

Herbicide application may be a useful tool for targeted restoration projects which have specific ecological objectives such as reducing noxious weeds like poison hemlock or French broom. These weeds change the composition of fuelbeds - specifically, they tend to increase the amount of fine and twiggy fuels, and may increase the likelihood of a fire gaining access to the canopies of adjacent trees. Torching and crowning fire behavior in these fuel types may also increase the likelihood of spot fires - which can dramatically increase the difficulty of fire suppression.

Herbicide treatments may be appropriate to remove dense stands of poison hemlock or broom in areas of mixed shrub and trees (for example, in infestations of broom growing into pockets of tree mortality caused by Sudden Oak Death). It should only be used if alternative methods of control such as pulling, mowing, and flaming are deemed infeasible.

Piling and Burning

The major objective of roadside thinning is to create conditions which allow control of wildfires approaching the road (namely, facilitating firing operations.) Any 'jackpots' or concentrated piles of fuels need to be removed from the immediate vicinity of the road. Piling and burning of slash is the most effective method for disposing of heavy accumulations of dead materials in SOD impacted areas - it lowers the risk of spreading the pathogen in chips hauled offsite, or in the chipper. Pulled broom may be piled on the same piles for disposal through burning.

Pile burning is the most efficient way to dispose of thinning slash. Piles should be covered and left for a summer to cure. Covered piles should be burned after sufficient rain has fallen to reduce hazard of fire escape. Burn the piles when surrounding litter is wet enough to prevent fire spread (do not construct large firelines around piles as bare soil creates habitat for weeds).

Avoid burning branches or tree trunks larger than 3-4” in diameter, as this will reduce smoke impacts, and make mop-up of piles easier. Also, reduced smoldering times reduce heat impacts to the soil beneath the piles. Larger material should be scattered on-site. It poses little fire hazard.

Mowing

As mowing has the potential to impact sensitive plant species, and can act to spread noxious weeds/thistles, we do not recommend any large-scale mowing treatments be conducted. We recommend that major ridgetop trails we mowed with a weed-eater to clear an area 4’ wide early each summer after grasses have cured.

Mechanical Fuels Treatment

'Mechanical Fuels Treatment' is similar to mowing, but generally describes work done by larger, heavier, brush and tree masticators. These heavier machines, with higher-energy grinding heads, are more likely to cause soil disturbance, and to spread weeds. While traditional tractor-mounted mowers may be used to conduct some of the fuel reduction work

along the major roads, we have not identified any specific areas where we suggest brush mastication.

Prescribed Burning

The plant communities of Palo Corona Regional Park are fire adapted and many of the grasslands require periodic fires to maintain themselves against invasion by scrub. Grazing fulfills some of the roles that fire once did, but is not a substitute for occasional fires. That said, the application of prescribed fire is made difficult by air quality regulations, infrequent weather windows, and complicated patterns of ownership. The development of prescribed burning projects is beyond the scope of this project, however, the grassland communities are the best candidates for the application of prescribed fire.

Burning projects should be developed on-the-ground by qualified contractors. The following suggestions are intended to focus prescribed burning discussions that may take place between the Park District and its collaborators:

- Any burning projects carried out in the Park should be based upon well-defined ecological restoration objectives.
- Grasslands and grassland areas being invaded by scrub are the most appropriate places in which to apply prescribed fire.
- Underburning may be an appropriate tool to reduce surface fuel loading in areas with heavy concentrations of Sudden Oak Death after standing dead trees have fallen and begun to decompose (maybe 5-10 years from now).
- Ridgelines are the best places in which to divide prescribed burning units. Avoid designing burn units with midslope control lines.
- Use existing roads and trails to design burn units.
- In general, ridgetop areas upslope of the Chavote are the best candidates for large grassland burning projects. Burning in these grasslands should take place mid to late afternoon, as increasing humidity after sunset will help to extinguish burning grasses.
- Burning should be avoided in areas with heavy weed infestations unless further research is done to evaluate the potential post-fire response of the weed being burned, or the burn is a component of a control strategy for that specific weed.

More information on CAL FIRE's prescribed burning planning process is available in Appendix C.

Integrating Fire Road, Trail, and Fuelbreak Maintenance

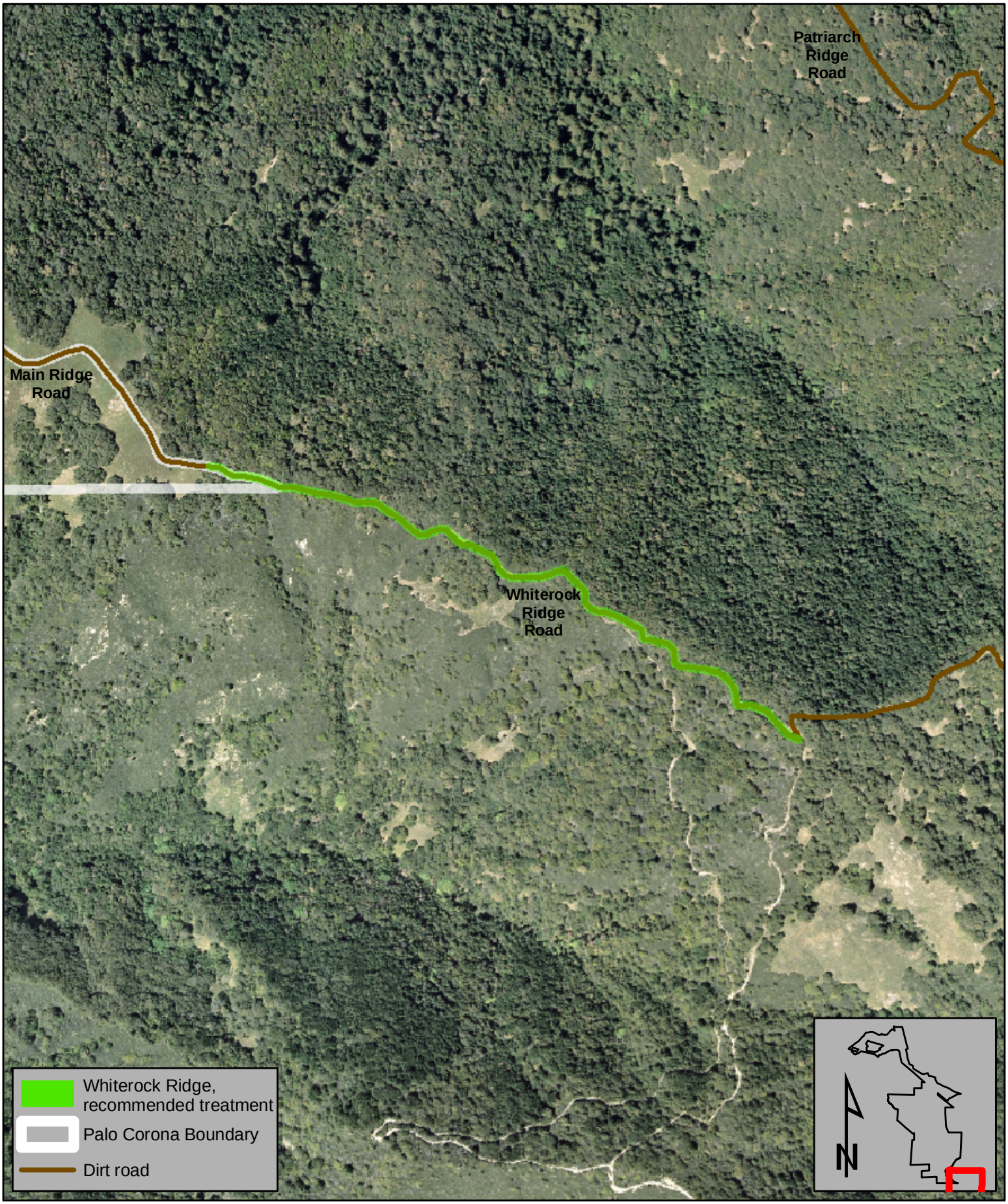
All fire-related vegetation management tasks for this project coincide with road and trail clearance needs. Annual mowing/weed-eating along Seneca and Cabin Ridges are priority projects.

Fuel reduction projects such as mowing and pruning/thinning need to be repeated periodically to keep up with the regrowth of the vegetation. If Sudden Oak Death causes heavy accumulations of downed woody fuels along Park roads, these areas should become priority areas for piling and burning of downed woody fuel.

If thinning is conducted along White Rock Road – south of the Park boundary, followup pruning of sprouting vegetation should be done as needed to maintain the thinned areas in an open condition. Thinning projects should be re-evaluated about 3-5 years after the initial project. If substantial regrowth has occurred in the oaks, or if Sudden Oak Death mortality has caused a substantial increase in the amount of dead and downed limbs, additional thinning and pileburning should be undertaken to reduce these fuel loads.

Mowing needs to be done annually, after grasses have finished growing for the year.

Palo Corona Regional Park
Fuel Treatment Recommendations



0 500 1,000 2,000 Feet

Prepared for Monterey Peninsula Regional Park District
Prepared by NorthTree Fire International

The Regulatory Environment

CEQA exemptions for fuels management projects

California Code of Regulations Sections 15304 and 15333 exempts fuels and vegetation management projects from the CEQA process unless they (a) Occur in an area with resources of critical concern, (b) Cause significant cumulative effects, (c) Cause Significant Environmental Effects, (d) Impact scenic highways, (e) Affect Hazardous Waste Sites, or, (f) Cause a substantial adverse change in the significance of an historical resource.

Projects which do not fall into the 6 categories above are exempted from CEQA per the following 2 sections:

{15304}(i) Fuel management activities within 30 feet of structures to reduce the volume of flammable vegetation, provided that the activities will not result in the taking of endangered, rare, or threatened plant or animal species or significant erosion and sedimentation of surface waters. This exemption shall apply to fuel management activities within 100 feet of a structure if the public agency having fire protection responsibility for the area has determined that 100 feet of fuel clearance is required due to extra hazardous fire conditions. (The 1998 revision of the section specified that this exemption applies to fuel management activities which will not impact threatened or endangered species or result in significant erosion or sedimentation).

{15333} (4) Projects to restore or enhance habitat that are carried out principally with hand labor and not mechanized equipment.

For a more comprehensive description of project activities exempted from the CEQA process, see *Appendix A*.

Botanical survey requirements

In areas covered mainly in Oak Woodland and Mixed Evergreen Forest, a botanist should evaluate areas designated for piling and burning, as soil under burned piles will be sterilized, and piles should not be built atop sensitive plants. However, we feel that thinning activities in oak-dominated areas are unlikely to adversely affect sensitive plant species. Please see

Appendix G for a list of plant species to survey for before any major vegetation management project.

It is recommended that Park staff continue to GPS sties of known rare plant occurrences and that a thorough data search is completed before field survey and subsequent fuels treatment.

Cultural/historical resource survey requirements

Lynn Overtree maintains a GIS coverage of known archeological sites. Any thinning or pile burning projects should be laid out in such a way as to avoid impacting these resources. To avoid destroying known arch sites, we recommend that the Park encourage CAL FIRE to use bulldozers for fire suppression only on established roads and historic roads.

Prescribed burning projects should be designed to avoid burning through historic cabin sites, or other known archaeological sites which could be adversely affected by fire.

Wildfire Related California Public Resource Code Sections

There are several dozen sections within the State Public Resource Code that regulate wildfire and prescribed burning. These codes range from restrictions on debris burning and campfires to detailed descriptions of the contracting mechanisms regulating the use of State resources for prescribed burning projects on private land and parks. *Appendix B* summarizes key State Laws relating to wildfire control and fire hazard reduction. Of particular importance are:

Public Resource Code Sections 4427-4431, **and 4442** which regulate the use of equipment which may cause fires during dry conditions. It is essential that Park management and maintenance staff are familiar with these laws and trained on them regularly, as they specify explicitly the number of: backpack pumps, hoses, fire extinguishers, and other fire control tools that must be onsite during the operation of any mechanical equipment (mowers, chainsaws, weed-eaters, and vehicles) operating in the Park in the summer.

S**ections 4439&40** which regulate pile burning, and **Sections 4475-80** which establish procedures for the use of CAL FIRE resources on prescribed burning or other vegetation management projects.

Applicable state prescribed fire regulations/procedures

The Monterey/San Benito Unit of CAL FIRE should be a primary point of contact in the development of any prescribed burning projects occurring within the Park. If the Park is interested in contracting a consultant to develop prescribed burning projects for habitat improvement, weed control, or hazard reduction, we recommend Barry Callenberger of WildlandRX. Mr. Callenberger has been providing consulting services to the Army on burning projects on Fort Ord, and he is intimately familiar with the specifics of burning on the Central Coast in general, and in Monterey County in particular.

See *Appendix B* **Sections 4475-80** (Public Resource Code Prescribed Burning Regulations) and *Appendix C* (overview of CAL FIRE's Vegetation Management Program's Prescribed Burning project implementation procedures) for a comprehensive list of State Laws regulating Prescribed Burning. Also, contact the Monterey County Air Pollution Control District for information on current Smoke Management Regulations.

Works Cited

Amme, D. 1988. Poison Hemlock Control at Elkhorn Slough , 1987—Final Report.

Alexander, J. and Carla M. D'Antonio 2003. Seed Bank Dynamics of French Broom in Coastal California Grasslands: Effects of Stand Age and Prescribed Burning on Control and Restoration Restoration Ecology 11 (2), 185–197.

Baskin, J.M. and C.C. Baskin. 1990. Seed germination ecology of poison-hemlock. Canadian J. Botany. 68:2018-24.

Bossard, C. C. 1990. Secrets of an ecological interloper: Ecological studies on *Cytisus scoparius* (Scotch broom) in California. PhD diss., University of California Davis.

Bossard, Carla. 2000. Genista monspessulana (L.) L. Johnson. In: Bossard, Carla C.; Randall, John M.; Hoshovsky, Marc C., eds. Invasive plants of California's wildlands. Berkeley, CA: University of California Press: 203-208.

California Invasive Plant Council (Cal-IPC). 2007. *Genista monspessulana* listed by Carla D'Antonio.

Davis, S. 2007. Personal interview and meeting regarding Palo Corona Regional Park and general fire management strategies for California Central Coast landscape.

FlamMap (Finney and others 2004). US Forest Service **Fire Sciences Lab** and Systems for Environmental Management, Missoula, Montana.

Fire Effects Information System (FEIS) Database. 2007. USDA Forest Service.
Graham and Johnson, Managing Poison and Western Water Hemlocks
University of Nevada Cooperative Extension fact sheet 04-09

King, D. 2007. Personal interview and meeting regarding Palo Corona Regional Park and general fire management strategies for Carmel, CA area.

Lee, L. 2007. USC Herbarium. Cirsium_vulgare1.jpg

Leppig, G., Pickart, A. J. 2005. A Photographic Guide to Plants of Humboldt Bay Dunes and Wetlands. http://www.humboldtbay.org/galleries/plantguide/t-grass/cor_jub_2.html

Mazza, S. 2005. California Department of Forestry and Fire Protection, San Benito – Monterey Unit 2005 Fire Plan. 87 pages.

McGraw, J. 2007. Grasslands and Grazing Management Plan For Palo Corona Regional Park. 191 pages.

National Park Service (NPS). 2007. Redwood National and State Park archive. Bull Thistle.

Overtree, L. 2001. Palo Corona Ranch Management Plan. 118 pages.

Overtree, L. 2007. Personal interviews and meetings regarding Palo Corona Regional Park.

Pitcher , D. 1986. Element Stewardship Abstract for Poison Hemlock (Conium maculatum). The Nature Conservancy, San Francisco , CA .

Plant Pest Control (PPC). 1998. Land Plant Pests: Pampas grass: Cortaderia selloana, C. jubata Hawke's Bay Regional Council, New Zealand.

Reade, S. 2007. Personal interview and meeting regarding Palo Corona Regional Park and general fire management strategies for Carmel Valley area.

RMI. 1996. Fuel Management Plan for the Santa Lucia Preserve, Wildland Resource Management, Inc. Alamo, CA

Scott, Joe H.; Burgan, Robert E. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model. Gen. Tech. Rep. RMRS-GTR-153. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p.

Shelterbelt INC, 2004. Colma Creek Headwaters Restoration Project For San Bruno Mountain State & County Park

Swezy, Michael; Odion, Dennis C. 1997. Fire on the mountain: a land manager's manifesto for broom control. In: Kelly, Mike; Wagner, Ellie; Warner, Peter, eds. Proceedings, California Exotic Pest Plant Council symposium; 1997 October 2-4; Concord, CA. Volume 3. Berkeley, CA: California Exotic Pest Plant Council: 76-81. [44102]
http://www.cal-ipc.org/symposia/archive/pdf/1997_symposium_proceedings1935.pdf

The Nature Conservancy (TNC). 1988. Element Stewardship Abstract For Cortaderia jubata (including C. atacamensis).