Habitat Assessment and Review of Fuel Modification Areas within the Buck Gully Reserve

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IRVINE RANCH CONSERVANCY

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Executive Summary

Buck Gully Reserve is a 300 acre open space area located in the City of Newport Beach, California. It is surrounded by development and managed for both wildlife habitat and recreational use. Much of Buck Gully Reserve falls within the Coastal Subregion of the NCCP/HCP Reserve System known as the Nature Reserve of Orange County. Although Buck Gully has not burned within the last 100 years, it has been placed within a Very High Fire Hazard Safety Zone by state and local officials. This report provides baseline data and recommendations intended to diminish the impact of vegetation removal on native habitats and the potential for invasion by non-native weeds within the reserve, while providing adequate fire protection to homeowners and the community. This is achieved through a review and analysis of the literature on fire ecology and fuel modification, and a review of the fire management framework, history, and policies. Baseline data, including a survey of the vegetation communities and invasive weeds within the fuel modification areas of Buck Gully Reserve, were collected. From this data, areas were prioritized for targeted weed removal, restoration of degraded communities, and were assessed based on a Combustible Fuel Index. Finally, recommendations based on surveys and policy and literature review are provided that will make fuel modification area management more consistent with habitat protection and policy. These recommendations seek to alter fuel modification practices in order to strengthen the goals of maintaining fire safety and habitat resources while incentivizing opportunities for communication and collaboration among managers and community stakeholders.

A review of relevant research and historical data has shown that adjacent urban development has increased water run-off to Buck Gully Creek causing an increase in vegetation that can become fuels and conditions that allow invasive insects to colonize. Surveys also documented that approximately 60 percent of the fuel modification areas in Buck Gully consist of vegetation communities dominated by non-native vegetation. Of the remainder, 30% are native Coastal Sage Scrub and Lemonade Berry Scrub, and 10% are other designations. Additionally, approximately 40 percent of vegetation communities surveyed were characterized as degraded; however, easily implemented improvements to fuel modification practices can decrease the extent of degraded areas.

Best management practices include adhering to local fuel management policies that emphasize vertical and horizontal space among shrubs and trees. It is recommended that an emphasis be placed on “thinning” vegetation instead of “clearance,” as many areas were found to be completely denuded. Loss of vegetation cover can cause harmful erosion and produce degraded areas easily colonized by invasive weeds that can proliferate and threaten neighboring reserve areas. A short term, long term, and fuels-based management approach are provided to address current conditions in the City-controlled fuel modification areas. Land managers can target specific weeds in otherwise intact habitat areas in the short term to control the spread of the most prolific weeds that threaten quality habitat areas. A long term approach consists of targeting priority degraded areas for comprehensive restoration as funding becomes available. A third analysis provides an assessment of areas based on a Fuels Index, showing areas that contain combustible fuels and higher densities of vegetation cover.

Finally, encouraging residents to take up a “Good Neighbor” policy by opting not to plant or even removing ornamentals planted beyond their property lines can strengthen the partnership between the City, land managers, and residents. Instead, planting attractive, low-growing, and fire resistive natives is a way to enhance the wildland-urban interface as a natural resource.

Purpose and Need

This report seeks to review and evaluate Buck Gully as an open space resource with ecological and recreational value, and account for these values when examining the costs and benefits of management actions within fuel modification areas. Native vegetation that constitutes valuable habitat sustaining wildlife and sensitive plants has been cleared in the past within fuel modification areas. A collective objective among managing agencies is to manage these areas responsibly with both land and fire management goals in mind. While fire management and prevention is a top priority for communities containing wildland urban interfaces, wildlands and the habitat and recreational value they provide can suffer unnecessary degradation. This report provides baseline data and management recommendations for fuel modification areas that will decrease the impact of vegetation removal on native habitats and the potential for invasion by non-native weeds, while providing adequate fire protection to homeowners and the community.

The goals of this report are to:

- Review and analyze wildland fire management practices and policies;
- Present results of baseline vegetation community and invasive weed surveys located within the fuel modification areas of Buck Gully;
- Where appropriate, make recommendations that will facilitate compliance with fire policies and guidelines, strengthen both the management goals of the NCCP/HCP reserve and fire protection for homeowners, and guide management and future restoration efforts;
- Establish baseline biological data and information that will facilitate collaboration with partners in developing long-term management policies.

Background

Setting

Buck Gully consists of approximately 300 acres of open space including the Buck Gully Creek and is bordered almost completely by residential development and roads. It is located in the southeastern half of the City of Newport Beach, Orange County California (Figure 1). The Buck Gully Reserve (BGR) encompasses the central region of a larger canyon and watershed that originate 3.5 miles upstream from the coast (Dudek 2009). The watershed draining into Buck Gully consists of approximately 1,200 acres that drain a portion of the San Joaquin Foothills and continues to the Pacific Ocean. Buck Gully is bounded by urbanized areas including single-family residences, major and residential roads, and a golf course; however, some habitat corridors are present linking other regional open space areas (Dudek 2009).

Figure 1. Buck Gully Reserve, Orange County.

Climate

The climate in the BGR area is Mediterranean, characterized by warm, dry summers and wet winters. Precipitation is variable from year to year and typically occurs between December and March. Prevailing winds consist of onshore flows with offshore Santa Ana winds from the northeast that typically occur in the fall and may gust to 50 miles per hour or higher. Because the BGR is adjacent to the Pacific Ocean, it typically has higher humidity and subsequently higher vegetation moisture content than would be found inland. From a fire hazard perspective, the local climate contributes significantly to fire risk as drying vegetation (lower fuel moisture) during the summer months becomes fuel available to advancing flames should an ignition occur.

History

Originally, Buck Gully was a part of the historic San Joaquin Land Grant making up 48,803 acres of present day Orange County (County of Orange 2012). Rancho San Joaquin consisted of both Rancho Cienega de las Ranas which makes up present day Irvine and Rancho Bolsa de San Joaquin consisting of the Newport Bay and estuary in present day Newport Beach south to present day Laguna Beach (County of Orange 2012). Rancho San Joaquin was purchased by the Irvine Family in 1864 and their land holdings were incorporated with the Irvine Company in 1898 (James Irvine Foundation 2012). In 1999, the land that makes up the BGR was given by the Irvine Company to Orange County through an Irrevocable Offer of Dedication (Instrument No. 19990518016; Dudek 2009). From 1999 to 2005 the County's Harbors, Beaches, and Parks District managed Buck Gully and implemented limited maintenance within the area due to funding restrictions; Buck Gully remained in the Newport Coast Planning Unit, an unincorporated area of Orange County, until 2002 (Dudek 2009). Newport Beach annexed a portion of the Newport Coast which included Buck Gully in 2002. Upon annexation, the City of Newport Beach began providing these areas with police, fire, and refuse collection as well as other municipal services except those that remain with the County. The City of Newport Beach's City Council authorized the acceptance of certain scenic easements, a resource preservation easement, and fee ownership of reserve lands in Buck Gully and the Newport Coast in 2005 (City of Newport Beach 2005).

Land Use

Buck Gully is designated as an Open Space land use by the City of Newport Beach. Historically, 203 acres of the southeastern portion of Buck Gully fell within the 9,493-acre Newport Coast Planned Community (PC-52), an unincorporated area of Orange County (Newport Beach 1998). A 54-acre portion of Buck Gully was located within Planning Area 17 and 18 of the Newport Ridge Planned Community, a 645-acre planned community established in 1998. These Planned Community Programs designated Buck Gully as a major Special Use Open Space Dedication/Recreation Area, and were subsequently dedicated to Orange County (Newport Beach 1998).

A majority of western Buck Gully is zoned as Open Space, while the remaining portion falls within the Newport Coast Planned Community and the Planned Community zoning designation (PC) (Figure 2). Historic land use in the regional area of Buck Gully consisted primarily of ranching. As the regional area around Buck Gully was converted to residential and commercial land uses, fire suppression likely

prevented Buck Gully from burning. This has contributed to a build-up of fuels in recent years. Although historically public access in Buck Gully was not prohibited, no established public access plan or trail system was implemented until 2009.

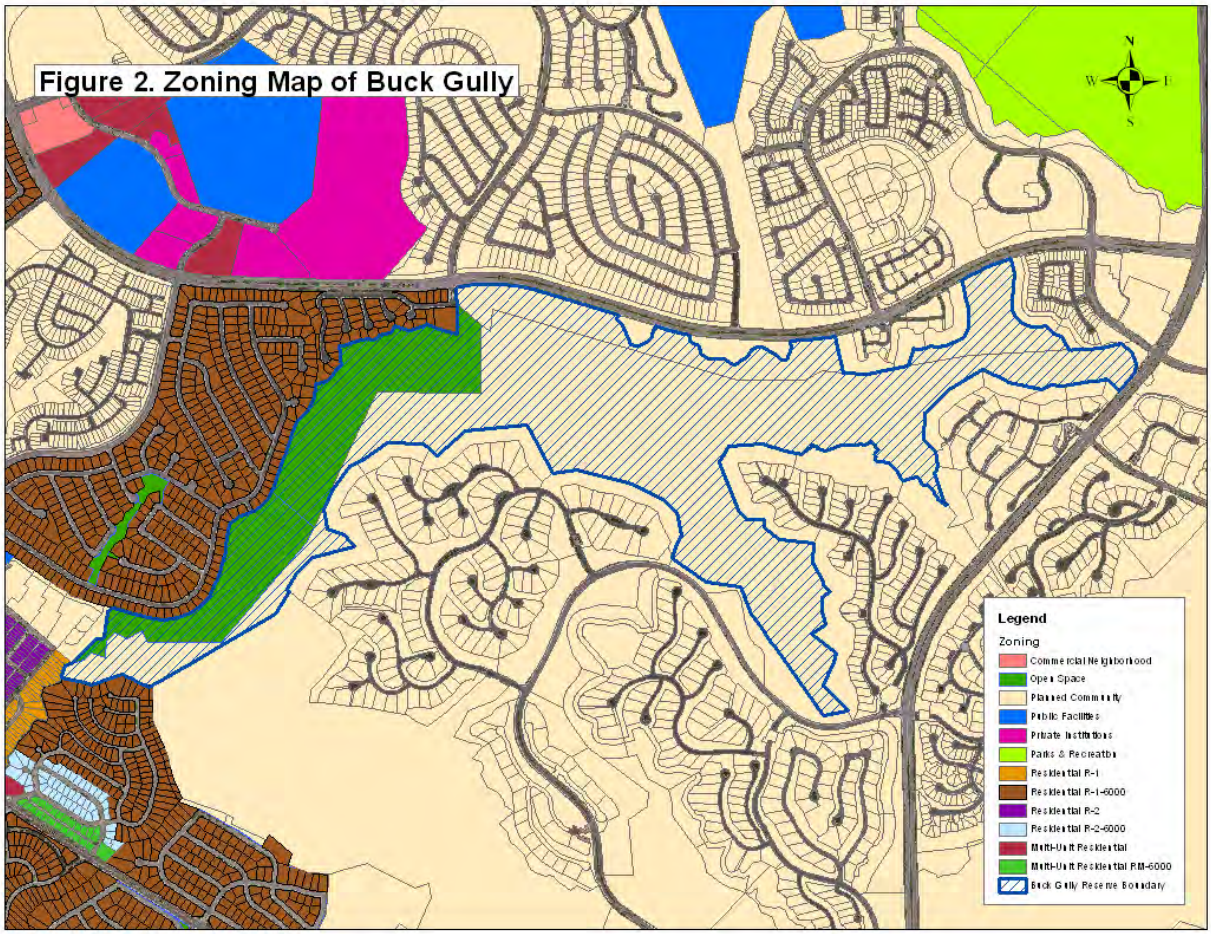

Figure 2. Zoning around Buck Gully Reserve.

Land Management Framework, Organizations, and Roles

The Natural Community Conservation Planning (NCCP) program identifies and provides protection for the plants, animals, and their habitats on a regional scale, while allowing compatible and appropriate economic activity and development. In July of 1996, a combined state and federal effort bringing together the NCCP and Habitat Conservation Plan (HCP) processes led to the adoption of an NCCP/HCP for the Central and Coastal Subregion of Orange County. The Central and Coastal subregion consists of 208,000 acres encompassing the area between the Pacific Ocean inland to Riverside County. A significant portion of Buck Gully Reserve is located within the Coastal Subregion NCCP/HCP (Figure 3). Other core areas in the region consist of the San Joaquin Hills (Core Reserve) and the Upper Newport Bay (Dudek 2009).

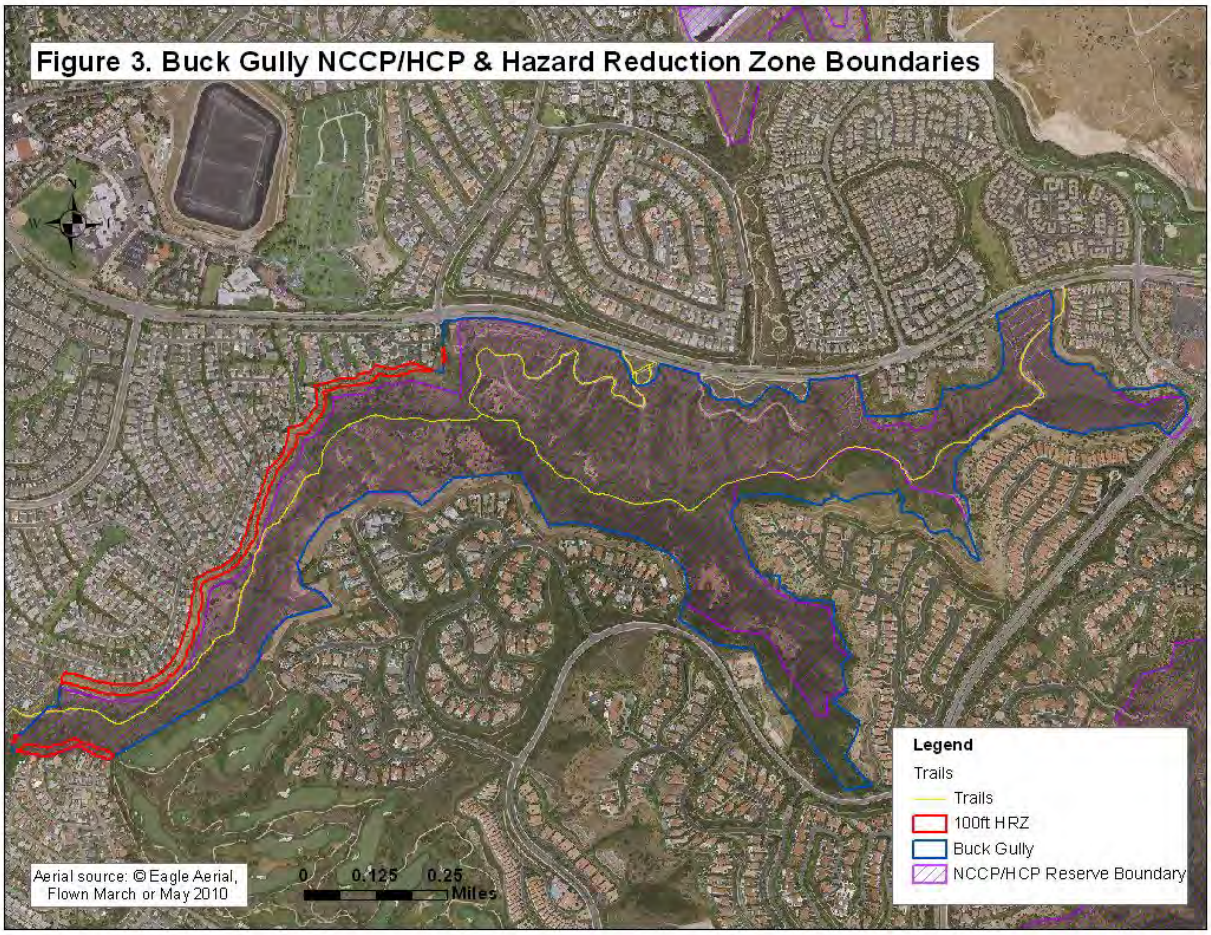

Figure 3. Hazard Reduction Zones associated with Buck Gully. Note southern HRZ lies within Reserve and NCCP whereas northern HRZ lies only within Reserve.

The NCCP/HCP establishes and requires the management of a 37,380-acre NCCP/HCP Reserve System, referred to as the Nature Reserve of Orange County (NROC). NROC is also the non-profit organization that coordinates implementation of the NCCP on the reserve system. The subregional design process focuses on protecting Coastal Sage Scrub (CSS) habitat and three designated "target species" the coastal California Gnatcatcher, the coastal Cactus Wren, and the Orange-throated Whiptail lizard (County of Orange 1996). These habitats and species are "covered" under an Incidental Take Permit authorized by the US Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG). Other covered habitats include oak woodlands, cliff and rock, and chaparral within the coastal subregion. In addition, incidental take coverage is provided to 39 species that are covered under the NCCP/HCP (County of Orange 1996).

In 2005, the City of Newport Beach was granted fee ownership of Buck Gully and is responsible for managing it a manner that is consistent with its land use and fire management policies. In 2008, the

Irvine Ranch Conservancy (IRC) accepted management and operation responsibilities for BGR. On May 30, 2012, a restored trail system was dedicated by the Mayor of Newport Beach that included three miles of renovated trails in the Buck Gully Reserve. Trail improvements included re-routing portions away from eroded areas, creek bank stabilization, and the addition of four aluminum bridges spanning portions of the Buck Gully Creek.

Biological Resources

Vegetation Communities

Buck Gully contains numerous vegetation communities that serve as habitat for wildlife, host sensitive plant species, and contribute to regional wildlife movement and persistence. The following is a list of vegetation communities observed within the fuel modification areas of Buck Gully:

Upland Grassland:

- Annual Grassland (AGL)
- Wild Rye (WR)

Coastal Sage Scrub (CSS) and the following CSS sub-associations:

- Coastal Sage Buckwheat Scrub (CSSB)
- Coastal Sage Scrub/Grassland (CSS/Grass)
- Coyote Brush Scrub (CSB)
- Sagebrush-Coyote Brush Scrub (SBCB)
- Southern Cactus Scrub (SCS)
- Lemonade Berry Scrub (LBS)

Chaparral Scrub:

- Southern Mixed Chaparral (SMC)
- Toyon Sumac Chaparral (TSC)

Upland Woodland:

- Mexican Elderberry Woodland (MEW)

Riparian Scrub:

- Southern Willow Scrub (SWS)

Land Cover Types:

- Ornamental (ORN)

Sensitive Plants:

A survey for sensitive and rare vegetation was conducted in the spring of 2012 by Fred Roberts Jr. (Roberts, in prep.). Of the sensitive species found, two occurred within or immediately adjacent to fuel modification areas (Table 1, Figure 4).

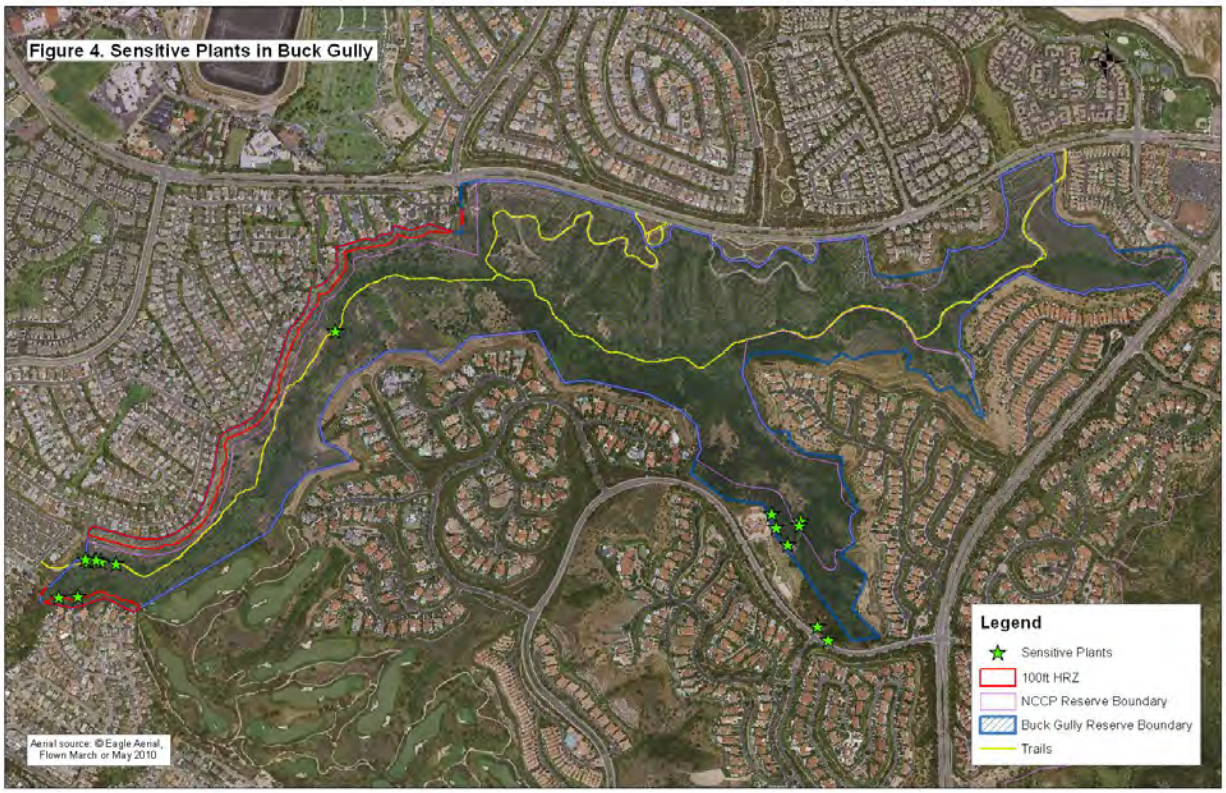

Figure 4. Sensitive plant locations within Buck Gully Reserve (Roberts 2012).

Table 1. Sensitive plants observed within fuel modification areas.

Scientific Name	**Common Name**	**Status**
Pseudognaphalium ramosissimum	Pink Everlasting	Local Concern[1]
Quercus dumosa	Nuttall's Scrub Oak	CNPS List 1.B.1[2]

[1] Local Concern = Locally rare within Orange County, or regionally rare without formal designation (Roberts 2008).

[2] California Native Plant Society (CNPS) List 1B = Species that are rare throughout their range and occur primarily within California.

CNPS Threat Ranks

0.1-Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)

0.2-Fairly threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat)

0.3-Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known)

Wildlife

During wildlife surveys conducted in 2008, 131 vertebrate wildlife species were observed within Buck Gully including, 4 amphibians, 9 reptiles, 66 birds, and 12 mammals (Dudek 2009). Many special-status wildlife species occur or have the potential to occur on site; these species are designated as Covered, Conditionally Covered, or Non-covered under the Central-Coast NCCP/HCP. The Coastal California Gnatcatcher (*Polioptila californica californica*), Least Bell's Vireo (*Vireo bellii pusillus*), Coyote (*Canis latrans*), San Diego Woodrat (*Neotoma lepida intermedia*), and Bobcat (Ly*nx rufus*) are a few of the species that have been observed or have a high potential to occur in Buck Gully (Dudek 2009).

Review of Local Fire Risk and Fire Management Practices

History

Because the Buck Gully Reserve is adjacent to the Pacific Ocean, it typically sees higher humidity and is able to support higher vegetation moisture and growth than similar habitats found inland. In drier summer months, abundant vegetation can become a fire risk as excessive dry fuels build up. Urban development has likely increased the creek flow in Buck Gully and the increased growth of vegetation that can fuel wildfires during drier periods. Historic topographic maps indicate that Buck Gully was an ephemeral drainage that only supported flows during and after precipitation events and did not contain perennial reaches or springs (Todd Engineers 2006). A Seepage Study performed in 2006 for three contiguous watersheds on the Newport Coast: Buck Gully, Morning Canyon, and three Pelican Point watersheds found a large increase in the soil moisture that has lead to increased runoff in Buck Gully likely due to urbanization (Todd Engineers 2006).

Urban development and land use change have increased water supply and impervious surfaces in the study area. This increase in flow in Buck Gully is likely due to the extensive residential development including an adjacent golf course. The construction of buildings and storm drains that directly feed Buck Gully Creek, as well as landscaping and the importation of water supply have contributed to the now relatively constant flow of Buck Gully Creek (Weston Solutions 2007). Although increased water flow can have many beneficial impacts on the habitat in and around Buck Gully, it has also increased the vegetation that becomes fuel for wildfires during excessively dry periods and has increased erosion within the Gully.

According to OCFA and NBFD records, there have been no occurrences of fire within the last 100 years in Buck Gully (Steve Michaels, NBFD, and George Ewan, OCFA Personal communication, August 1, 2012). The Laguna Beach Fire came close in 1993, but it was diverted by a change in wind direction. Despite a long-term absence of fire, Buck Gully has abundant vegetation that could ignite in dry periods by accidental human activity or arson.

Orange County Wildland-Urban Interface Task Force in 1994

The Wildland-Urban Interface Task Force was held in response to the catastrophic Laguna Beach fire in 1993 that destroyed 441 homes and resulted in $528 million dollars of damage (Lait 1994). The Task Force consisted of more than 70 representatives from fire departments, cities, the County, developers, and others, and produced a report of findings with recommendations that were adopted by the Orange County Board of Supervisors. The report included recommendations such as prescriptive burning, encouraging the insurance industry to give premium credits to homeowners in fire hazard areas who implement fire safety measures, and providing minimum training levels for county fire agencies that handle wildfires that encroach in urban areas (Lait 1994). Homes adjacent to Buck Gully may have benefited from credits from insurance companies as well as the increased fire safety training; however, prescription burning was never conducted in Buck Gully. In addition, fuel management guidelines were established by the task force forming the basis for those developed by NBFD.

Prescription Burning

In the past, fire management policies in California shrublands have been heavily influenced by policies designed for coniferous forests. However, these management policies were ineffective at excluding fire from chaparral and coastal sage scrub landscapes because large wildfires in these areas are often the result of severe fire weather and not the accumulation of fuels (Keeley 2002). In recent years, the scientific community and fire safety officials have come to understand the ecological differences between shrublands and forested areas and how to incorporate these differences into fire management policies. Fires in shrublands are often crown fires which burn the entire plant, not just the understory (Barro & Conrad 1991). Some common chaparral and CSS species have adapted to severe infrequent fire conditions by being long-lived and regenerating primarily from an accumulated seed bank after fire; these species are not adapted to frequent and less intense burns like those utilized in prescription burning (Minnich & Howard 1984).

With this new understanding of how shrubland systems respond to varying fire conditions, fire safety officials have largely discontinued the use of prescription burning as a fire management strategy in Orange County's shrublands. Although there are benefits to prescription burning to rid native grasslands of non-native annual grasses, the draft NCCP/HCP Wildland Fire Management Plan (WFMP) states that it is not a recommended method of fuel treatment under current conditions due to high frequency fire return interval in much of the NROC. In fact, over 75% of NROC has burned in the last two decades, and this has threatened the integrity of covered species and communities, particularly the Coastal Cactus Wren, Tecate cypress, and coastal sage scrub (Dudek 2012, in prep). Other concerns including the difficulty of controlling burns and excessive air pollution have added to the argument for discontinuation of prescription burning (Tran & Abrams 2006).

Current NCCP/HCP Fire Management Practices. The NCCP/HCP WFMP (likely to be released December 2012) will provide a toolbox of fuel management methods that can be applied by land managers and fire safety officials when appropriate. This will allow an adaptive approach that allows managers and officials to change and tailor their management strategies for fuel reduction and invasive weed control in response to changing conditions. Such tools may include hand cutting, chipping or piling, and mechanical crushing, and will likely be applied in existing fuel modification areas in focused areas of invasive weed invasion.

Current Fire Management Policy Makers and Policies

California Department of Forestry and Fire Protection (CALFIRE)

CALFIRE is responsible for fire protection in State Responsibility Areas of California as well as the administration of the state's private and public forests. In 2010, a revised Strategic Fire Plan was developed creating goals and objectives that provide a framework to address the protection of lives, property, and natural resources from wildland fire and improve environmental resilience to wildland fire. CALFIRE is also responsible for Fire Hazard Zones within State and Local Responsibility Areas.

Newport Beach Fire Department (NBFD)

NBFD provides fire prevention and firefighting for the City of Newport Beach, including Buck Gully. The City has published fuels management policies that govern Special Fire Protection Areas that include the Hazard Reduction Zones (HRZ) and Fuel Modification Zones (FMZ). HRZ are City property and are the management responsibility of the City or its designee, and FMZ are privately owned and managed pursuant to the City's fire management guidelines. NBFD's current duties include conducting maintenance in the HRZ and overseeing compliance with the policies outlined in the Fire Prevention Guidelines for Special Fire Protection Areas G.01 and G.02. for the HRZ and FMZ (Appendix 1).

NCCP/HCP Fire Management Plan

A short-term Fire Management Plan (FMP) was approved by the NROC Board of Directors in 1999 and distributed to USFWS and CDFG. In addition, the consulting firm Firewise 2000 was engaged in 2001 to revise the long-term FMP. Subsequently, it was then decided to combine the short-term tactical and long-term strategic plans to for a "Wildland Fire Management Plan" for the NCCP. The NROC Board of Directors approved an interim long-term strategic FMP in 2003 with the understanding that there would be additional review and changes. The wildlife agencies and fire authority agreed that the Lake Mathew's FMP would be used as a model for the NROC plan. After a draft was released for review in June of 2011, some concerns about the plan were expressed in a letter from landowners and fire agencies, and a task force was formed to assure completion of the plan (McAfee 2011). Dudek Inc. has been selected as a consultant to finalize the NCCP/HCP Wildland Fire Management Plan. The Fire Management Plan task force is overseeing progress of report development, which should be completed by December of 2012 (Milan Mitrovich, Personal Communication, August 21, 2012).

State Fire Policy

Very High Fire Hazard Safety Zones (VHFHSZ)

The Bates Bill, Government Code Section 51175, prompts CALFIRE to evaluate fire hazard severity in Local Responsibility Areas (LRA) and to make a recommendation to the local jurisdiction as to where Very High Fire Hazard Severity Zones (VHFHSZ) should exist. The Government Code then provides direction for the local jurisdiction to take appropriate action including revisions to zones and implementation of fire policies within designated zones. The bill originated in the mid-1990's after the devastating Oakland Hills Fire of 1991 (City of San Diego 2009). California law requires CALFIRE to

identify VHFHSZ based on factors such as fuel, slope, and fire weather. There are three zones, based on increasing fire hazard including medium, high and very high. The Fire Hazard Severity Maps are updated every five years.

Senate Bill 1595

In 2009, California State Senate Bill 1595 became law and amended State Code Section 51175 requiring CALFIRE to identify and classify fire hazards in each Local Responsibility Area (LRA). LRA are incorporated cities like Newport Beach which have jurisdiction over their own land use and planning decisions. CALFIRE conducts a fire hazard analysis, classifies VHFHSZ, and distributes these maps to cities. Senate Bill 1595 requires landowners within a VHFHSZ to provide a minimum of 100ft of defensible space from an occupied dwelling or structure. The law also requires new structures or additions to comply with Chapter 7A of the California Building Code and makes it mandatory for a transferor of real property within a VHFHSZ zone to disclose to any prospective transferee the fact that the property is located within a VHFHSZ and is subject to the requirements of Section 51182. State law requires the City to adopt the State Map with any modifications it deems necessary. Figure 5 shows the regional area around Buck Gully and its location with respect to the State and City of Newport Beach's VHFHSZ.

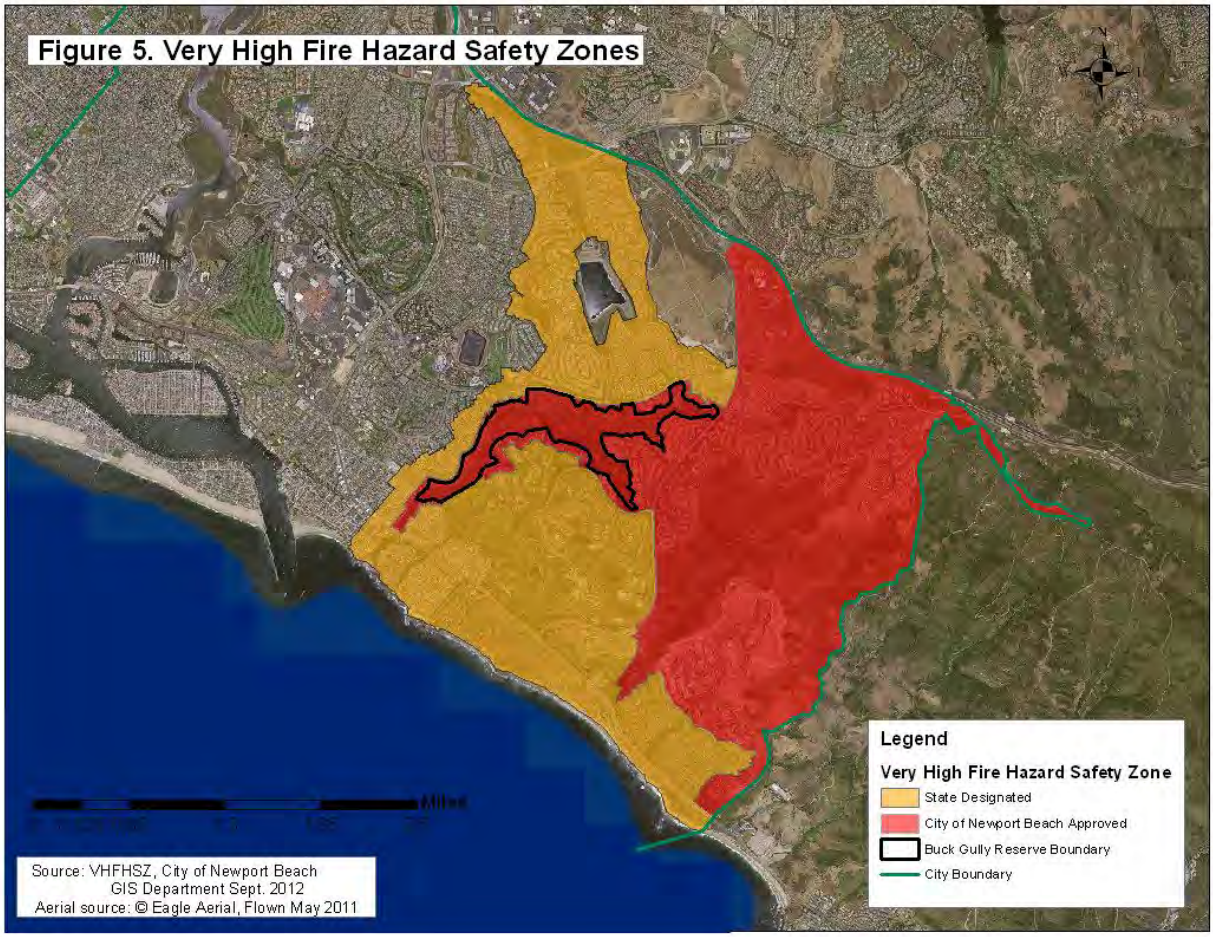

Figure 5. Very High Fire Hazard Safety Zones as identified by CALFIRE.

On August 28, 2012, the Newport Beach City Council approved Ordinance 2012-15 revising the VHFHZ within the City and instituting the Newport Beach Local Responsibility Area for VHFHSZ. The Newport Beach LRA is roughly half the size of the State's VHFHSZ, and was based on fire hazard analysis that considered terrain, wind, topography, fuel type, and the risk of contributing to wind-driven landscape-scale conflagrations. Buck Gully is included in both the State and Newport Beach VHFHSZ LRA. In a July 10th City Council meeting, Chief Scott Poster asserted that the designation as a VHFHSZ was unnecessary for many areas of the Newport Coast as the requirements included in the designation were already met through compliance with other local regulations and guidelines (Newport Beach 2012).

Local Fire Policy

Because Buck Gully is located within the City of Newport Beach, the City has the authority to institute and implement fire management and protection policies. City Fire Prevention Guidelines Section G: Special Fire Protection Areas are guidelines for defensible space for structures and residences that apply

to the homes adjacent to Buck Gully. Special Fire Protection Areas are defined as "any geographical area designated by the Fire Chief where structures directly abut wildland space or a fuel modification zone on one or more sides" (City of Newport Beach 2008). Section G.01 describes "Guidelines for Hazard Reduction Zones" and Section G.02 "Fuel Modification Plans and Maintenance Standard" describes those for the privately owned FMZ. Hazard Reduction Zones and Fuel Modification Zones are hereafter referred to together as Fuel Modification Areas; both occur in Buck Gully.

Hazard Reduction Zones (HRZ)

Hazard Reduction Zones within Buck Gully are on City property and are maintained by the NBFD. The guidelines for the HRZ apply to homes and structures within the Special Fire Protection Area built prior to July 1, 1999, and are not designated as a Fuel Modification Zone. The HRZ primarily consists of homes along the northwestern boundary and some along the southwestern boundary of Buck Gully (see Figure 3). The guidelines of primary concern require removal of dead and dying foliage from tree canopies and shrubs and removal of any dead trees or shrubs. In addition, trees must be pruned to maintain a clearance of five feet from any structure. Also, where shrubs are located within the drip line of a tree, the lowest branches of that tree must be three times as high as the shrubs. Finally, HRZ guidelines allow ground cover that is properly planted, irrigated and maintained is permitted, and chipped biomass or its equivalent may be used to a maximum height of five inches. The HRZ guidelines do not require a maximum vegetation coverage value or a defined percentage to be removed. For the full text of HRZ guidelines see Appendix 1.

Fuel Modification Zones (FMZ)

A FMZ is a wide strip of land where combustible vegetation has been removed and/or modified and partially or totally replaced with drought-tolerant, fire-resistant plants to provide an acceptable level of risk from wildland and vegetation fires (NBFD 2011). FMZ in Buck Gully make up the 170 ft between adjacent developments and the Buck Gully Reserve boundary and are frequently managed by a Homeowners Association. Developments that occur in fire hazard zones that include lands containing combustible vegetation require modification at the urban interface. FMZ can vary depending on the amount and arrangement of vegetation, topography, degree of exposure, local weather conditions, construction, design, and placement of structures (NBFD 2011). FMZ are typically maintained by a contracted landscaping company and apply to homes built after July 1, 1999 or have been designated as an FMZ by NBFD. FMZ adjacent to BGR consist of fuel requirements in Zones A-D.

For all zones the following requirements apply:

Complete removal of plants species found on the Combustible Plant List and vegetation used should be from the Fire Resistive Plant List (Appendix 2). Appendix 1 contains a full list of guidelines and requirements for each zone. The following represent the primary requirements for each FMZ zone:

Zone A setback Irrigated Zone: A 20 foot setback zone from the property line.

Requirements:

- Automatic irrigation system to maintain vegetation with high moisture content
- Tree species are not allowed within 10 feet of a combustible structure.
- Ongoing removal and/or thinning of undesirable combustible vegetation, replacement of dead/dying fire resistive plantings, maintenance of irrigation systems, and regular trimming of ladder fuels

Zone B Irrigated Zone: A 50 foot zone that begins where Zone A ends and, according to the guidelines, is permanently irrigated.

Requirements:

- Plans for this zone should include methods for erosion control to protect against slope failure.
- With the exception of approved native vegetation, irrigated surface vegetation should be a maximum height of 18 inches.
- Native grasses should not exceed 8 inches and should be cut after annual seeding.
- Plantings and existing trees and shrubs will be in accordance with planting guidelines and spacing standards established in Attachment 6 (Appendix 1).

Zone C & D Thinning Non-Irrigated Zones: Zone C (50ft) and Zone D (50 ft).

Requirements:

- Zone C requires a 50% thinning of vegetation as well as removal of dead, dying, and undesirable species
- Zone D shares the basic requirements of Zone C but requires a 30% thinning of vegetation as well as removal of dead, dying, and undesirable plants.
  Plantings and existing trees and shrubs will be in accordance with planting guidelines and spacing standards established in Attachment 6.

Literature Review

Hydrological Changes and Impacts

Residential and recreational development surrounding the headwaters and slopes of Buck Gully and the addition of several storm drain outlets has dramatically changed the flow of Buck Gully Creek making it vulnerable to high fuel loads. The removal of vegetation, especially shrubs and trees with deeper roots, can increase the water table level and lead to increase flow in nearby creeks due to a decline in evapotranspiration (Bosch and Hewlett 1982). A larger and more consistent water source coupled with the disturbance provided by fuel modification areas promote invasion by alien insect species, such as Argentine ants (*Linepithema humile*) into native habitats (Sugihara et al. 1996). Argentine ants are able to invade undisturbed habitats up to a distance of 650 feet from a water source (Suarez et al. 1998) making them able to colonize nearly all areas of Buck Gully. Community-based analysis conducted revealed that the number of arthropod species decreased when invaded by Argentine ants. The same findings have been reported in disturbed areas such as fuel modification areas where disturbed coastal sage scrub contains fewer arthropod predator species and are dominated by exotic arthropods such as Argentine ants, European earwigs (*Forficula auricularia*), pillbugs (*Armadillidium vulgare*), and sowbugs (*Porcellio spp.*) (Longcore 2003). Changes in insect species composition can have resonating impacts on a variety of bird, mammal, reptile, and amphibian species because they rely on arthropods as a food source.

A survey of arthropods was conducted along Buck Gully Trail which loosely follows the course of Buck Gully Creek in July and August of 2012. The survey found Argentine ants across the entire length of the reserve and only documented a single native ant species, the thief ant (*Solenopsis molesta*), suggesting that native ants are now largely missing from this system (Appendix 3).

With increased flow, water quality has also become an issue for Buck Gully Creek. The drainage area for Buck Gully falls within the Newport Coast Watershed and also includes Morning Canyon, Pelican Point Creek, Pelican Point Middle Creek, Pelican Hill Waterfall Creek, Los Trancos Creek, Muddy Creek, El Moro Canyon, and Emerald Canyon. Lower Buck Gully (below Pacific Coast Highway) is 303(d)-listed for total and fecal coliform and falls within the jurisdiction of the Santa Ana Regional Water Quality Control Board (EIC 2008). Section 303(d) of the federal Clean Water Act and 40 CFR §130.7 require states to identify water bodies that do not meet water quality standards, and are placed on the Section 303(d) List of Water Quality Limited Segments. The List identifies the pollutant or stressor causing impairment and establishes a schedule for developing a control plan to address the impairment. Placement on this list generally triggers development of a pollution control plan called a Total Maximum Daily Load (TMDL) for each water body and associated pollutant/stressor on the list. The TMDL serves as the means to attain and maintain water quality standards for the impaired water body; however, no TMDLs have been established for the Newport Coast Watershed.

Fire Risk in a Wildland Urban Interface

Eight conclusions were derived from a review of recent scientific studies of fuels and fires at the wildland-urban interface from a habitat protection perspective. They are listed along with supporting documentation below:

1. The most important factor in protecting homes against wildfire is the physical attributes and the material composition of a home.

Computations, experiments, and fire investigations have shown that a home's fire ignition potential is principally determined by the characteristics of the home's exterior materials, design, and flammable debris present on or within 100 feet of the home when lofted floating embers are present (Cohen 2010). Thus, most homes are not destroyed by the radiant heat from an encroaching fire, but often by embers that enter vents that ignite piles of dead leaves on roofs or in gutters (Keeley 2010). Chimney location and easily ignitable roofing and siding are large factors when determining why one home burns while another directly adjacent remains untouched. Because an ember can travel over a mile from its source, clearance zones are not likely to prevent housing losses, especially during severe weather conditions (Keeley 2010).

2. Complete removal of native vegetation results in the colonization of invasive weeds that can alter the amount and flammable biomass.

Complete clearance of vegetation around homes can actually enhance fire spread by both increasing non-native weed abundance that consist of flashy fuels, and by eliminating "ember catchers" such as oak trees (Keeley 2010). Invasive weeds may be directly responsible for changes in fire regimes through increased biomass and flammability, changes in the spatial distribution of flammable biomass, and altered timing of fuel drying periods (Lambert et al. 2010). Invasive plant species can profoundly affect ecosystem structure and function by not only modifying fire regimes, but also modifying nutrient cycling and erosion patterns (Mooney et al 1986, Minnich and Dezzani 1998, Rundel 1998). Thus, clearing large areas of native vegetation can have lasting and far-reaching impacts on these areas.

3. "Thinning" vegetation in fuel modification areas is just as effective as "clearance" and has the benefit of avoiding invasive weed colonization that can impact nearby wildland areas.

Unfortunately, the word "clearance" has been institutionalized into statutes and made its way into common vernacular when clearance of all vegetation is undesirable (Keeley 2010). Thinning implies cutting some shrubs to ground level, breaking up the contiuity of fuels both vertically and horizontally, and reducing the amount of dead to live wood, but not removing roots (Keeley 2010, Rubin 2010).

4. Mulching fuel modification areas conserves soil moisture, helps to prevent vegetation from drying out, and suppresses invasive weeds.

Wood chips, bark, and other mulches are helpful in keeping moisture in the soil and desired plants within a fuel modification area and help prevent invasive weeds from colonizing disturbed barren areas

(Schettler 2010). Mulch should be kept at a depth of no more than six inches to prevent it from becoming a fuel and ignition source itself (Schettler 2010).

5. It is a misconception that native habitats such as chaparral and coastal sage scrub promote frequent fire. Furthermore, many low growing, high moisture ornamental plants thought to be fire-resistant hide a deep layer of dry dead thatch beneath green foliage that can carry fire in dry conditions.

It is commonly believed that native plants that make up chaparral and coastal sage scrub communities in California are intrinsically flammable and need frequent fire to thrive (Drill 2010). While several Southern California native species do possess characteristics that make them fire-prone, many are highly resistant to fire and recover quickly after a wildfire making them excellent choices for a fire-safe landscape (Drill 2010). Even plants that are non-native but typically fire resistive, such as iceplant (*Carpobrotus chilensis* and *Carpobrotus edulis*), freeway acacia (*Acacia redolens*), and periwinkle (*Vinca major*) (all found in the Buck Gully fuel modification areas), can ignite under very dry conditions and pose a fire risk in some situations. If poorly maintained, these low growing ground covers can be healthy-looking on the surface while a layer of dead, dry, and entangled thatch lies underneath (Drill 2010). The most "fire-resistant species" can become great fuel for a wildfire if it contains a lot of dead tissue due to a lack of proper maintenance (Drill 2010).

6. "Light touch" methods of fuel modification focus on creating vertical and horizontal space while retaining as much native vegetation as possible to provide habitat and protect slopes from erosion.

Thinning vegetation by creating vertical separation of understory shrubs and grasses from tree canopies as well as creating space among shrubs without denuding the landscape will help prevent the spread of wildfire. Thinning vegetation (instead of clearance) will prevent the erosion that occurs when deep-rooted native perennial vegetation is replaced by shallow rooted weedy annual vegetation (Drill 2010).

7. Fuel modification areas have far-reaching ecological impacts on native species abundance that extends beyond these areas and into wildland habitats.

The cleared understories of fuel modification areas become rapidly dominated by invasive non-native grasses and forbs increasing the movement of aliens into disturbed wildland area edges (Keeley 2002). The effects of fuel modification activities extend beyond the boundary of a fuel modification area, degrading habitats over a much larger area (Sugihara et al. 2006). Many bird, mammal, and other vertebrate species rely on interior habitat, where resources are typically more abundant and there is increased protection from outside predators. By extending fuel modification zones, the amount of interior habitat diminishes and marginalized edge habitat increases, exasperating the impacts of urbanization in these wildland areas (Sugihara et al. 2006).

8. Vegetation modification is more effective in preventing fire spread in regions sheltered from extreme fire weather.

Based on limited data collected by NBFD, Buck Gully is not typically subject to high speed Santa Ana winds (Steve Michael, Newport Beach Fire Inspector, Personal Communication, August 1, 2012). Consequently, it is likely that the fuel composition and spatial location of fuels are larger factors in determining severe fire conditions. Moritz et al. (2010) found that any fire-prone region is likely to see wildfires become large and unstoppable if ignitions occur where wind conditions tend to be most severe. Further, the study found that vegetation characteristics and fire suppression efforts are more important in preventing fire spread in regions sheltered from extreme fire weather. Thus, fuel modification is a more effective fire management strategy in areas that do not experience severe fire weather characterized by high winds along the wildland-urban interface, including Buck Gully. In light of these findings, the goals and performance expectations of fuel treatment should be evaluated with respect to gradients in fire weather severity, the vast majority of which have yet to be mapped. Thus, with additional wind data, more can be learned about the nature of severe weather conditions in Buck Gully and better inform effective fire management.

Fire Risk and Fuel Modification In Buck Gully

The delineation of management jurisdiction, property ownership, and application of fuel management policies in Buck Gully is complex. Table 2 provides the management policies that are applicable to each jurisdictional area within Buck Gully.

Table 2. Application of management policies to jurisdictional areas within Buck Gully

	Within Buck Gully Reserve & NCCP/HCP	Within Buck Gully Reserve	Private Property	Applicable Fuel Management Policies
HRZ	**Yes**	No	No	• Follow City G.01 Guidelines for HRZ • Follow fuel management recommendations outlined in this report and those that conform with IRC's management responsibilities for Buck Gully Reserve • Follow fuel management policies in the NCCP/HCP Wildland Fire Management Plan
	No	**Yes**	No	• Follow City G.01 Guidelines for HRZ • Follow fuel management recommendations outlined in this report and those that conform with IRC's management responsibilities for Buck Gully Reserve
	No	No	**Yes**	• Follow City G.01 Guidelines for HRZ, obtain owner's permission to conduct stewardships
FMZ	N/A			Not Applicable
	No	**Yes**	No	• Follow City G.02 Guidelines for Fuel Modification Plans and Maintenance Standard • Encourage FMZs to follow fuel management recommendations outlined in this report.
	No	No	**Yes**	• Follow City G.02 Guidelines for Fuel Modification Plans and Maintenance Standard

Many factors contribute to fire risk in Buck Gully; however, compliance with prudent and effective resource and fire management policies can greatly reduce this risk. A prominent fire risk stems from increased runoff from the surrounding residential and commercial development, and this has increased

vegetation and fuels in past years. Increased runoff has also changed the ecological characteristics of Buck Gully from a grassland-dominated area to a shrubland and woodland in some areas and has also likely encouraged the colonization of invasive Argentine ants. For these reasons, a steady reduction of hydrological inputs would likely diminish the risk fuels impose on neighboring homes and reduce undesirable ecological impacts.

Assuming Buck Gully is rarely susceptible to high fire hazard weather, fuel management is an important component of a fire management strategy. When pursuing vegetation removal as a management strategy, the cost of losing vegetation as a habitat resource should be considered along with the potential benefits in fire safety. Although there has been a large focus on fuels management for Buck Gully, conditions immediately surrounding homes are arguably even more critical. Research has shown that the primary factors in maintaining fire safety for homeowners is to close open vents, eliminate leaf litter from roofs and gutters, and replace easily ignitable materials that make up roofs and siding.

Current fuel modification policies for HRZ are broad but provide prudent guidance on vegetation spacing among shrubs, between shrubs and tree branches, and between trees and homes. Additionally, the fuel modification guidelines and maintenance practices should discourage removal of large areas of vegetation without immediate replacement plantings to discourage invasive weed invasions and prevent erosion. If there are bare areas where vegetation has been removed as when annual grasses are mown, mulching should be encouraged and applied at a depth of no more than 5 inches.

Land managers and City Staff can advocate planting low-growing native species that reduce invasive weed invasion, prevent the erosion caused by clearance of all vegetation, and provide better alternatives to ornamental plants for wildlife and habitat protection.

California natives that include California Sagebrush, California Buckwheat, and Black Sage currently reside on the City's Combustible Plant List. Because these species provide native habitat for many species in Buck Gully Reserve, it is recommended that non-native and ornamental vegetation be prioritized for targeted removal before these species. To prevent the spread of invasive weeds into natural areas and the colonization of flashy fuels into fuel modification areas, compliance with FMZ guidelines is essential. Many areas within the HRZ and FMZ were observed to have nearly complete removal of vegetation when FMZ guidelines require at most only a 50% thinning. Because the FMZ make up a significant portion of adjacent lands to Buck Gully Reserve, these large bare areas are a likely source of invasive weeds. Collaboration and cooperation among homeowners associations, landscapers, City Staff, and land managers can improve these conditions in ways that provide fire safety and do not harm adjacent natural resources.

Vegetation Mapping

Introduction& Purpose

Vegetation mapping of fuel modification areas within Buck Gully commenced in June of 2012. Surveyed areas included the HRZ consisting of the northern and southern slope of western Buck Gully as well as the FMZ adjacent to the Newport Ridge Vistas, Pelican Hill, and Santa Lucia development communities (Figure 6). The Pelican Heights Homeowners Association and St. Laurent Community Association declined permission to allow access to survey their FMZ. The results of these surveys were used to characterize the ecological resources of these areas and understand how they may impact adjacent lands in Buck Gully Reserve. Vegetation community survey results were also used to assist in prioritizing targeted weed removal and habitat restoration within the parameters of existing fuel modification guidelines. Results were also compared to earlier vegetation mapping conducted by Dudek (2009) to identify areas where habitat quality may be degrading.

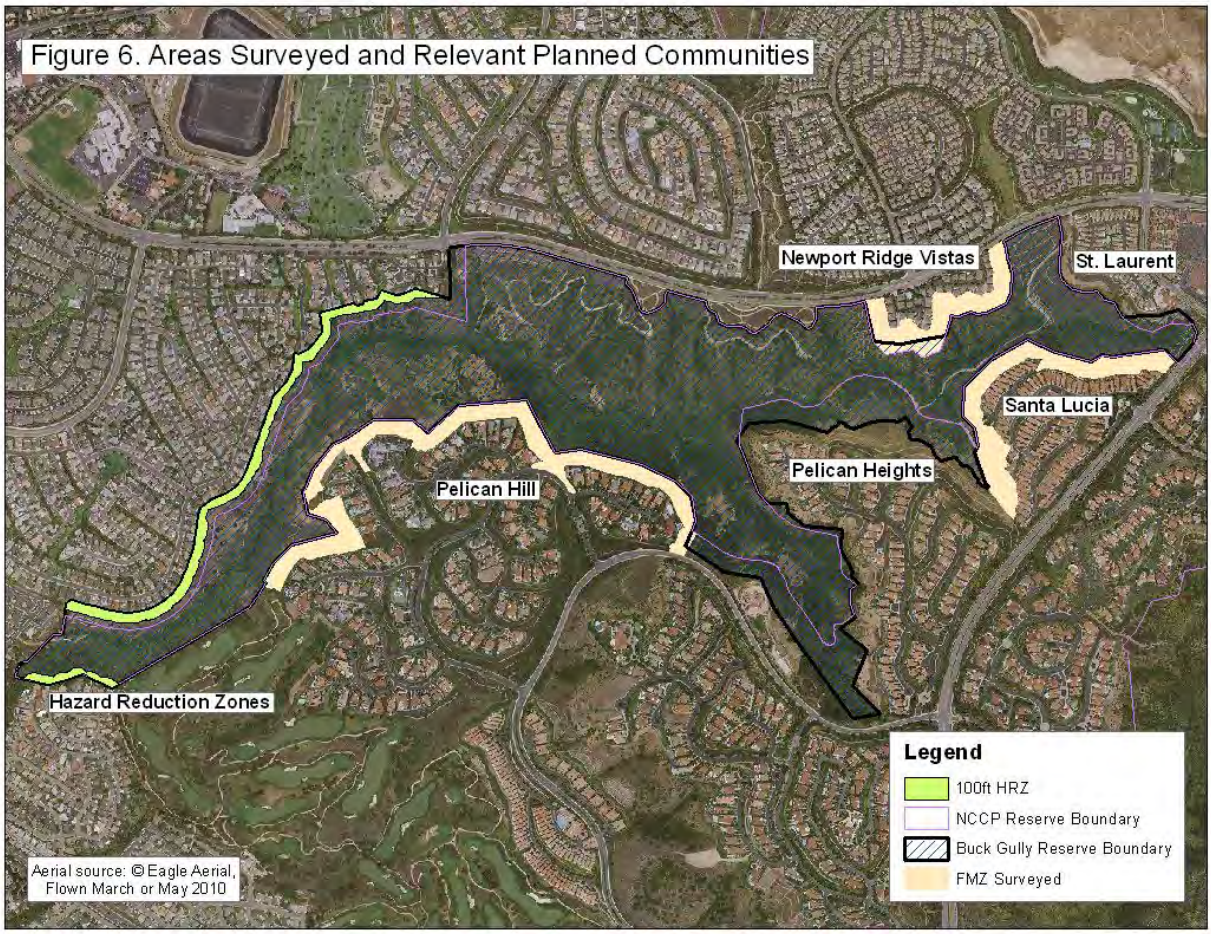

Figure 6. Fuel modification zones surrounding Buck Gully Reserve. Note extension of Newport Ridge Vistas fuel modification zone into Buck Gully Reserve and NCCP.

Methods

Ground surveys as well as aerial maps were used to characterize vegetation communities and delineate their boundaries. Maps were created using 3" pixel resolution aerial ortho-imagery from Eagle Aerial Imaging ® (EAI 2011). During surveys, plant species and their designation as a native or non-native, ground cover percentage, density, condition, and relative dominance were observed and recorded. This information was used to determine the vegetation community that most accurately characterized the recorded observations. During field surveys, the aerial maps were used to delineate vegetation community boundaries. Mapped areas were usually measured with a 25 square meter minimum mapping unit value; however, this varied somewhat depending on the location and extent of the vegetation community. For instance, large patches of AGL may have larger minimum units, while small patches of SCS may be mapped at a more precise scale.

Vegetation Community Types

The fuel modification areas surveyed within Buck Gully contain approximately 15 primary vegetation communities and land covers. Vegetation communities were designated as disturbed if a significant portion of the total area contained bare ground, dead vegetation, and or invasive weeds. These are identified with a lower case "d" prior to listing the vegetation community's abbreviation. A more detailed description of vegetation communities is provided in Appendix 4.

Vegetation Communities were identified within, and sometimes beyond, the HRZ and FMZ by conducting field surveys. To maintain consistency, the plant community classification system based on Gray and Bramlet's 1992 Habitat Classification System and used for the *Buck Gully Resource and Recreation Management Plan* (Dudek 2009) was used. Some minor modifications and additions were also incorporated from *California Vegetation* (2nd addition) by Sawyer, Keeler-Wolf, and Evens.

Results

Table 3 provides a list of the vegetation communities observed within HRZ and FMZ areas surveyed, the acronym used throughout the document to identify them, and a short description of how the communities were identified. Table 4 provides the total area of each vegetation community in both the HRZ and the areas surveyed within the FMZ. Figure 7 provides the mapped vegetation communities for all areas surveyed in Buck Gully, and Appendix 5 provides a description of plant species and additional observations for each vegetation community mapped.

Table 3. Buck Gully Fuel Modification Area Vegetation Communities.

Shrublands and Woodlands		
Acronym	**Title**	**Description**
CBS	Coyote Brush Scrub	Almost exclusively coyote bush, cover is >50% more than other species
SBCB	Sagebrush Coyote Bush	Mix of other Coastal Sage Scrub species with coyote bush as 30-60% cover or dominant
CBSS	California Buckwheat Sage Scrub	Almost exclusively California Buckwheat, cover is >50% more than other species
CSSB	Coastal Sage California Buckwheat Scrub	Mix of other Coastal Sage Scrub species with buckwheat as 30-60% cover or dominant
CSS	Coastal Sage Scrub	Coyote bush (BAPI), Cal Sunflower (ENCA), Cal Buckwheat (ERFA), Coast Goldenbush (ISME), Opuntia littoralis, black and white sage. California Sage should be >60%
CSS/GRASS	Coastal Sage Scrub/Grassland	Mixture of species listed above and 30-70% grass.
LBS	Lemonade Berry Scrub	LB is dominant or co-dominant, other species: ARCA, ERFA, Opuntia spp, Sages, etc.
MEW	Mexican Elderberry Woodland	Elderberry are dominant species or >50% cover
ORN	Ornamental	Not recognized as native or invasive, adjacent to residential properties
SCS	Southern Cactus Scrub	>4 sq meters and opuntia is >30% relative cover as a dominant or co-dominant with other coastal sage scrub species
SMC	Southern Mixed Chaparral	Scrub oak, redberry (Rhaminus), Ceonothus, toyon, lemonade berry (by itself), laurel sumac, some elderberry. Vegetation is generally green in summer, leathery leaves.
SOC	Scrub oak chaparral	>60% cover of scrub oak or is dominant and includes mainly other chaparral species
SRW	Sycamore Riparian Woodland	Dominated by sycamore and is within 200 ft of creek
SWS	Southern Willow Scrub	Dominated by willow and consists of other
TSC	Toyon Sumac Chaparral	Laurel Sumac or Toyon are >50% or are >30% relative cover if co-dominant.
WR	Wild Rye	Giant Reed or Giant Wild Rye makes up >50% cover or >30% relative cover. Minimum patch size of 4 sq meters
DH	Disturbed Habitat	90-100% cover by non-native invasives in which the former habitat cannot be identified.
d*	Disturbed _____	A disturbed habitat type is dominated by an invasive or is >50% cover of an invasive, e.g. dCBS

Grasses		
Acronym	**Title**	**Description**
PGL	Perennial Grasslands	
AGL	Annual Grasslands	>50% annual invasive grasses
dAGL	Disturbed Annual Grasslands	<50% cover of annual grass, rest bare ground.

Table 4. Total area of each vegetation community within the HRZ, FMZ, and total area surveyed. Also, the percentage of the total area surveyed is provided for each vegetation community (see Table 3 for definitions).

Vegetation Communities	Total Area (Acres)		TOTAL	Percent of Total	Vegetation Communities	Total Area (Acres)		TOTAL	Percent of Total
	HRZ	FMZ				HRZ	FMZ		
AGL	1.27	0.22	1.49	2.75%	CSSB/ORN	0.16	--	0.16	0.29%
AGL/dLBS	--	0.26	0.26	0.49%	DH/ORN	0.09	--	0.09	0.16%
dAGL	1.77	10.71	12.47	22.95%	ORN	1.93	11.54	13.46	24.77%
dAGL/dCSS	0.08	--	0.08	0.14%	ORN/SMC	0.02	0.64	0.66	1.22%
dAGL/dLBS	0.16	--	0.16	0.30%	Total ORN	2.19	14.78	16.98	31.23%
dAGL/LBS	--	0.63	0.63	1.15%	CSSB	--	0.06	0.06	0.11%
dAGL/ORN	--	0.39	0.39	0.73%	CSSB/LBS	--	1.57	1.57	2.88%
dAGL/SCS	0.20	--	0.20	0.38%	CBS	0.04	--	0.04	0.07%
Total AGL/dAGL	3.48	12.22	15.70	28.88%	dCBS	0.12	--	0.12	0.22%
CSS	0.43	3.33	3.75	6.90%	dMEW	0.05	--	0.05	0.08%
CSS/GRASS	--	0.00	0.00	0.00%	dSBCB	0.20	--	0.20	0.36%
CSS/LBS	--	1.26	1.26	2.32%	dSMC	0.20	--	0.20	0.36%
Total CSS	0.53	4.59	5.12	9.42%	MEW	0.01	--	0.01	0.01%
LBS	0.05	2.47	2.53	4.65%	SBCB	0.03	1.55	1.59	2.92%
dLBS	0.22	0.52	0.74	1.37%	SBCB/WR	--	0.23	0.23	0.43%
LBS/CSS	0.02	--	0.02	0.04%	SCS	0.42	--	0.42	0.78%
LBS/SCS	0.91	--	0.91	1.67%	SMC	0.80	0.96	1.77	3.25%
LBS/ORN	--	2.21	2.21	4.07%	SWS	--	0.16	0.16	0.29%
LBS/SMC	--	0.58	0.58	1.07%	WR	--	0.42	0.42	0.76%
Total LBS	1.37	9.24	10.62	19.53%	DH	1.59	3.88	5.47	10.06%
					Total Disturbed	4.67	16.40	21.07	38.75%
TOTAL						**10.77**	**43.59**	**54.36**	

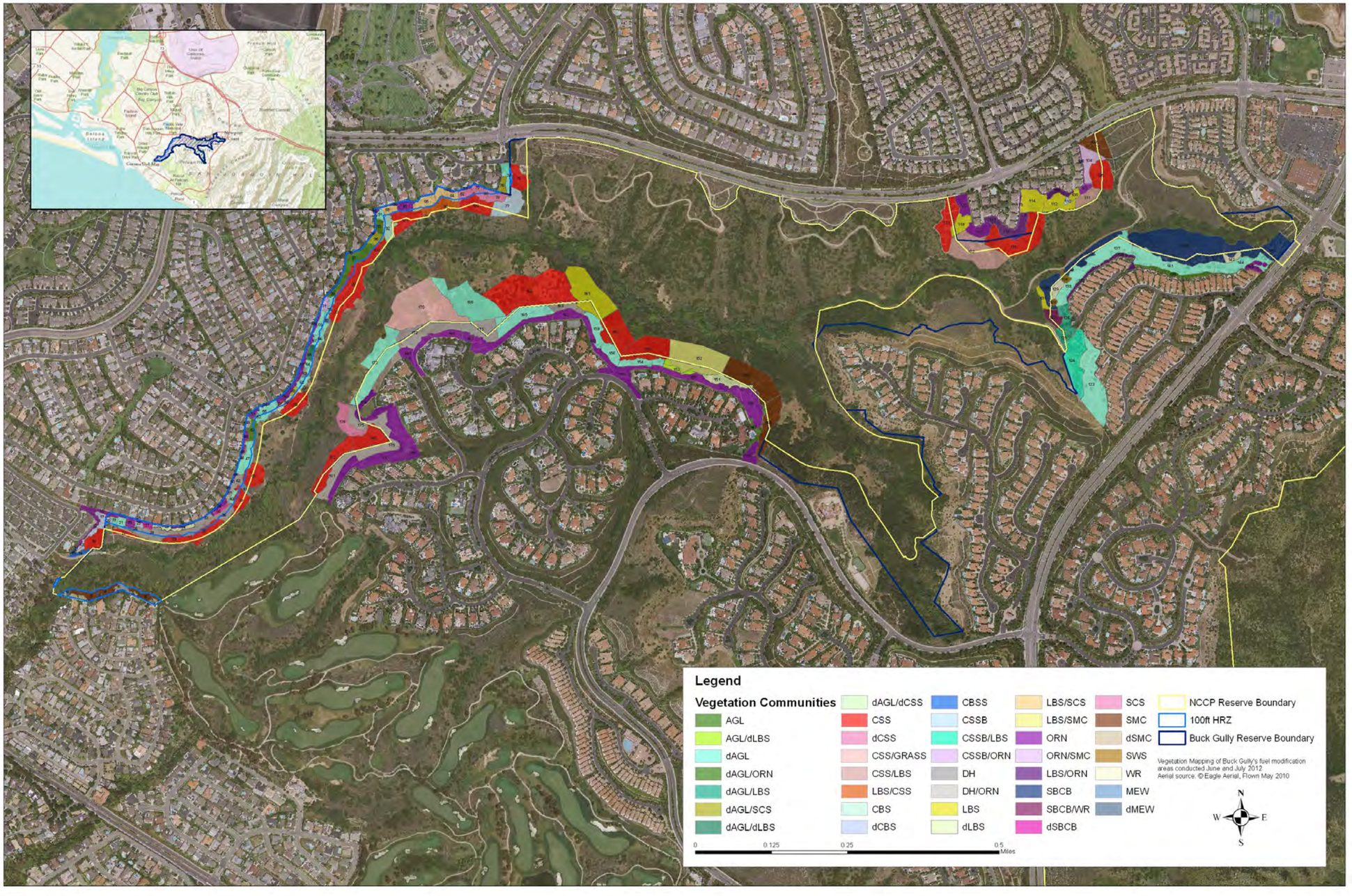

Figure 7. Vegetation communities within and around select fuel modification areas.

Invasive Weed Survey

Introduction & Purpose

Buck Gully contains numerous invasive and non-native plant species. The species that have been targeted by land managers in recent years include artichoke thistle, garland chrysanthemum, castor bean, tree tobacco, wild fennel, pampas grass, and Brazilian peppertree.

Invasive weed surveys within fuel modification areas of Buck Gully commenced in June of 2012 and were conducted concurrently with vegetation mapping surveys. Surveyed areas included the HRZ consisting of the northern and southern slope of western Buck Gully as well as the FMZ adjacent to the Newport Ridge Vistas, Pelican Hill, and Santa Lucia development communities (see Figure 5). The Pelican Heights Homeowners Association and St. Laurent Community Association declined permission to allow access to survey their FMZ. The results of these surveys were used to obtain baseline data on the extent of weed invasion within fuel management areas as well as ascertain specific locations for targeted removal for areas within the Reserve. Invasive weed survey results were also used to assist in the prioritization of specific areas within Buck Gully Reserve for habitat restoration. The extent of invasive weed cover assisted in characterizing the health of vegetation communities and provided valuable information on potential impacts to adjacent lands in Buck Gully Reserve.

Methods

Ground surveys were conducted using a Trimble Juno Global Position System (GPS) unit to record invasive weed observations as well areas with erosion, dead or dying vegetation, and flammable refuse. Invasive weeds were mapped by estimating the total area in which invasive weeds, bare ground, and other natives might occur as a length and width measurement. Next, the net area, or the area covered by just the invasive weed within the total area is estimated. These observations provide a spatial extent and density of invasive weed cover within a given area. Stand-alone invasive species were mapped individually; individuals occurring within approximately 100 feet were lumped together within a general area for efficiency.

Results

Table 5 provides a list of the most common invasive weeds observed within the fuel management areas and the total net area covered. Figure 8 shows observed invasive weeds and their coverage area throughout Buck Gully. *Carpobrotus chilensis* had the highest total area coverage (12,162 m^2), far more than the second most common, *Salsola tragus* with a coverage of 2,769 m^2. The total net area of invasive weed coverage is 21,121 square meters (4.97 acres). Invasives observed within the HRZ made up 16,816 m^2, about 80% of the total.

Table 5. The most common invasive weeds observed during surveys of both the HRZ and FMZ.

Species	Total Net Area (Square Meters)
Carpobrotus chilensis (Sea-fig, iceplant)	12,162
Salsola tragus (Tumbleweed, Russian Thistle)	2,769
Schinus terebinthifolius (Brazilian Peppertree)	975
Carpobrotus edulis (Hottentot fig, iceplant)	883
Cynara cardunculus (Artichoke Thistle)	575
Schinus molle (Peruvian Peppertree)	523
Hedera helix (Common Ivy/English Ivy)	472
Nicotiana glauca (Tree Tobacco)	388
Vinca major (Periwinkle)	225
Other non-native	221
Atriplex semibaccata (Australian Saltbush)	218
Other	141
Echium candicans (Pride of Madeira)	121
Brassica nigra (Black Mustard)	67
Foeniculum vulgare (Wild Fennel)	61
Cortaderia selloana (Pampas Grass)	39
Silybum marianum (Milk Thistle)	20
Cirsium vulgare (Bull Thistle)	15
Ricinus communis (Castor Bean)	14
Chrysanthemum coronaria (Garland Chrysanthemum)	10
Pulicaria paludosa (Spanish Sunflower)	6
TOTAL	20,121

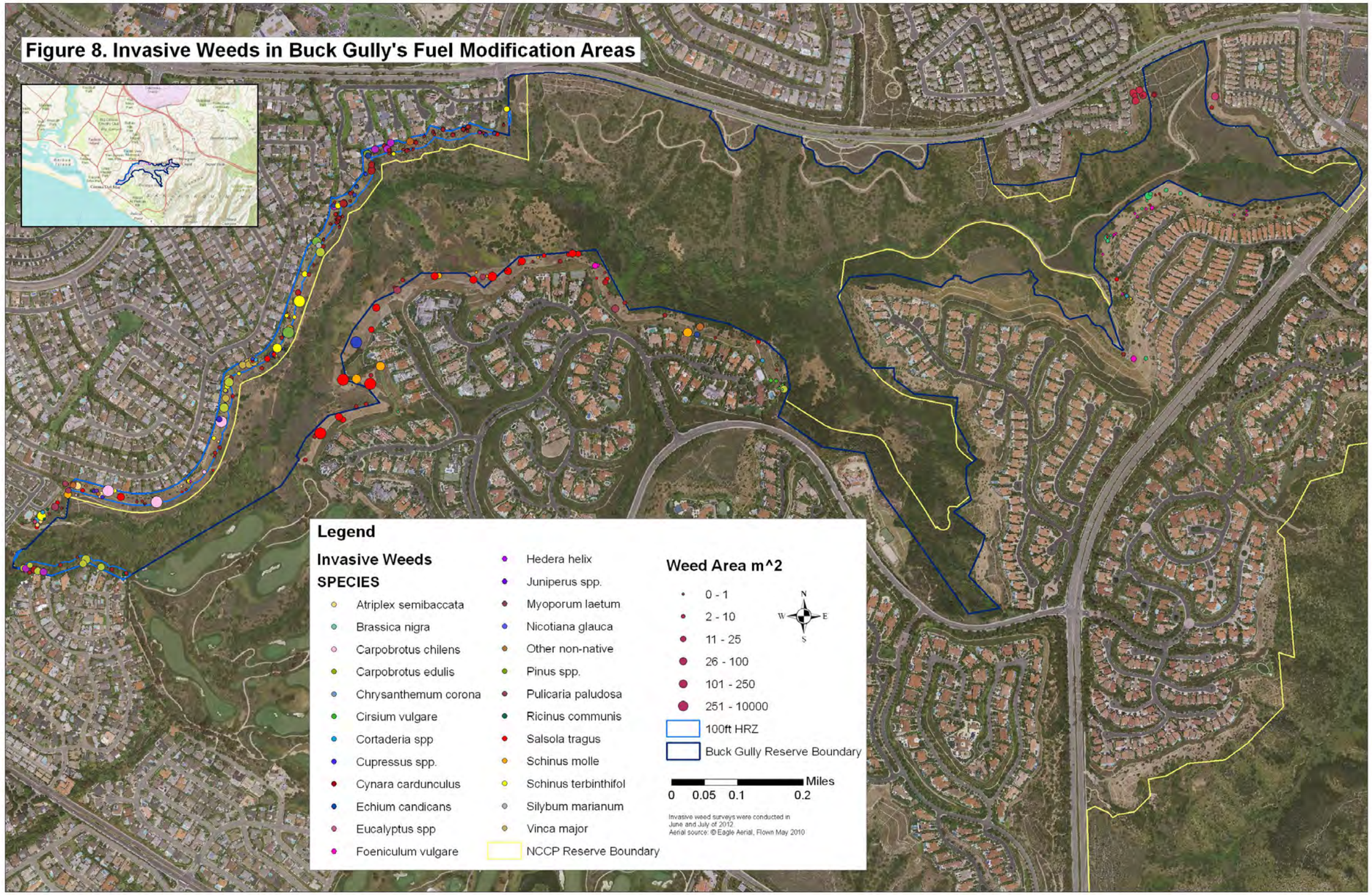

Figure 8. Invasive species identified within fuel modification areas.

Discussion & Recommendations

Analysis, discussion, and recommendations are mainly focused on the HRZ because they are the management responsibility of the City and IRC; however, many of the recommendations would benefit all fuel management areas.

Survey Discussion

The composition of vegetation communities and land covers is roughly 30% non-native annual grassland, 30% native CSS/LBS, 30% ornamental, and 10% other. Thus, approximately 60% is non-native (grassland and ornamental), and nearly 40% was characterized as degraded (see Table 4). Improvements in fuel modification practices such as planting natives and emphasizing thinning instead of clearing can improve these statistics. Practices could include planting low growing native plants in bare areas dominated with non-native grasses and emphasizing thinning instead of complete clearance to reduce colonization of non-natives. Residents can also take up a "Good Neighbor" policy by opting not to plant or by removing ornamentals beyond their property lines, and instead planting attractive and fire resistive natives. Lastly, shifting annual maintenance occurring in the HRZ to spring before invasive weeds have gone to seed would both prevent them from going to seed and reduce inadvertent dispersal of seed by those doing fuel management.

Prioritization of areas with target invasive weeds

Certain areas within Buck Gully have been prioritized for weed eradication due to the presence of high risk, perennial, and/or emerging invasive weeds in otherwise high quality vegetation communities. These areas are recommended for immediate and periodic weed removal to maintain the integrity and quality of the habitat they provide; however, weed removal activity will not be limited to these areas as it is anticipated that they will proliferate beyond them. Table 6 provides a list of targeted invasive weeds. This list of target species was compiled based on discussions with land managers and information from the *NROC Central Coastal Subregion Habitat Restoration and Enhancement Plan* list. Some species such as *Vinca major*, *Carpobrotus chilensis*, and *Hedera helix*, although receiving a high rank on the California Invasive Plan Council (Cal-IPC) lists, were not included because they are widespread in the Buck Gully fuel modification areas and would be more effectively managed with restoration efforts.

Table 6. Target Invasive Weeds

Common Name	Scientific Name	California Invasive Plant Council Inventory Rating
Artichoke Thistle	*Cynara cardunculus*	Moderate
Garland Chrysanthemum	*Chrysanthemum coronarium*	Moderate
Castor Bean	*Ricinus communis*	Limited
Tree Tobacco	*Nicotiana Glauca*	Moderate
Wild Fennel	*Foeniculum vulgare*	High
Pampas Grass	*Cortaderia selloana*	High
Brazilian Peppertree	*Schinus terebinthifolius*	Limited
Australian Saltbush	*Atriplex semibaccata*	Moderate
Bull Thistle	*Cirsium vulgare*	Moderate

Major areas of targeted invasive weeds, denoted in Figure 9 with black circles and ellipses. In total, 13 major areas were selected in the HRZ.

The prioritization model for target invasive weeds involved first determining the location and extent of intact or high quality vegetation communities. Next, the location and net area of invasive weeds in and adjacent to fuel modification areas were determined. The locations where target invasive weeds had infiltrated intact vegetation communities were prioritized first, using a black circle or ellipse to show the extent of weeds adjacent or inside intact vegetation communities. Additional areas were included if the density and extent of invasive weeds outside but within approximately 10 meters of intact vegetation communities was high and if the species were rated as high or moderate by the Cal-IPC Inventory.

Prioritization of areas for restoration of degraded communities

Sub-sections of the study area were prioritized for long-term restoration efforts based on vegetation community mapping and invasive weed data. These areas were usually designated as "degraded" during vegetation mapping, have a low percent cover of natives, and/or contain widespread invasive weeds that are difficult to effectively remove on a small and targeted scale. These species include *Hedera helix, Vinca major, Brassica nigra, Salsola tragus, Carpobrotus edulis,* and *Carpobrotus chilensis*. The selection of Target Restoration Areas (Figure 10) was made by

overlaying the degraded vegetation communities and ornamental land cover types with the locations of the invasive weeds noted above. Finally, the total area of all invasive weeds, the adjacency to intact habitat, and the presence of invasives spreading into reserve areas were taken into consideration when determining the targeted areas for future restoration. A total of seven areas were selected for restoration.

Figure 9. Priority invasive control areas based on target species and proximity to intact vegetation.

Figure 10. Priority restoration areas based on entrenched invasive weed cover and proximity to intact vegetation.

Vegetation communities were prioritized for restoration as high, medium, or low based on the following criteria:

1. Vegetation communities were designated as disturbed (see "d*" in Table 3), and weeds from the Restoration Target Weed list (Table 7) are present.
2. The vegetation community was designated as fully Disturbed Habitat (DH) during vegetation mapping indicating a significantly degraded area with essentially no habitat value and approximately 90-100% coverage of non-native vegetation.
3. The overall net area of all invasive weeds was relatively high (approximately 40% or higher) when compared to other areas with fuel modification areas.
4. The disturbed vegetation community was close in proximity (approximately 15 meters or less) to the NCCP/HCP boundary, indicating it had a higher likelihood of impacting the NCCP/HCP reserve.

High restoration priority vegetation communities possess criteria 1 and at least one of criteria 2-4. Medium restoration priority vegetation communities possess criteria 1 or 2, and low restoration priority communities may have possessed criteria 3 or 4 but not the crucial criteria that define restoration needs, 1 or 2.

Table 7. Restoration Target Weeds and Cal-IPC designation

Common Name	Scientific Name	California Invasive Plant Council Overall Rating and Invasability Rating
Black Mustard	Brassica Nigra	Moderate, B
Sea-fig, iceplant	Carpobrotus chilensis	Moderate, B
Hottentot fig, iceplant	Carpobrotus edulis	High, B
Common Ivy	Hedera helix	High, A
Not Applicable	Ornamental	Not Applicable
Russian Thistle, tumbleweed	Salsola tragus	Limited, B
Vine, Periwinkle	Vinca major	Moderate, B

Prioritization for fuels management based on combustion potential

The Hazard Reduction Zones have been assessed based on the Fuel Index that utilizes a scoring system that uses the vegetation type, percent cover, and species observed. The presence of non-native vegetation on the City's Combustible Plant List (Appendix 6), dying or dead shrubs or trees, combustible refuse, and other violations of the City's policies regarding fuel management were used to score each vegetation community. Figure 11 provides an assessment of high, medium, and low Fuel Index vegetation communities based on the scoring system. Species of note, including sensitive plants surveyed in 2012 and locations of *Opuntia occidentalis*, were included to ensure they are avoided during fuel modification. Sensitive plants are protected under the NCCP and by state ranking. *Opuntia* is a fire resistant succulent that also provides habitat for the Coastal Cactus Wren, a California Species of Special Concern. Table 8 provides a list of plant species and items observed that indicate a fuel load risk and a justification as to why they indicate that fuel risk.

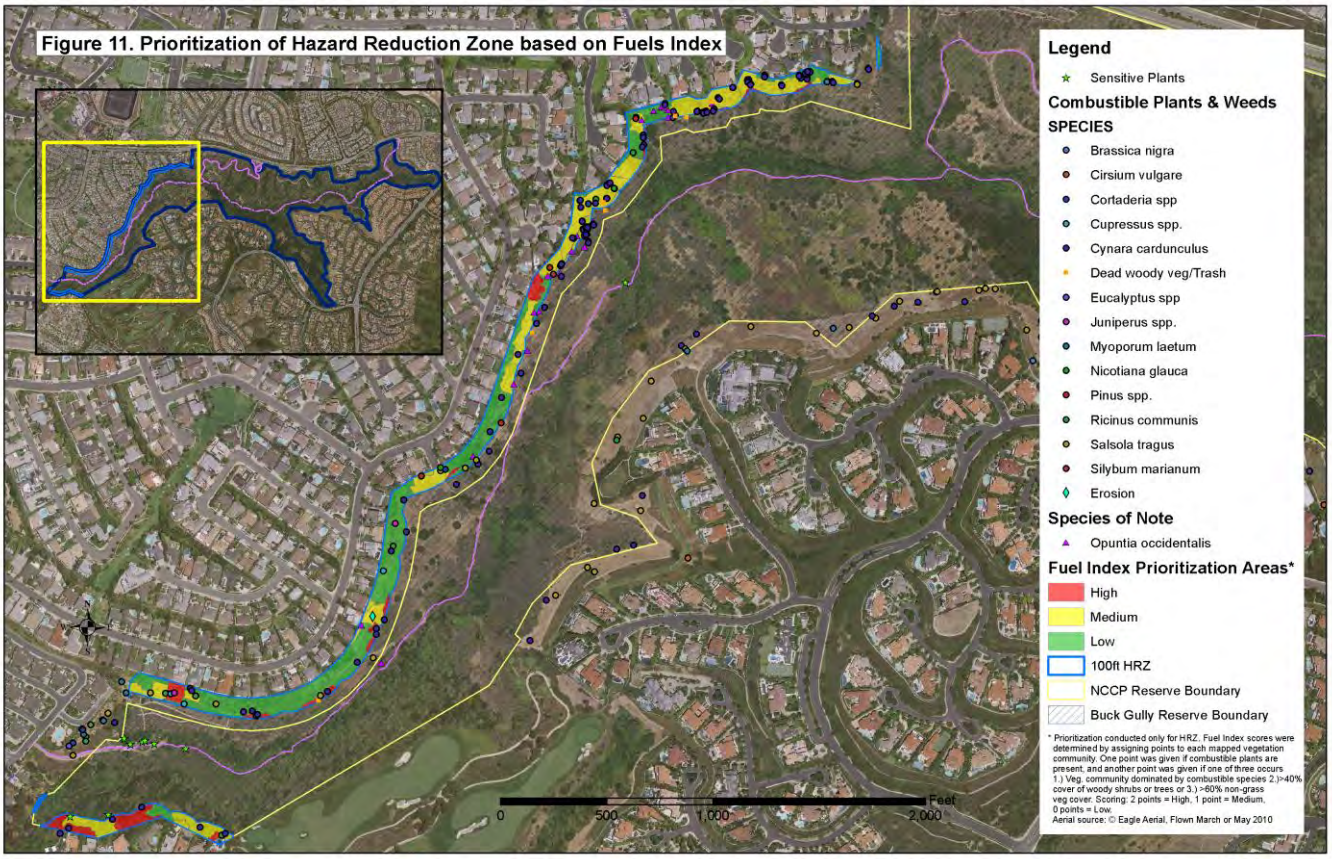

Figure 11. Priority areas within hazard reduction zones based on fuels index (see legend)

Table 8. Indicator species for prioritization of areas needing fuel treatment

Common Name	Scientific Name	Justification for being a Combustible Source
Artichoke Thistle	*Cynara cardunculus*	Combustible Plant List
Bull Thistle	*Cirsium vulgare*	Combustible Plant List
Castor Bean	*Ricinus communis*	Combustible Plant List
Tree Tobacco	*Nicotiana glauca*	Combustible Plant List
Black Mustard	*Brassica nigra*	Combustible Plant List
Milk Thistle	*Silybum marianum*	Combustible Plant List
Russian Thistle/Tumbleweed	*Salsola tragus*	Combustible Plant List
Myoporum	*Myoporum laetum*	Often in poor health, dead woody material
Pampas Grass	*Cortaderia selloana*	Combustible Plant List
Cypress	*Cupressus spp.*	Combustible Plant List
Eucalyptus	*Eucalyptus spp.*	Combustible Plant List
Juniper	*Juniperus spp.*	Combustible Plant List
Pine	*Pinus spp.*	Combustible Plant List
Dead woody vegetation/Trash	N/A	Fuel load risk

City of Newport Beach fire management policies were reviewed prior to field surveys. Although the main focus of the surveys was an inventory of vegetation communities and invasive weed locations, inconsistencies with City fire policies were noted. These primarily consisted of observations of plants on the City's Combustible Plant List, which, according to City policy, necessitate immediate removal. The presence of dead or dying vegetation among shrubs and bushes also occurred in some locations in the HRZ, violating Guideline G.01 – Guidelines for Hazard Reduction Zones Maintenance of defensible space requirement.

In reviewing the Fuel Management Zone Plans, we noted that invasive weeds such as *Myoporum laetum* were planted in the Fuel Modification Zones. *Myoporum laetum* displaces native vegetation, forms dense mono-cultures, and is toxic (Cal-IPC 2012). Despite its toxicity, it is often infested by the Myoporum Thrips, a small insect that deforms and defoliates trees, causing

defoliated dry and even dead trees. Because of its invasive nature and its threat to fuel buildup within the defensible space around these homes, it is recommended *Myoporum laetum* be placed on the Combustible Plant List pursuant to the City of Newport Beach Urban Wildland Interface Area Standard for Hazard Reduction and that those found within HRZ be removed as soon as possible.

During surveys of the Fuel Modification Zones, extensive and dense coverage of Freeway Acacia (*Acacia redolens)* were noted, especially in Zone B. Although this shrub is generally low growing if maintained properly, its outer greenery can be deceiving because its understory consists of dense woody stems and branches that, in dry conditions, could ignite (Jon Keeley, personal communication July 20, 2012). In some areas of the FMZ, Freeway Acacia was observed at heights above those specified in the G.02 guidelines for Zone B require. During surveys in Buck Gully, landscapers were observed removing Freeway Acacia in the areas surrounding the Newport Ridge Vistas Development. This was confirmed by the Landscape Manager for Santa Lucia, St. Laurent, and Newport Ridge Vistas developments, Manuel Vargas of O'Connell Landscape and Maintenance. Much of the Freeway Acacia was planted close together and is now difficult to maintain at the required height. Many Homeowners and Community Associations are substantially thinning it out, completely removing it and replanting with another more low-growing type of Acacia, or removing it and replanting with something from the City's Fire Resistive Plant List (Appendix 2.).

Conclusions

This report has outlined a short and long-term approach, incorporating the strategies of targeting specific invasive weeds that threaten high quality vegetation communities and restoration of degraded areas. In addition, a fuels index was developed to inform fuel management within Buck Gully's fuel modification areas. Persistent control and removal of invasives and a gradual replacement of ornamental vegetation with fire resistive, attractive, low-growing, perennial natives are the primary goals of this report for the management of the HRZ. Minimizing complete vegetation clearance in the FMZ can improve the habitat quality of Buck Gully Reserve by reducing the extent of degraded areas that can harbor invasive weeds. Implementing measures to gradually decrease the runoff in Buck Gully through water conservation measures will be instrumental in minimizing erosion, the extent of fuels in Buck Gully, and maintaining its ecological health. Finally, cooperation, collaboration, and a Good Neighbor policy among residents, City staff, and land and landscape managers could improve communication about Buck Gully's resources, threats to those resources, and what measures can be taken to effectively management them. Simple outreach events that involve teaching landscapers which plants are native and which are invasive could, over time, vastly reduce the extent of invasive weeds and improve habitat quality throughout the reserve.

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Appendices

Appendix 1: City of Newport Beach Special Fire Protection Area Guidelines

G.01- Guidelines for Hazard Reduction Zones &

G.02- Fuel Modification Plans and Maintenance Standard

Guideline G.01 – Guidelines for Hazard Reduction Zones

G.01.1 PURPOSE

The purpose of this guide is to provide information necessary to ensure the modification, and maintenance of the vegetation in areas adjacent to structures in order to create a defensible space between the structure and the vegetation. Persons owning, leasing, controlling, operating, or maintaining buildings or structures requiring defensible space are responsible for modifying or removing non-fire resistive vegetation.

G.01.2 SCOPE

All structures including any attachments to that structure located within designated Hazard Reduction Zones shall comply with the requirements outlined in this document. Requirements for new construction are found in Guideline G.02, "Fuel Modification Zones".

The requirements found in this guideline only apply to those sides of the structure that face the wildland area.

G.01.3 DEFINITIONS

Defensible Space: An area either natural or man-made, where vegetation and other natural fuels have been treated, cleared, or modified to slow the rate and intensity of an advancing wildfire. The defensible space created allows firefighters to suppress the advancing fire and protect the structure. Defensible space also reduces the chance of a fire in a structure from moving into the surrounding wildland area.

Hazard Reduction Zone: Sub-area of the Special Fire Protection Area containing structures built prior to July 1, 1999 and not designate as a Fuel Modification Zone.

Special Fire Protection Area (SFPA): Any geographical area designated by the Fire Chief where structures directly abut wildland space or a fuel modification zone on one or more sides. Special Fire protection areas include, but are not limited to, Very High Fire Hazard Severity Zones. These areas are subject to a greater risk of wildland conflagration due to vegetation, topography, weather, density, access and other relevant factors. Special Fire Protection Areas include both Fuel Modification Zones and Hazard Reduction Zones.

G.01.4 PROCEDURE

MAINTENANCE OF DEFENSIBLE SPACE

1. Structure Side Yards:

   - For the purpose of firefighter entrance and egress provide three feet of clear access along both sides of the structure.

2. **Trees:** All trees located within 100 feet of any portion of a structure, which is facing an urban wildland interface area, shall comply with the following guidelines:

   - Existing trees are not required to have a separation of tree canopies but must be maintained free of all dead or dying foliage.

   - The selection of any new trees shall be made from the fire resistive plant list, and the trees shall be planted such that mature canopies will have a minimum separation of ten feet. For the purposes of this document, branch tip to branch tip is synonymous with the term canopy to canopy.

   - Trees shall be maintained free of dead wood and foliage, and all dead trees shall be removed.

   - Where shrubs are located within the drip line of a tree, the lowest tree branch shall be at least three times as high as the shrub. This process will remove the potential for fires to spread from lower shrubs and bushes to higher trees and structures.

   - Trees extending to within five feet of any structure shall be pruned to maintain a minimum clearance of five feet.

3. **Shrubs and Bushes**: All shrubs and bushes located within 100 feet of any portion of a building shall comply with the following guidelines:

   - All dead and dying growth shall be removed from shrubs and bushes.

   - All shrubs and bushes **not** on the fire resistive plant list shall have a minimum separation of ten feet apart branch tip to branch tip.

   - One to three shrubs and bushes together in a small group can be considered a single bush if properly maintained.

- All shrubs that are listed on the fire resistive plant list need not be separated if properly maintained as determined by the fire code official.

- Vines and other climbing plants are prohibited from growing on structures.

4. **Ground Cover**: All ground cover located within 100 feet of any portion of a building shall comply with the following guidelines:

   - Ground cover that is properly planted, irrigated, and maintained is permitted within the defensible space.

   - Non-planted areas may be covered with a maximum of five inches of chipped biomass or its equivalent.

   - All ground cover that is either dead and/or dying shall be removed.

5. **Firewood:** Firewood and combustible material for consumption on the premises shall not be stored in unenclosed spaces beneath buildings or structures, on decks or under eaves, canopies of other projections or overhangs. Storage of firewood and combustible material stored in the defensible space must be located a minimum of 15 feet from structures and separated from the drip lines of trees and shrubs by a minimum of 15 feet.

6. **Roofs:** All roofs of structures in designated wildland fire hazard areas shall comply with the following guidelines:

   - Leaves, needles, twigs, and other combustible matter shall be removed from roofs and rain gutters.

   - Any portion of any tree, bush, or shrub which is located within ten feet of the outlet of a chimney, shall be removed.

   - All chimneys attached to any appliance or fireplace that burns solid fuel shall be equipped with an approved spark arrester constructed in accordance with the California Building code. The spark arrester screen shall be made from a material that is both heat and corrosion resistant, and the openings shall not permit the passage of spheres having a diameter larger that one half inch.

Nothing contained in this section shall be deemed to preclude the fire code official from requiring more than the minimum specific requirements set forth above when the fire code official determines that conditions exist, which necessitate greater fire protection measures.

Guideline G.02 – Fuel Modification Plans and Maintenance Standard

G.02.1 PURPOSE

The Newport Beach Fire Department, (NBFD) has applied vegetation management requirements for over 25 years. Fuel Modification guidelines, an alternative to traditional brush clearance practices, were established by the Wildland Urban Interface Task Force in July 1994. The purpose of these guidelines is to provide information on how fuel modification zones are to be designed, installed, and maintained in order to meet safety requirements. The many variables involved with fuel modification make precise regulations impractical.

G.02.2 SCOPE

All structures including any attachments to that structure located within designated Fuel Modification Zones shall comply with the requirements outlined in this document.

The requirements found in this guideline only apply to those sides of the structure that face the wildland area.

G.02.3 DEFINITIONS

CONDUCTION - Direct transfer of heat by objects touching each other.

CONVECTION HEAT - Transfer of heat by atmospheric currents, and is most critical under windy conditions and in steep terrain.

CROWN - Upper part of tree or other woody plant carrying the main branch system and foliage.

CANOPY - More or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees or other woody growth.

DEFENSIBLE SPACE - An area around the perimeter of structures or developments in the wildland which are key points of defense/attack against encroaching wildfires or escaping structure fires.

DRIPLINE - Ground area at the outside edge of the canopy.

DROUGHT TOLERANCE - The ability of a plant or tree to survive on little water.

FINE FUELS - Fuels such as grass, leaves, and draped pine needles which, when dry, ignite readily and are consumed rapidly (also called flash fuels).

FIRE BREAK - Removal of growth, usually in strips, around housing developments to prevent a fire from spreading to the structures from open land or vice versa.

FIRE RESISTANT - Any plant will burn with enough heat and proper conditions. Resistance is often used as a comparative term relating to the ability of a plant to resist ignition.

FIRE RESISTIVE PLANT LIST - List of plants exhibiting characteristics of low fuel volume, fire resistance, and drought tolerance which make them desirable for planting in areas of high fire danger. (List available on web page).

FIRE RETARDANCE - Relative comparison of plant species related to differences in fuel volume, inherent flammability characteristics, and ease of fire spread.

FUEL BREAK - A wide strip or block of land on which the native or pre-existing vegetation has been permanently modified so that fires burning into it can be more readily extinguished.

FUEL LOAD - The weight of fuels in a given area, usually expressed in tons per acre.

FUEL MODIFICATION ZONE - A strip of land where combustible native or ornamental vegetation has been modified and partially or totally replaced with drought tolerant, fire retardant, plants.

FUEL MOISTURE CONTENT - The amount of water in a fuel, expressed as a percentage of the oven dry weight of that fuel.

FUEL VOLUME - The amount of fuel in a plant in a given area of measurement. Generally an open-spaced plant will be low in volume.

HORIZONTAL CONTINUITY - The extent or horizontal distribution of fuels at various levels or planes.

LADDER FUELS - Fuels which provide vertical continuity between strata. Fire is able to carry from surface fuels by convection into the crowns with relative ease.

LITTER - The uppermost layer of loose debris composed of freshly fallen or slightly decomposed organic material such as dead sticks, branches, twigs, leaves or needles.

LONG TERM - In perpetuity of the fuel modification plan requirement.

PROBABILITY OF IGNITION - A rating of the probability that a firebrand (glowing or flaming) will cause a fire, providing it lands on receptive fuels. It is calculated from air temperature, fuel shading, and fuel moisture.

RADIANT HEAT - Transfer of heat by electromagnetic waves and can, therefore, travel against the wind. For example, it can preheat the opposite side of a burning slope in a steep canyon or a neighboring home to the ignition point.

SUBDIVISION - A parcel of land that is subdivided to create multiple individual lots for residential purposes in accordance with the State of California Subdivision Map Act.

TARGET SPECIES - Undesirable species that are generally removed as part of the fuel modification plan (see undesirable species).

URBAN INTERFACE - That line, area, or zone where structures and other human development meets or intermingles.

VERTICAL CONTINUITY - The proximity of fuels to each other that governs the fire's capability to sustain itself. Vertical continuity applies to the relationship of aerial fuels to surface fuels or fuels low to the ground.

SPECIAL FIRE PROTECTION AREA & VERY HIGH FIRE HAZARD SEVERITY ZONE - Any geographic area designated pursuant to Government Code Section 51178 to contain the type and condition of vegetation, topography, weather, and structure density due to increased possibility of conflagration fires. See Special Fire Protection Areas Guidelines and Very High Fire Hazard Severity Zones for Construction.

G.02.4 PROCEDURE

I. APPLICABILITY

A. A fuel modification zone is a wide strip of land where combustible vegetation has been removed and/or modified and partially or totally replaced with drought-tolerant, fire-resistant plants to provide an acceptable level of risk from wildland and vegetation fires.

II. REQUIREMENTS

A. Development occurring within fire hazard zones (e.g., foothills, mountains, non-irrigated former farming areas, and other lands containing combustible vegetation) requires modification of natural vegetation at the urban interface.

1. Fuel modifications vary in complexity and are dependent upon the amount and arrangement of vegetation, topography, degree of exposure, local weather conditions, construction, design, and placement of structures.
2. A typical fuel modification installation consists of a 20-foot setback zone (Zone A), a 50-foot minimum irrigated zone (Zone B), with an additional 100-foot minimum of vegetation thinning zones (Zones C and D).
3. The minimum width of a fuel modification area is normally 170 feet and in some cases the width increases due to type of terrain and/or type and mass of vegetation.

III. SUBMITTAL CRITERIA: CONCEPTUAL FUEL MODIFICATION PLANS

Conceptual fuel modification plans must be approved by the NBFD, concurrent with review and approval of any tentative map. This is usually in conjunction with the approval of an urban edge treatment plan by the jurisdiction building/planning department.

Conceptual fuel modification plans show the areas of fuel modification necessary to achieve an acceptable level of risk regarding exposure of structures to combustible vegetation.

Submit three (3) sets of plans, prepared by a licensed landscape architect or other design professional with equivalent credentials, to the NBFD for review.

The following shall be included on the conceptual fuel modification plan: (also, refer to Attachment 1):

1. Delineation of each zone (setback, irrigated, and thinning) with a general description of each zone's dimensions and character; i.e., 50' - 70' Zone B, with existing vegetation removed, irrigated, and planted with drought-tolerant and fire-resistant plant material (see The Fire Resistive Plant List available on web page).
2. Identify removal of undesirable plant species in accordance with the NBFD Combustible Plant Species List (see Combustible Plant list available on web page).

3. Existing vegetation impacted by the required fuel modification and, if available, proposed vegetation to be planted in the fuel modification area. The conceptual plans should be **sensitive to rare and endangered species. The design professional must be prepared to address their disposition in the final plans.**

4. Identify the design of the proposed development, showing all property lines, contour lines, and the proposed location of all structures nearest to the fuel modification area, if available.
5. Photographs of the area showing the type of vegetation that currently exists, including height and density, and the topography of the site.
6. Description of the methods to be used for vegetation removal, if appropriate; i.e., mechanical or manual.
7. Location of emergency and maintenance access easements every 500' of the fuel modification area. Access easements shall have a minimum 10' width; alternatively, 5' wide easements provided every 250' is acceptable. Gates shall be a minimum of 36" wide. The easements shall be maintained free of vegetation or any structures greater than 5" in height.
8. Identify what exists 300' beyond the development property lines in all directions; i.e., construction, natural vegetation, roads, parks, etc. (Note: the NBFD may require additional information on a project-specific basis.)
9. Identify all proposed off-site fuel modification areas and appropriate legal agreements with adjacent property owners.
10. A note stating plant species will be selected from the NBFD Approved Plant Palette.

Note: Approval of a fuel modification plan by the NBFD does not eliminate the requirement to obtain appropriate environmental, grading, and zoning clearance/permits.

IV. SUBMITTAL CRITERIA: PRECISE FUEL MODIFICATION PLANS

Precise fuel modification plans shall include all information required on conceptual fuel modification plans and the following additional information (also, refer to Attachment 1):

1. Location and detail of permanent zone markers (see Attachment 4).
2. Plant palette to be installed in accordance with acceptable guidelines.
3. Irrigation plans and specifications.
4. Building footprints or statement that clearly indicates the limits of proposed development.
5. All applicable maintenance requirements and assignment of responsibility (see Section XI).
6. Tract or project conditions, CC&R and/or deed restrictions relative to fuel modifications (see Attachment 5).

Additional information and details to be included on plans:

On large developments, fuel modification zones should be located within common lettered lots owned and maintained by associations representing common ownership; e.g., homeowners' associations. The integrity and longevity of the fuel modification zones shall be maintained with sufficient tract/project conditions and CC&Rs to specifically identify the restrictions within the fuel modification areas. Likewise, when fuel modification zones are located on private property, deed restrictions are required to specifically identify the restrictions on any portion of the property subject to fuel modification. (See Attachment 2)

A plant palette must be submitted containing both the botanical and common names of all plant materials that are to be used. In the irrigated zone areas (which commonly serve as a screening buffer between development and open space/park land), plants must be fire resistant and drought-tolerant. Plant materials used outside of the irrigated zones must be fire resistant. **Note: All plants shall be selected from the NBFD Fire Resistive Plan List and specified for appropriate fuel modification zones.**

Note: There is no such thing as a plant that will not burn. The term *fire resistant* may be misleading. All plants will burn given sufficient heat and low moisture content. Vegetative fire resistance may be enhanced through adequate irrigation or precipitation.

Devices that burn solid fuel are not permitted in any fuel modification zone.

V. ZONE A – SETBACK IRRIGATED ZONE (SEE ATTACHMENTS 2 & 3)

The purpose of the setback zone is to provide a defensible space for fire suppression forces and to protect structures from radiant heat and convective heat. **No combustible construction shall be allowed within the 20-foot setback zone (Zone A). In no case shall the A Zone be less than 20 feet minimum.** This zone is to be located on a level graded area at the top or base of slope and immediately adjacent to the protected development.

Zone A – Specific Requirements

- Automatic irrigation systems to maintain healthy vegetation with high moisture content.
- Irrigation maintained outside the drip line of native oak trees.
- Pruning of foliage to reduce fuel load, vertical continuity, and removal of plant litter and dead wood.

- Complete removal of combustible plant species (see Combustible Plant list available on web page), minimal allowance for retention of selected native vegetation.
- Plants in this zone shall be highly fire resistant and selected from the approved fire resistive plant list for the setback zone and given geological area (see Fire Resistive Plant List available on web page).
- Tree species are not allowed within 10 feet of combustible structures (measured from the edge of a full growth crown).
- Special consideration should be given for rare and endangered species, geologic hazards, tree ordinances, or other conflicting restrictions.
- Maintenance including ongoing removal and/or thinning of undesirable combustible vegetation, replacement of dead/dying fire resistant plantings, maintenance of the operations integrity and programming of the irrigation system, regular trimming to prevent ladder fuels.

VI. ZONE B – IRRIGATED ZONE

This portion of fuel modification consists of irrigated landscaping. The plans must delineate that portion of the fuel modification area that will be permanently irrigated. Plant material selection, irrigation system design, and the landscape maintenance management plan shall sensitively address water conservation practices and include methods of erosion control to protect against slope failure. All irrigation shall be kept a minimum of 20 feet from the drip line of any Quercus (oak) species. These irrigated zones are a minimum of 50 feet in width and may be increased as conditions warrant. Zone B shall be cleared of all combustible plant species, irrigated, and planted with plants from the approved NBFD Fire Resistive Plant List. Exceptions to save desirable species may be submitted for approval by the Fire Chief on a site-specific basis. As in Zone A, combustible construction is not allowed in Zone B.

Zone B – Specific Requirements

- With the exception of specimen native vegetation approved for retention, irrigated surface fuels shall be maintained at a height not to exceed 18 inches.
- Native grasses, when used, shall be cut after annual seeding. Heights shall not exceed 8 inches.
- Irrigation shall be designed to supplement native vegetation, and establish and maintain planted natives and ornamentals.
- Any plants selected for planting in this zone shall be selected from the fire resistive plant list for irrigated zones for a given geographical area (see Fire Resistive Plant List available on web page).
- Planting will be in accordance with planting guidelines and spacing standards established in this guideline (see Attachment 6).

- In Zones B, C, and D, sensitive and/or protected plant species shall be identified on the fuel modification plans and tagged in the field for further disposition.
- Trees and large tree-form shrubs (e.g., oaks, sumac, toyon) which are being retained with the approval of the agency having jurisdiction shall be pruned to provide clearance of **three times the height of the under story plant material or 10 feet, whichever is higher** (see Attachment 6). Dead and excessively twiggy growth shall also be removed.
- All existing plants or plant groupings except cacti, succulents, trees, and tree-form shrubs shall be separated by a distance of **three times the height of the plant material or 20 feet, whichever is greater** (see Attachment 6).
- Special consideration should be given for rare and endangered species, geological hazards, tree submitted for project approval, upon further review.
- Removal of undesirable plant species (see Combustible Plant List available on web page).

VII. ZONES C & D – THINNING ZONES – NON-IRRIGATED

Zone C is 50 feet in width and requires 50% thinning with removal of all dead and dying and undesirable species. Zone D is 50 feet in width and requires 30% thinning with removal of all dead and dying growth and undesirable species. Thinning zones are utilized to reduce the fuel load of a wildland area adjacent to urban developments, thereby reducing the radiant and convective heat of wildland fires. Thinning zones are located adjacent to the irrigated zone and can extend 100 feet or more into wildland areas. The percentage of vegetation to be removed is determined by many factors, including topography, exposure, and vegetation type and density. All dead and dying vegetation shall also be removed from the thinning zones. Additionally, undesirable plant species shall be removed from the thinning zones due to their susceptibility to wildland fire.

Zone C and D – Specific Requirements

- Removal of all dead and dying vegetation, all fine fuels reduced to a maximum of 8-12 inches in height.
- Native grasses, when used, shall be cut after annual seeding. Heights shall not exceed 8 inches.
- Any plants selected for planting in this zone will be chosen from the approved plant list for the setback, irrigated, or thinning zone for a given geographical area (see fire resistive plant list available on web page).
- Special consideration will be given for rare and endangered species, geologic hazards, tree ordinances, or other conflicting restrictions as identified in the environmental documents submitted for project approval review.

- Reduce fuel loading by reducing the fuel in each remaining shrub or tree without substantial decrease in the canopy cover or removal of tree holding root systems.
- In Zones B, C, and D, sensitive and/or protected plant species shall be identified on the fuel modification plans and tagged in the field for further disposition.
- Trees and large tree-form shrubs (e.g., oaks, sumac, toyon) which are being retained with the approval of the agency having jurisdiction shall be pruned to provide clearance of **three times the height of the under story plant material or 10 feet, whichever is higher** (see Appendix 6). Dead and excessively twiggy growth shall also be removed.
- All existing plants or plant groupings except cacti, succulents, trees, and tree-form shrubs shall be separated by a distance of **three times the height of the plant material or 20 feet, whichever is greater** (see Appendix 6).
- Maintain sufficient cover to prevent erosion without requiring planting.

VIII. ZONE E – INTERIOR/MANUFACTURED SLOPES

Zone E may or may not be applicable depending on the location and size of interior slopes. By definition, these slopes are planted and irrigated. However, the NBFD will make an interpretation based on topography, size, and plant palette as to whether improper maintenance could create a hazard to adjacent homes. If the potential for a hazard exists, the slopes shall be designated as fuel modification area Zone E. The intent is to ensure maintenance in accordance with Section XI and Attachment 5.

Zone E – Specific Requirements

- Designated as fuel modification for purposes of maintenance.
- Completely irrigated.
- Planted with approved Fire Resistive Plant materials in accordance with NBFD Fire Resistive Plant List (available on web page).
- Some planting restrictions may apply depending on location and size.

IX. OFF-SITE FUEL MODIFICATION REQUIREMENTS

Due to the variable and sometimes considerable amount of land necessary for fuel modification, development proposals often include a request to have the required fuel modification zones extend onto adjacent properties. However, off site fuel modification is not recommended due to problems inherent with enforcement of regulations on adjacent property and the potential for confusion regarding responsibility for fuel modification on areas outside of legal ownership. Proper on-site fuel modification design should determine where development can safely be located and should be an integral part of the development proposal.

Should off-site fuel modification be deemed a necessity, appropriate legally recorded instruments must be established that clearly state the responsibilities and rights of the parties involved relative to the establishment and maintenance of the fuel modification area. Appropriate recorded documents must include a recorded agreement between all parties and a grant of easement for the establishment and maintenance of the fuel modification area. It should be understood that the allowance of off-site fuel modification by an adjacent property owner may affect the rights and/or use of the off-site property. All agreements for any off-site fuel modifications shall be integrated into fuel modification plans with a letter from adjoining property owner giving rights to maintain fuels.

X. FUEL MODIFICATION PLAN REVISIONS

Revisions to previously approved fuel modification plans shall follow procedures as established by NBFD. Note: Revisions to plans will not be reviewed without a copy of the original stamped approved plan for reference.

XI. FUEL MODIFICATION IMPLEMENTATION & REQUIRED INSPECTIONS

(Note: This section shall be placed verbatim on precise fuel modification plans)

- **Prior to Building Permit Issuance:** The developer shall complete that portion of the approved fuel modification plan determined to be necessary by the NBFD prior to the introduction of any combustible materials into the area. This generally involves removal and thinning of plant materials indicated on the approved plan.

- **Prior to Issuance of Certification of Occupancy:** The fuel modification must be installed, completed, and inspected. This includes physical installation of features identified in the approved precise fuel modification plan (including, but not limited to, plant establishment, thinning, irrigation, zone markers, access easements, etc). An NBFD Fire Inspector will provide written approval of completion at the time of this final inspection.
- **Prior to Home Owner Association (HOA) Acceptance (if applicable):** This activity must include the NBFD Fire Inspector and the following representatives:
  - Landscape design professional
  - Installing landscape contractor
  - HOA management representative
  - HOA landscape maintenance contractor

The fuel modification shall be maintained as originally installed and approved. A copy of the approved plans must be provided to the HOA representatives at this time. Landscape professionals must convey ongoing maintenance requirements to HOA representatives.

- **Maintenance & Inspection:** The property owner is responsible for all maintenance of the fuel modification. All areas must be maintained in accordance with approved fuel modification plans. This generally includes a minimum of two growth reduction maintenance activities throughout the fuel modification areas each year (spring and fall). Other activities include maintenance of irrigation systems, replacement of dead or dying vegetation with approved materials, removal of dead plant material, and removal of undesirable species. The NBFD conducts regular inspections of established fuel modification areas. Ongoing maintenance shall be conducted *regardless* of the date of these inspections.

Attachment 1

FUEL MODIFICATION PLAN SUBMITTAL CHECKLIST

SUBMITTAL AND APPROVAL

	PRECISE PLANS
☐ Concurrent with review and approval of tentative map (if applicable)	
☐ Prior to issuance of grading permit (If no grading permit is required, prior to issuance of building permit)	X
☐ # of plans sets to the processing jurisdiction	3 sets

PLAN REQUIREMENTS

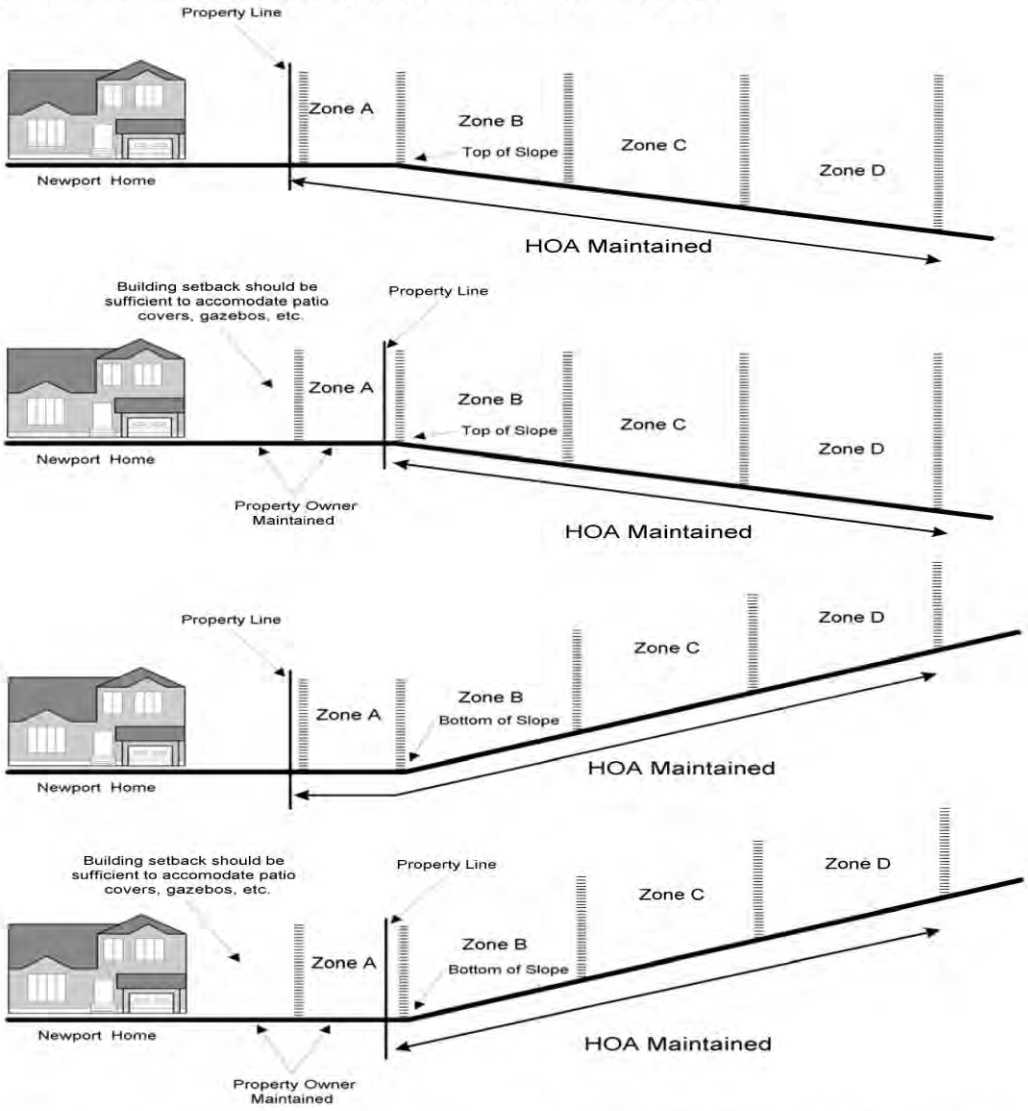
☐ Delineation of each fuel modification zone	X
☐ Scale Dimensions	X
☐ Site Characterization	X
☐ Photographs of area with emphasis on existing vegetation and topography	X
☐ Indication of permanent zone marker locations and detail	X
☐ Delineation of impacted existing vegetation	X
☐ Description of vegetation removal methodology	X
☐ Note indicating compliance with approved NBFD Fire Resistive Plant List	X
☐ Plant palette & specifications, including a plant legend (botanical & common names) for existing and proposed plants (1″ = 40′ min.)	X
☐ Designation of irrigated areas	X
☐ Irrigation plans and specifications (1″ = 40′ min.)	X
☐ Removal of combustible plant species	X

DELINEATION OF PROPOSED DEVELOPMENT:

☐ Property lines	X
☐ Contour lines	X
☐ Building lines or statement indicating limits of proposed development	X
☐ Emergency and maintenance access easements	X
☐ Description of existing improvements, land uses, & vegetation for 100′ beyond property lines in all directions	X
☐ Statement, on the plans, of ultimate maintenance responsibility requirement	X
☐ On title sheet, indicate tract/project conditions, CC&Rs, and/or deed restrictions relative to fuel modification areas	X
☐ Location of all proposed offsite fuel modification areas with easements	X

Attachment 2

FUEL MODIFICATION CONFIGURATION OPTIONS



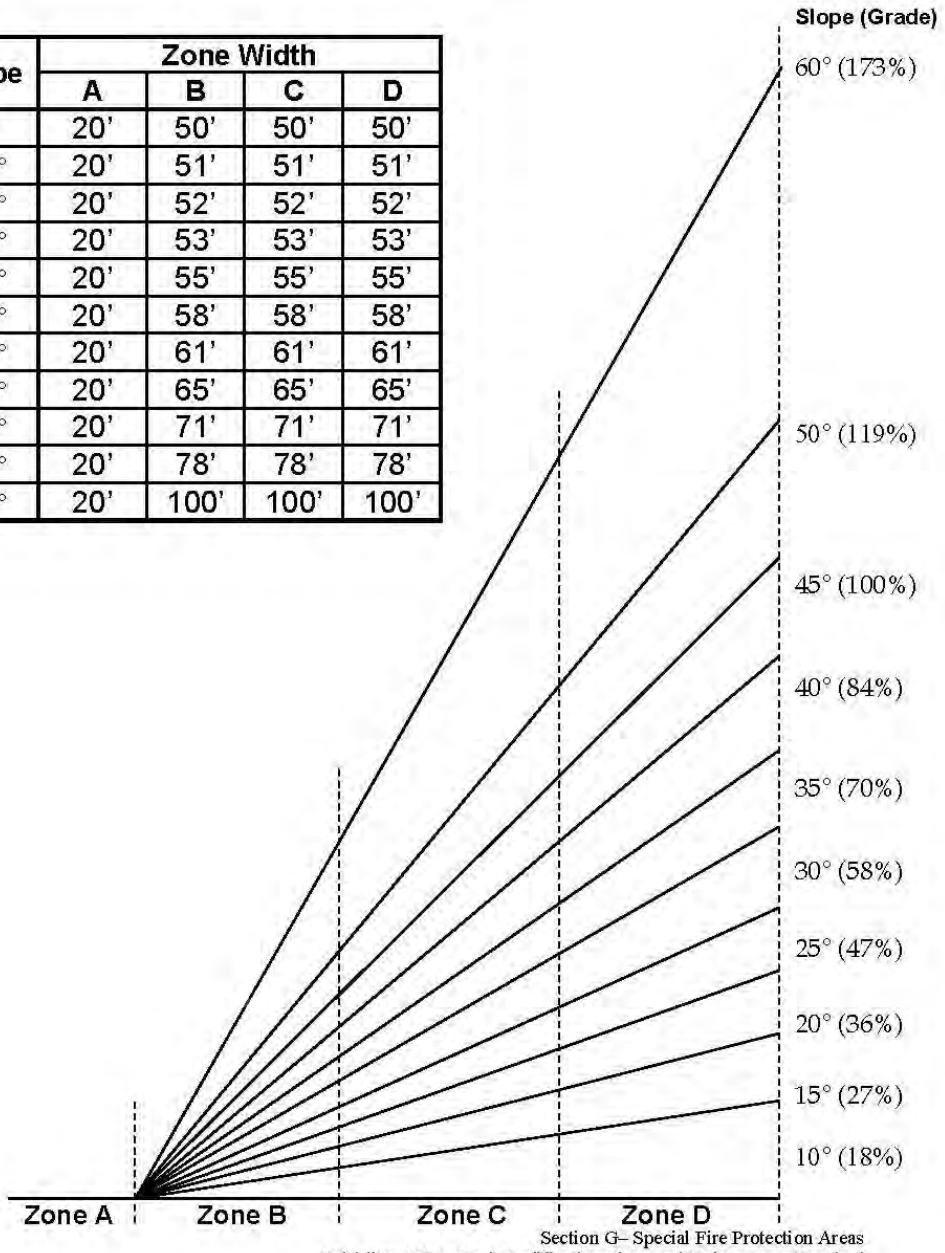
Note 1: The location of property lines will vary; however, if property lines must be located within fuel modification area, appropriate documentation (e.g., maintenance easements and/or deed restrictions) shall be established to: 1) restrict certain activities and uses on those portions of any private property within the fuel modification area, and 2) identify those responsible for the establishment and continued maintenance of the fuel modification area located on private property.

Note 2: Regardless of the entity responsible for fuel modification maintenance, the continued maintenance shall be in accordance with Section VI "Fuel Modification Implementation & Required Inspections" and other applicable sections.

Attachment 3

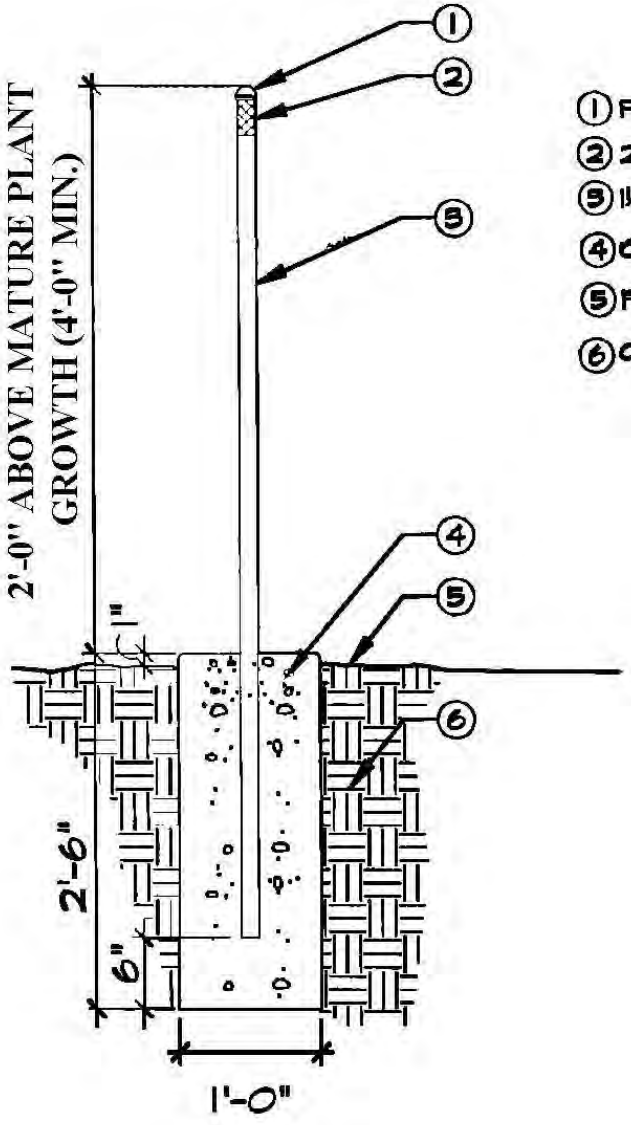
INCLINE MEASUREMENT FOR SELECTED SLOPES

Slope	Zone Width			
	A	B	C	D
0°	20'	50'	50'	50'
10°	20'	51'	51'	51'
15°	20'	52'	52'	52'
20°	20'	53'	53'	53'
25°	20'	55'	55'	55'
30°	20'	58'	58'	58'
35°	20'	61'	61'	61'
40°	20'	65'	65'	65'
45°	20'	71'	71'	71'
50°	20'	78'	78'	78'
60°	20'	100'	100'	100'



Attachment 4

ZONE MARKER DETAILS



Attachment 5

SAMPLE CC&R MAINTENANCE LANGUAGE

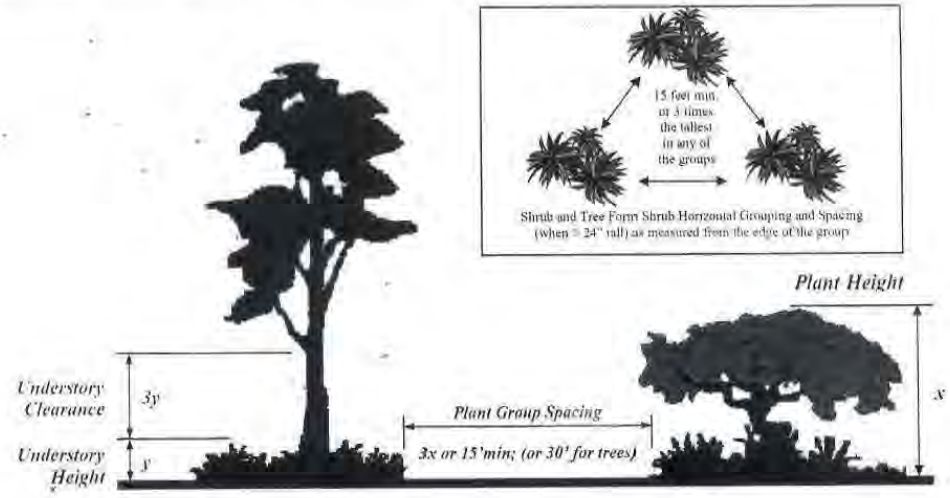
The following is a sample fuel modification maintenance condition intended to be inserted into CC&Rs:

> " _____ is responsible for maintaining, in accordance with any Newport Beach Fire Department requirements, those portions of the Covered Property identified as Fuel Modification Zones in Exhibit ___ and exhibits to any Supplemental Declarations. Construction or maintenance of structural improvements in Fuel Modification Zones, construction or maintenance of any combustible structural improvements on or adjacent to Fuel Modification Zones, and installation, maintenance, or modification of any landscaping improvements in Fuel Modification Zones that are inconsistent with any plant palette required by the Newport Beach Fire Department or the City of _____ are prohibited. All setback requirements with respect to the Fuel Modification Zones must be complied with."

Attachment 6

TREE AND SHRUB PRUNING AND SPACING

In Zones B, C, and D, sensitive and/or protected plant species shall be identified on the fuel modification plans and tagged in the field for further disposition. Trees and large tree-form shrubs (e.g., oak, sumac, toyon), which are being retained with the approval of the agency having jurisdiction, shall be pruned to provide clearance of three times the height of the understory plant material or 10 feet, whichever is higher (see figure below). Dead and excessively twiggy growth shall also be removed. Plant groupings specified in the NBFD "Fire Resistive Plant" must be spaced at a distance of at least three times the plant material height or 20 feet, whichever is greater (see figure below).



1. **Understory Clearance.** New and existing trees and tree form shrubs (naturally reaching 4' and taller), which are being retained with the approval of the fire department, shall be pruned to provide a clearance of 3 times the height of the understory plant material or 10 feet, whichever is greater (see figure above). New trees and tree form shrubs may comply with the lesser if sufficient height is not available to achieve 10 feet. Dead and excessively twiggy growth shall be removed.

2. **Plant Group Spacing.**
   a. Tree-form shrubs shall be single specimens or in a maximum grouping of three plants. Groupings shall be separated by a distance of three times the diameter of the largest individual mature crown or 15 feet, whichever is greater (see figure above).
   b. Trees shall be single specimen or in a maximum grouping of three. Groupings shall be separated by a distance of three times the diameter of the largest individual mature crown or 30 feet whichever is greater (see figure above).

Appendix 2: City of Newport Beach Urban Wildland Interface Area Standard for Hazard Reduction Fire Resistive Plant List

City of Newport Beach
Urban Wildland Interface Area
Standard for Hazard Reduction

Fire Resistive Plant List

Botanical Name	Common Name	Plant Form	Remarks
Abelia x grandiflora	Glossy Abelia	Shrub	
Acacia redolens desert carpet (1)	Desert Carpet	Shrub	
Acer macrophyllum	Big Leaf Maple	Tree	
Achillea millefolium	Common Yarrow	Low Shrub	Prune back after flowering to remove dried fire fuel
Achillea tomentosa	Woolly Yarrow	Low Shrub	Prune back after flowering to remove dried fire fuel
Aeonium decorum	Aeonium	Ground cover	
Aeonium simsii	no common name	Ground cover	
Agave attenuata	Century Plant	Succulent	
Agave shawii	Shaw's Century Plant	Succulent	
Agave victoriae-reginae	no common name	Ground Cover	Low maintenance
Ajuga reptans	Carpet Bugle	Ground Cover	Poor on slopes
Alnus cordata	Italian Alder	Tree	
Alnus rhombifolia	White Alder	Tree	30-50 feet height
Aloe arborescens	Tree Aloe	Shrub	Highly invasive
Aloe aristata	no common name	Ground Cover	
Aloe brevifoli	no common name	Ground Cover	
Aloe Vera	Medicinal Aloe	Succulent	
Alogyne huegeii	Blue Hibiscus	Shrub	
Ambrosia chammissonis	Beach Bur-Sage	Perennial	
Amorpha fruticosa	Western False Indigobush	Shrub	Native
Anigozanthus flavidus	Kangaroo Paw	Perennial/accent	
Antirrhinum nuttalianum ssp.	no common name	Subshrub	
Aptenia cordifolia x 'Red Apple'	Red Apple Aptenia	Ground cover	High fire retardance
Arbutus unedo	Strawberry Tree	Tree	
Arctostaphylos 'Pacific Mist'	Pacific Mist Manzanita	Ground Cover	
Arctostaphylos edmundsii	Little Sur Manzanita	Ground Cover	Slow to establish
Arctostaphylos glandulosa ssp.	Eastwood Manzanita	Shrub	
Arctostaphylos hookeri 'Monterey Carpet'	Monterey Carpet Manzanita	Low Shrub	Excellent drought tolerance, semi-upright to 12 inches
Arctostaphylos pungens	no common name	Shrub	
Arctostaphylos refugioensis	Refugio Manzanita	Shrub	
Arctostaphylos uva-ursi	Bearberry	Ground Cover	Excellent drought tolerance, spreading 4-6', height to 1'
Arctostaphylos x 'Greensphere'	Greensphere Manzanita	Shrub	
Artemisia caucasica	Caucasian Artesmisia	Ground Cover	Very low maintenance; takes some foot traffic
Artemisia pycnocephala	Beach Sagewort	Perennial	
Atriplex canescens	Four-Wing Saltbush	Shrub	
Atriplex lentiformis ssp. breweri	Brewer Saltbush	Shrub	Native
Baccharis emoyi	Emory Baccharis	Shrub	
Baccharis pilularis ssp. Consanguinea	Chaparral Bloom	Shrub	Native - Drought tolerant
Baccharis pilularis var. pilularis 'Twin Peaks #2'	Twin Peaks	Ground Cover	Use only male plants
Baxtylis glomerata	Berber Orchard Grass	Grass	

Baccharis salicifolia	Mulefat	Shrub	Native - Drought tolerant

Botanical Name	**Common Name**	**Plant Form**	**Remarks**
Baileya multiradiata	Desert Marigold	Ground Cover	Drought tolerant
Beaucarnea recurvata	Bottle Palm	Shrub/Small Tree	
Bougainvillea spectabilis (2)	Bougainvillea	Shrub	
Brahea armata (3)	Mexican Blue Palm/Blue Hesper Palm	Palm	
Brahea brandegeei (4)	San Jose Hesper Palm	Palm	
Brahea edulis (5)	Guadalupe Palm	Palm	
Brickellia californica	no common name	Subshrub	
Bromus carinatus	California Brome	Grass	
Camissonia cheiranthifiloa	Beach Evening Primrose	Perennial Shrub	Native
Carissa macrocarpa	Green Carpet Natal Plum	Ground Cover/Shrub	Fair-good drought tolerance, spreads 12-18"
Carpobrotus chilensis	Sea Fig Ice Plant	Ground Cover	
Ceanothus gloriosus 'Point Reyes'	Point Reyes Ceanothus	Shrub	Excellent drought tolerance, semi-upright 12-18"
Ceanothus griseus 'Louis Edmunds'	Louis Edmunds Ceanothus	Shrub	
Ceanothus griseus horizontalis	Yankee Point	Ground Cover	
Ceanothus griseus var. horizontalis	Carmel Creeper Ceanothus	Shrub	Excellent drought tolerance.
Ceanothus griseus var. horizontalis 'Yankee Point'	Yankee Point Ceanothus	Shrub	2-3' tall
Ceanothus megarcarpus	Big Pod Ceanothus	Shrub	
Ceanothus prostratus	Squaw Carpet Ceanothus	Shrub	Excellent drought tolerance; spreads 2-6'
Ceanothus spinosus	Green Bark Ceanothus	Shrub	
Ceanothus verrucosus	Wart-Stem Ceanothus	Shrub	
Cerastium tomentosum	Snow-in-Summer	Ground cover/Shrub	White flower color
Ceratonia siliqua	Carob	Tree	
Cercis occidentalis	Western Redbud	Shrub/Tree	Drought tolerant
Chrysanthemum leucanthemum	Oxeye Daisy	Ground Cover	Ornamental, flowering
Cistus crispus	no common name	Ground Cover	
Cistus hybridus	White Rockrose	Shrub	
Cistus incanus	no common name	Shrub	
Cistus incanus ssp. Corsicus	no common name	Shrub	
Cistus salviifolius	Sageleaf Rockrose	Shrub	
Cistus x purpureus	Orchid Rockrose	Shrub	
Citrus spp.	Citrus	Tree	
Clarkia bottae	Showy Fairwell to Spring	Annual	
Cneoridium dumosum	Bushrue	Shrub	
Collinsia heterophyllia	Chinese Houses	Annual	
Comarostaphylis diversifolia	Summer Holly	Shrub	
Convolvulus cneorum	Bush Morning Glory	Shrub	White flower color
Coprosma kirkii	Creeping Coprosma	Ground Cover/Shrub	Subject to dieback after 3-4 years
Coprosma pumila	Prostrate Coprosma	Low shrub	
Coreopsis californica	Califiornia Coreopsis	Annual	
Coreopsis lanceolata	Coreopsis	Ground Cover	Ornamental flowering
Corea pulchella	Australian Fuscia	Ground Cover	12" height, 36" spread
Cotoneaster buxifolius	no common name	Shrub	
Cotoneaster congestus 'Likiang'	Likiang Cotoneaster	Ground Cover/Vine	
Cotoneaster aprneyi	no common name	Shrub	
Crassula lactea	no common name	Ground Cover	
Crassula multicava	no common name	Ground Cover	Not recommended for steep slopes

Botanical Name	Common Name	Plant Form	Remarks
Crassula ovata	Jade Tree	Shrub	
Crassula tetragona	no common name	Ground Cover	
Croton californicus	California Croton	Ground Cover	
Delosperma 'alba'	White trailing Ice Plant	Ground Cover	Not recommended for steep slopes
Dendromecon rigida	Bush Poppy	Shrub	
Dichelostemma capitatum	Blue Dicks	Herb	
Distinctis buccinatoria	Blood-Red Trumpet Vine	Vine/Climbing vine	
Dodonaea viscosa	Hopseed Bush	Shrub	Drought tolerant
Drosanthemum floribundum	Rosea Ice Plant	Ground Cover	
Drosanthemum hispidum	no common name	Ground Cover	
Drosanthemum speciosus	Dewflower	Ground Cover	
Dudleya lanceolata	Lance-leaved Dudleya	Succulent	Native
Dudleya pulverulenta	Chalk Dudleya	Succulent	Native
Elaeagnus pungens	Silverberry	Shrub	
Encelia californica	California Encelia	Small Shrub	Native
Epilobium canum [Zauschneria californica]	Hoary California Fuschia	Shrub	
Eriastrum sapphirinum	Mojave Woolly Star	Annual	
Eriobotrya japonica	Loquat	Tree	
Eriodictycon crassifolium	Thick Leaf Yerba Santa	Shrub	
Eriodictycon trichocalyx	Yerba Santa	Shrub	
Eriophyllum confertiflorum	no common name	Shrub	Native
Erythrina spp.	Coral Tree	Tree	Red/pink flower color
Escallonia spp.	Several varieties	Shrub	
Eschscholzia californica	California Poppy	Flower	
Eschscholzia mexicana	Mexican Poppy	Herb	
Euonymus fortunei	Winter Creeper Euonymus	Ground Cover	
Feijoa sellowiana	Pineapple Guava	Shrub/Tree	
Fragaria chiloensis	Wild Strawberry/Sand Strawberry	Ground Cover	
Frankenia salina	Alkali Heath	Ground Cover	Native
Fremontondendron californicum	California Flannelbush	Shrub	
Gaillardia x grandiflora	Blanketflower	Ground Cover	Ornamental flower
Galvezia speciosa	Bush Snapdragon	Shrub	Red flowers
Garrya ellipta	Silktassel	Shrub	
Gazania hybrids	South African Daisy	Ground Cover	
Gazania rigens leucolaena	Training Gazania	Ground Cover	Strongly recommended; creeping varieties
Gillia capitata	Globe Gilia	Perrenial	
Gilia leptantha	Showy Gilia	Perrenial	
Gilia tricolor	Bird's Eyes	Perrenial	
Ginkgo biloba	Maidenhair Tree	Tree	
Gnaphalium Californicum	California Everlasting	Annual	
Grewia occidentalis	Starflower	Shrub	
Grindelia stricta	Gum Plant	Ground Cover	Green foliage
Hakea suaveolens (6)	Sweet Hakea	Shrub	
Hardenbergia comptoniana	Lilac Vine	Shrub	
Heliathemum mutabile	Sunrose	Ground Cover/Shrub	Good drought tolerance, 6-12"
Helianthemum scoparium	Rush Rose	Shrub	Small leaves, drought tolerant
Heliotropium curassavicum	Salt Heliotrope	Ground Cover	Native
Helix Canariensis	English Ivy	Ground Cover	

Botanical Name	Common Name	Plant Form	Remarks
Hesperaloe parviflora	Red Yucca	Perennial	
Heteromeles arbutifolia (7)	Toyon	Shrub	Native - May be trimmed up to tree form
Hypericum calycimum	Aaron's Beard	Shrub	Good t very good drought tolerance
Iberis sempervirens	Edging Candytuft	Ground Cover	White flower color
Iberis umbellatum	Globe Candytuft	Ground Cover	Ornamental flowering
Isocoma menziesii	Coastal Goldenbush	Small Shrub	Native
Isomeris arborea	Bladderpod	Shrub	Native - Drought tolerant
Iva hayesiana	Poverty Weed	Ground Cover	Erosion control, fast growth, spreads
Juglans californica	California Black Walnut	Tree	
Juncus acutus	Spiny Rush	Perrenial	Native
Keckiella antirrhinoides	Yellow Bush Penstemon	Subshrub	
Keckiella cordifolia	Heart Leaved Penstemon	Subshrub	
Keckiella ternata	Blue Stemmed Bush Penstemon	Subshrub	
Kniphofia uvaria	Red Hot Poker	Perennial	
Lagerstroemia indica	Crape Myrtle	Tree	
Lagunaria patersonii	Primrose Tree	Tree	
Lamprathus aurantiacus	Bush Ice Plant	Ground Cover	
Lampranthus filicaulis	Redondo Creeper	Ground Cover	
Lampranthus spectabilis	Trailing Ice Plant	Ground Cover	
Lantana camara cultivars	Yellow Sage	Shrub	Water deeply, infrequently
Lantana montevidensis	Trailing Lantana	Shrub	Frost tender
Lasthenia californica	Dwarf Goldfields	Annual	
Lavandula dentata	French Lavender	Shrub	
Leptospermum laevigatum	Australian Tea Tree	Shrub	
Leucophyllum frutescens	Texas Ranger	Shrub	
Leymus condensatus	Giant Wild Rye	Large Grass	Native
Ligustrum japonicum	Texas privet	Shrub	White flower color
Limonium pectinatum	no common name	Ground Cover	Drought and salt tolerant
Limonium perezii	Sea Lavender	Shrub	Perennial
Liquidambar styraciflua (8)	American Sweet Gum	Tree	
Liriodendron tulipfera	Tulip Tree	Tree	
Lonicera japonica 'Halliana'	Hall's Japanese Honeysuckle	Vining Shrub	
Lonicera subspicata	Wild Honeysuckle	Vining Shrub	Creamy white flowers
Lotus corniculatus	Bird's Foot Trefoil	Ground Cover	Green lush look
Lotus hermannii	Northern Woolly Lotus	Perennial	
Lotus scoparius	Deerweed	Shrub	Native
Lupinus arizonicus	Desert Lupine	Annual	
Lupinus benthamii	Spider Lupine	Annual	
Lupinus bicolor	Sky Lupine	Flowering annual	
Lupinus sparsiflorus	Loosely Flowered Annual Lupine/Coulter's Lupine	Annual	
Lyonothamnus floribundus ssp. Asplenifolius	Fernleaf Ironwood	Tree	
Macadamia integrifolia	Macadamia Nut	Tree	
Mahonia aquifolium 'Golden Abundance'	Golden Abundance Oregon Grape	Shrub	Bright yellow flowers
Mahonia nevenii	Nevin Mahonia	Shrub	Yellow flowers
Malacothamnus Fasciculatus	Chapparal Mallow	Shrub	
Malephora luteola	Training Ice Plant	Ground Cover	Yellow flowers

Botanical Name	Common Name	Plant Form	Remarks
Maytenus boaria	Mayten Tree	Tree	
Melaleuca nesophila	Pink Melaleuca	Shrub	
Metrosideros excelsus	New Zealand Christmas Tree	Tree	
Mimulus spp.	Monkeyflower	Flower	
Mirabilis californica	Wishbone Bush	Perrenial	
Myoporum debile	no common name	Shrub	Excellent along seacoast
Myoporum insulare	Boobyalla	Shrub	
Myoporum parvifolium	no common name	Ground Cover	
Myoporum 'Pacificum'	no common name	Ground Cover	
Nassella (stipa) lepidra	Foothill Needlegrass	Ground Cover	Native
Nassella (stipa) pulchra	Purple Needlegrass	Ground Cover	Native
Nemophilia menziesii	Baby Blue Eyes	Annual	
Nerium Oleander	Oleander	Shrub	Subject to leaf gall in large groupings
Nolina cismontana	Chapparal Nolina	Shrub	
Nolina spp.	Mexican Grasstree	Shrub	Drought tolerant
Oenothera belandieri	Mexican Evening Primrose	Ground Cover	
Oenothera hookeri	California Evening Primrose	Flower	Drought tolerant
Oenothera speciosa	Show Evening Primrose	Perrenial	
Ophiopogon japonicus	Mondo Grass	Ground Cover	
Opuntia littoralis	Prickly Pear	Cactus	Native
Opuntia oricola	Oracle Cactus	Cactus	Native
Opuntia prolifera	Coast Cholla	Cactus	Native
Osmanthus fragrans	Sweet Olive	Shrub	
Osteospermum fruticosum	Training African Daisy	Ground Cover	
Parkinsonia aculeata	Mexican Palo Verde	Tree	Yellow flowers
Pelargonium peltatum	Ivy Geranium	Ground Cover	
Penstemon spp.	Beard Tongue	Shrub	
Photinia fraseria	no common name	Shrub	
Pistacia chinesis	Chinese Pistache	Tree	
Pittosporum undulatum	Victorian Box	Tree	
Plantago erecta	California Plantain	Annual	
Plantago insularis	Woolly Plantain	Annual	
Plantago sempervirens	Evergreen Plantain	Ground Cover	Grey leaves; drought tolerant
Plantanus racemosa	California Sycamore	Tree	Native
Plumbago auritulata	Plumbago Cape	Shrub	
Popolus fremontii	Western Cottonwood	Tree	Native
Portulacaria Afra	Elephant's Food	Shrub	
Potentilla glandulosa	Sticky Cinquefoil	Subshrub	
Potentilla tabernaemontanii	Spring Cinquefoil	Ground Cover	
Prunus carolinana	Carolina Cherry Laurel	Shrub/Tree	White flower color
Prunus ilicifolia ssp. Ilicifolia	Holly Leafed Cherry	Shrub	
Prunus lyonii	Catalina Cherry	Shrub/Tree	White flower color
Punica granatum	Pomegranate	Shrub/Tree	
Puya spp.	Puya	Succulent/Shrub	
Phyla nodiflora	Lippia	Ground Cover	
Pyracantha spp.	Firethorn	Shrub	
Quercus agrifolia	Coast Live Oak	Tree	Oak woodland
Quercus berberdifolia (9)	California Scrub Oak	Shrub	Valuable soil binder
Quercus dumosa (10)	Coastal Scrub Oak	Shrub	
Quercus engelmannii	Engelmann Oak	Tree	Open structure
Quercus suber	Cork Oak	Tree	

Botanical Name	Common Name	Plant Form	Remarks
Rhamnus alaternus	Italian Buckthorn	Shrub	
Rhamnus californica	California Coffee Berry	Shrub	Green leaves; drought tolerant
Rhamnus crocea	Redberry	Shrub	Native - Intricate branching
Rhamnus crocea ssp. Ilicifolia	Hollyleaf Redberry	Shrub	
Rhaphiolepis spp.	Indian Hawthorne	Shrub	
Rhus integrifolia	Lemonade Berry	Shrub	Native - May be trimmed up to tree form
Rhus lancea	African Sumac	Tree	25' height
Rhus ovata (11)	Sugarbush	Shrub	
Ribes aureum	Golden Currant	Shrub	
Ribes indecorum	White Flowering Currant	Shrub	
Ribes speciosum	Fuschia Flowering Goosebberry	Shrub	Native
Ribes viburnifolium	Evergreen currant	Shrub	
Romneya coulteri	Matilija Poppy	Shrub	Large showy white flowers
Romneya coulteri 'White Cloud'	White Cloud Matilija Poppy	Shrub	
Rosmarinus officinalis (12)	Rosemary	Shrub	
Salvia greggii (13)	Autumn Sage	Shrub	
Salvia sonomensis (14)	Creeping Sage	Ground Cover	
Sambucus mexicana	Mexican Elderberry	Tree	Drought tolerant
Santolina chamaecyparissus	Lavender Cotton	Ground Cover	
Santolina virens	Green Lavender Cotton	Shrub	
Satureja chandleri	San Miguel Savory	Perennial	
Scirpis scutus	Hard Stem Bulrush	Perennial	
Scirpus californicus	California Bulrush	Perennial	Native
Sedum acre	Goldmoss Sedum	Ground Cover	Not recommended on steep slopes
Sedum album	Green Stonecrop	Ground Cover	
Sedum confusum	no common name	Ground Cover	
Sedum lineare	no common name	Ground Cover	
Sedum x rubrotinctum	Pork and Beans	Ground Cover	
Senecio serpens	no common name	Ground Cover	
Sisyrinchium bellum	Blue Eyed Grass	Ground Cover	Drought tolerant
Solanum douglasii	Douglas Nightshade	Shrub	
Solanum xantii	Purple nightshade	Perennial	Native
Stenocarpus sinuatus	Firewheel Tree	Tree	
Strelitzia nicolai	Giant Bird of Paradise	Perennial	
Strelitzia reginae	Bird of Paradise	Perennial	
Symphoricarpos mollis	Creeping Snowberry	Shrub	
Tecoma stans (Stenolobium stans)	Yellow Bells	Shrub/Small Tree	
Tecomaria capensis	Cape Honeysuckle	Ground Cover	Vine
Teucarium chamedrys	Germander	Ground Cover	
Thymus serpyllum	Lemon Thyme	Ground Cover	
Trachelospermum jasminoides	Star Jasmine	Shrub	White flower color
Trichostems lanatum	Woolly Blue Curls	Shrub	
Trifolium hirtum 'Hyron'	Hyron Rose Clover	Ground Cover	Drought tolerant
Trifolium fragerum 'O'Connor's'	O'Connor's Legume	Ground Cover	
Umbellularia californica	California Laurel	Tree	Very spreading
Verbena lasiostachys	Western Vervain	Perennial	
Verbena peruviana	no common name	Ground Cover	
Verbena spp.	Verbena	Ground Cover	Ornamental flowering
Vinca minor	Dwarf Periwinkle	Ground Cover	Very spreading

Botanical Name	Common Name	Plant Form	Remarks
Vitis girdiana	Desert Wild Grape	Vine	
Vulpia myuros 'Zorro'	Zorro Annual Fescue	Grass	
Westringia fruticosa	no common name	Shrub	
Xanthorrhoea spp.	Grass Tree	Perennial accent/shrub	
Xylosma congestum	Shiny Xylosma	Shrub	
Yucca spp.	Yucca	Shrub	Drought tolerant
Yucca whipplei	Yucca	Shrub	

Approved Plant Palette – Qualification statements for Select Plant Species

1. **Acacia redolens desert carpet:** May be used in the upper ½ of the "B" fuel modification zone. The plants may be planted at 8' on center, maximum spacing in meandering zones not to exceed a mature width of 24' or a mature height of 24".

2. **Bougainvillea spectabilis (procumbent varieties):** Procumbent to mounding varieties may be used in the mid "B" fuel modification zone. The plants may be planted in clusters at 6' on center spacing not to exceed eight plants per cluster. Mature spacing between individual plants or clusters shall be 30' minimum.

3. **Brahea armata:** Additional information may be required as directed by NBFD.

4. **Brahea brandegeel:** Additional information may be required as directed by NBFD.

5. **Brahea edulis:** May be used in upper and mid "B" fuel modification zone. The plants shall be used as single specimens with mature spacing between palms of 20' minimum.

6. **Hakea Suaveolens:** May be used in the mid "B" fuel modification zone. The plants shall be used as single specimens with mature spacing between plants of 30' minimum.

7. **Heteromeles arbutifolia:** May be used in the mid to lower "B" fuel modification zone. The plants may be planted in clusters of up to 3 plants per cluster. Mature spacing between individual plants or clusters shall be 30' minimum.

8. **Liquidambar styraciflua:** May be used in the mid "B" fuel modification zone. The plant shall be used as single specimens with mature spacing between trees and 30' minimum.

9. **Quercus berberdifolia:** Additional information may be required as directed by NBFD.

10. **Quercus dumosa:** May be used in the mid to lower "B" fuel modification zone. The plants may be planted in clusters of up to 3 plants per cluster. Mature spacing between individual plants or clusters shall be 30' minimum.

11. **Rhus ovata:** May be used in the mid to lower "B" fuel modification zone of inland areas only. The plants may be planted in clusters of up to 3 plants per cluster. Mature spacing between individual plants or clusters shall be 30' minimum.

12. **Rosmarinus officinalis:** Additional information may be required as directed by NBFD.

13. **Salvia greggii:** Additional information may be required as directed by NBFD.

14. **Salvia sonomensis:** May be used in the mid to upper "B" fuel modification zone. The plants may be planted in clusters of up to 3 plants per cluster. Mature spacing between individual plants or clusters shall be 15' minimum.

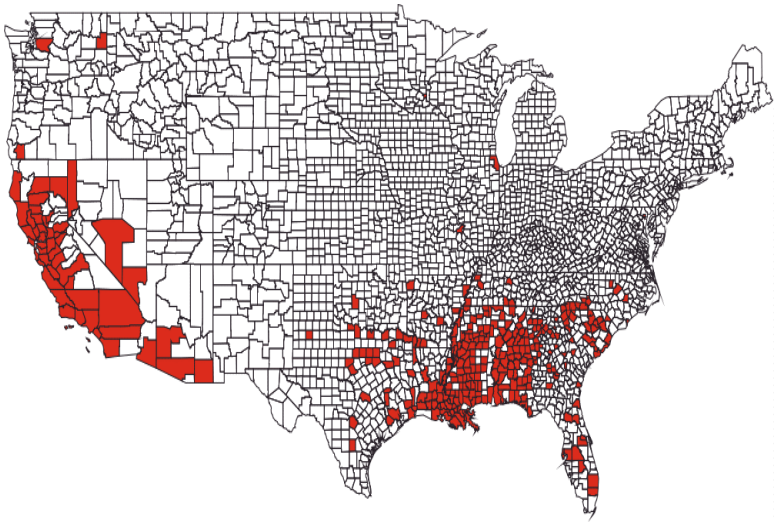
Appendix 3: Buck Gully Invasive Ant Survey and Report

Buck Gully Insect Survey 2012

INTRODUCTION

Residential and recreational development surrounding the headwaters and adjacent banks of Buck Gully, including several storm drain outlets, has dramatically changed the flow of Buck Gully Creek. This larger and more consistent water source, coupled with the disturbance of native vegetation through fuel modification areas has created a favorable environment for Argentine ants (*Linepithema humile*). Argentine ants are able to invade undisturbed habitats up to a distance of 650 feet from a water source (Suarez et al. 1998) making them able to colonize nearly all of Buck Gully.

The Argentine Ant is one of the world's most pervasive invasive ant species and can be found on all continents except Antarctica. It is believed that the Argentine ant arrived in the United States in the early 1890s, via coffee shipments from Brazil. Today, Argentine ants can be found in most southern states, a few northern states, and across most of California, including Orange County.



Areas infested by Argentine ants in red.
(McDonald 2000)|

Community-based analysis reveals that the number of arthropod species decreases when invaded by Argentine ants (source). The same findings have been reported in disturbed areas constituting fuel modification areas where disturbed coastal sage scrub contains fewer arthropod predator species and are dominated by exotic arthropods such as Argentine ants, European earwigs (*Forficula auricularia*), pillbugs (*Armadillidium vulgare*), and sowbugs (*Porcellio spp.*) (Longcore 2003). Changes in insect species diversity can have resonating impacts on a variety of birds, mammals, reptiles, and amphibians that rely on arthropods as a food source.

To confirm the density and distribution of Argentine ants in Buck Gully, a survey of arthropods was conducted in July and August of 2012 along Buck Gully Trail, which loosely follows the course of Buck Gully Creek.

METHODS

The Insect survey of Buck Gully consisted of 37 ant traps placed along the perimeters of Buck Gully Trail, beginning at the trail head at Poppy Street and 5th Avenue and concluding just below the San Joaquin Hills Road trail head. The traps were placed at intervals of 100 meters and locations identified using a Juno Trimble GPS Unit.

The traps were placed Tuesday, July 31st and collected Thursday, August 2nd. Each ant trap consisted of a 6-ounce sample cup filled with 2 to 3 ounces of a soap saline solution (3 tbsp of salt, 100 oz of water ~ 3 liters, 1 tbs/L).

Setting Traps

1. Once a sample location was found, the sample cup was labeled sequentially with a sharpie, for example, BG-1, BG-2.

2. Using a hand auger and trowel, a pit was dug so that the cup was flush with the soil surface, approximately one-half meter upslope from Buck Gully Trail.

3. With the lid on, the sample cup was placed in the hole and soil arranged to create a smooth surface/transition from soil to cup lip.

4. Following placement in the hole, the sample cup lid was removed, and the cup filed about one third full with the soap saline solution (approximately 60ml or 2 oz.)

5. Three nails were then placed in a triangular position on the outside of the cup, but angled inward with nail heads up to support the lid. Placing the lid approximately one half inch above the cup allowed for trapping while reducing debris accumulation and evaporation of the soap solution.

Trap Collection

1. Collected 38 sample cups, ensuring lids were secure. Two of the 40 sample cups had been compromised and were subsequently disposed of.

2. Transported samples back to the IRC lab.

3. A mesh cloth was used as sieve to obtain insects and dispose of soap-saline solution.

4. Identified ant species using a microscope to determine presence/absence of Argentine ants and other ant species.

5. Placed ant samples in vial with ethanol solution.

6. Documented findings in an Excel spreadsheet.

RESULTS

For a list of all ant species found during surveys see Table 1.

- Total Ant Traps Placed: 36
- Total Ant Traps Retrieved and Studied: 34
- Minimum: 0 ants in two of 38 traps - traps 7 & 9
- Maximum: 1,164 ants - trap 22, including 5 thief ants (S*olenopsis molesta)* and1,159 argentine ants (Figure 1).
- Total Ants Trapped and Identified: 5,559
  - Total Argentine ants Identified: 5,542
  - Total Thief Ants Identified: 17, traps 19 (1), 22 (5), 26 (2), 31 (8), 33 (1)

Table 1. Insect Survey Results

Sample #	Argentine Ants	Thief Ants	Sample #	Argentine Ants	Thief Ants
1	3	0	**19**	420	1
2	--	--	**20**	116	0
3	5	0	**21**	57	0
4	2	0	**22**	1159	5
5	--	--	**23**	37	0
6	46	0	**24**	223	0
7	0	0	**25**	40	0
8	3	0	**26**	235	2
9	0	0	**27**	295	0
10	4	0	**28**	50	0
11	10	0	**29**	230	0
12	90	0	**30**	258	0
13	802	0	**31**	212	8

14	276	0	**32**	56	0
15	291	0	**33**	14	1
16	104	0	**34**	41	0
17	256	0	**35**	19	0
18	150	0	**36**	38	0

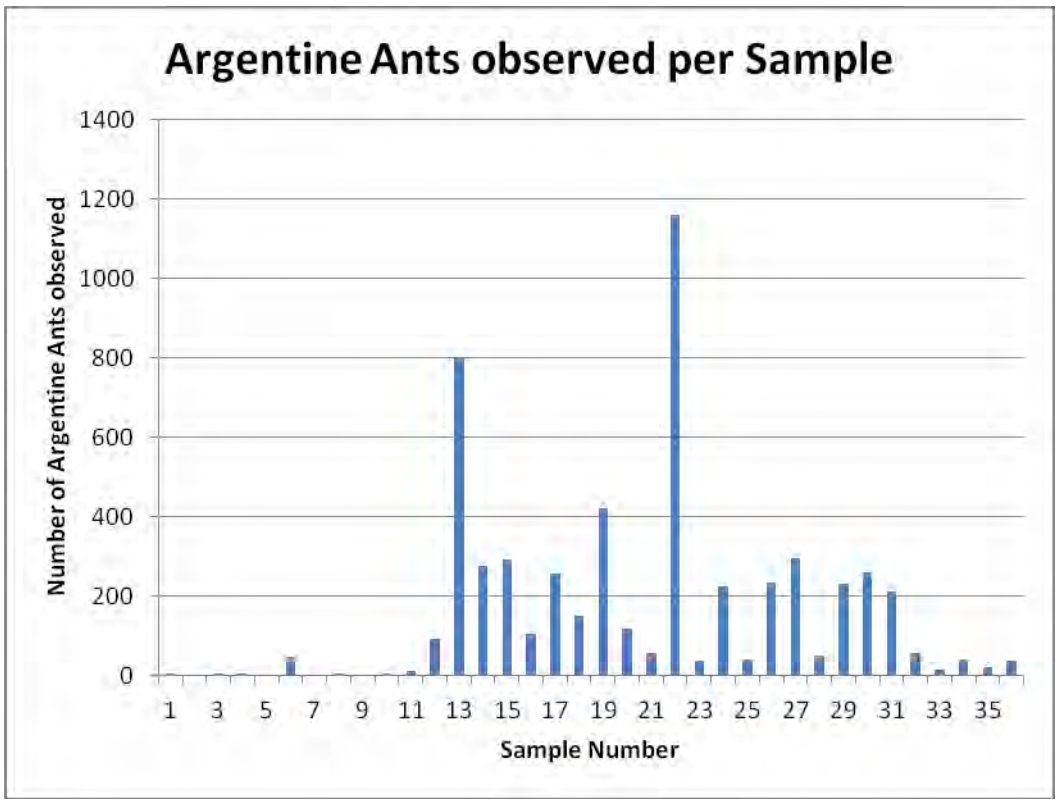


Figure 1. Argentine ants observed per sample

DISCUSSION

Survey results yielded observations of Argentine ants in 34 of the 36 traps set along Buck Gully Trail. Although, this is the first known insect survey of Buck Gully, it is likely that the increased runoff and flow in Buck Gully creek has created ideal environmental conditions for invasions of Argentine ants.

The only other ants among the 5,559 ants trapped and identified were 18 thief ants. Although, an opportunist that is found in many places, thief ants are native to California; however, no other native ant species were observed. It appears that in regions of Buck Gully in close proximity to the creek, Argentine ants are dominant. Similar cases have been published in scientific literature including one study conducted at the University of California, San Diego, published in the *Proceedings of the National Academy of* Sciences entitled "Success of Introduced Argentine Ants Tied to Reduced Genetic Variation" (McDonald 2000). David A. Holway, a postdoctoral researcher at UCSD and co-author stated "the striking thing about Argentine ants in California is that as long as the habitat is favorable, they completely dominate."

Insects occupy a location in the food web that makes them an important food source to many birds, mammals, and other insects. Thus limiting the diversity of native insects can have ripple effects with significant consequences throughout the food web. Decreasing the flow in Buck Gully Creek may limit further invasion by Argentine ants and even scale back a colonies ability to thrive in areas that are currently colonized. Additional surveys of upland areas of Buck Gully and continued monitoring of current sites are recommended.

REFERENCES:

McDonald, K. (2012). Success of introduced argentine ants tied to reduced genetic variation. Retrieved from: http://ucsdnews.ucsd.edu/newsrel/science/mcants.htm

Appendix 4: Vegetation Community Descriptions

Vegetation Community Descriptions

GRASSLAND

Annual Grassland (AGL)

Annual grassland is typically dominated by non-native grasses and occurs on gradual slopes with deep soils below 3,000 feet AMSL (Gray and Bramlet 1992). It may occur where disturbance by maintenance (mowing, scraping, discing, spraying, etc.), grazing, repetitive fire, agriculture, or other mechanical disruption have altered soils and removed native seed sources from areas formerly supporting native vegetation. Some of the most commonly found species found in Buck Gully Reserve include slender oat (*Avena barbata*), foxtail chess (*Bromus madritensis* ssp. *rubens*), soft chess (*B. hordeaceus*), and glaucous barley (*Hordeum murinum* ssp. *glaucum*) (Dudek 2009). California annual grasslands may support certain special-status plant and animal species and provide open foraging habitat for raptors (birds of prey) such as red-tailed hawk (*Buteo jamaicensis*) and American kestrel (*Falco sparverius*).

Wild Rye (WR)

Wild rye grassland is a native grassland that is dominated by wild rye (*Elymus condensatus*) (Jones & Stokes 1993). This somewhat rare community is typically found adjacent to annual grassland and other disturbed communities on site (Dudek 2009).

COASTAL SAGE SCRUB (CSS)

Coastal Sage Scrub is a protected community under the NCCP program established in Orange County in 1996. Approximately 75 special-status plant and animal species are associated with CSS, the most notable of which is the federally listed threatened coastal California gnatcatcher (*Polioptila californica californica*), and locally, the cactus wren (*Campylorhynchus brunneicapillus*. CSS is considered special-status habitat by state and federal resource agencies, most southern California jurisdictions, and local conservation organizations. CSS is considered a Conserved Vegetation Community under the Central-Coastal NCCP/HCP. Several sub-associations are included in the CSS community because they provide similar habitat functions and contain many of the same species.

CSS is a native plant community characterized by a variety of low-statured, aromatic, drought-deciduous shrubs, such as California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasiculatum*), California encelia (*Encelia californica*), coast goldenbush (*Isocoma menziesii*), and sages (*Salvia* spp.) (Dudek 2009). CSS typically develops on south-facing slopes and other dry areas.

The following are Coastal Sage Scrub habitat sub-associations that were observed during surveys of the fuel modification zones:

Coastal Sage California Buckwheat Scrub (CSSB)

Coastal sage California buckwheat scrub is a type of CSS co-dominated by California sagebrush and California buckwheat, with several other mostly drought-deciduous shrubs that occur throughout the

mountains and low foothills of Orange County (Gray and Bramlet 1992). It can include low statured and broad-leaved shrubs as well as native and non-native grasses in its understory. Shrubs such as black sage (*salvia melliflora*), white sage (*salvia apiana*), bush monkeyflower (*mimulus aurantiacus*), deerweed (*Lotus scoparius*), and giant wild rye are common. Broad-leaved shrubs such as lemonadeberry (*Rhus integrifolia*), coyote brush (*Baccharis pilularis*), and chaparral bushmallow (*malacothamnus fasciculatus*), and grasses such as *Bromus* spp. and foothill stipa (*Nasella lepida*) as well as forbs such as blue dicks (*Dichelostemma capitata*) and bicolor cudweed (*Gnaphalium bicolor*). It occurs primarily along the south- and west-facing slopes of upper Buck Gully and is typically very dense often approaching 100% vegetative cover.

CSS/Grass

CSS/grass contains an open cover of California sagebrush and non-native grasses. This habitat, found mostly in Orange County's lowlands and foothills provides seeds and grass that support small mammal species (Gray and Bramlet 1992). CSS/grass is found primarily on the northern portion of Buck Gully Reserve and appears to be the result of prior and continued disturbance, possibly related to human impacts from the adjacent residential housing.

Coyote Brush Scrub

Coyote brush scrub is described by Gray and Bramlet (1992) as being dominated by coyote brush (*Baccharis pilularis*), with California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), bush monkeyflower (*Mimulus aurantiacus*), coastal goldenbush (*Isocoma menziesii*), giant rye grass (*Elymus condensatus*), and white sage (*Salvia apiana*), found in coastal areas of southern Orange County. Jones & Stokes (1993) note that the sage scrub community usually occurs on flat and gentle slopes that have been disturbed within the past 20 years. It generally is regarded as a post-disturbance community in a successional state, with the climax community most often being coastal scrub (Dudek 2009).

Sagebrush-Coyote Brush Scrub

Sagebrush- coyote brush scrub is described in Gray and Bramlet (1992) as being dominated by California sagebrush and coyote brush, with other scrub species holding a less dominant position. This CSS community is known to grow in coastal areas of southern Orange County.

Southern Cactus Scrub

Southern cactus scrub consists of scrub vegetation dominated by cacti and CSS species. The presence of paddle cactus or prickly-pear cactus (*Opuntia* spp.) at 20% or more relative cover defines this community. This habitat can also includes species such as California sagebrush, California buckwheat, black sage and blue elderberry (Gray and Bramlet 1992).Southern cactus scrub is primarily found along a south- facing slopes on the north side of Buck Gully adjacent to residential housing.

Lemonade Berry Scrub

Lemonadeberry is a rounded, aromatic, evergreen shrub or small tree growing to 10' tall, sometimes taller, with a stout, shortish trunk and many spreading branches and flat to slightly inrolled, entire-margined to ± sharp-toothed, coriaceous leaves, which are also alternately spaced, oval-shaped and rounded at both ends. The flowers are in tightly grouped clusters and are small, white to rose-pink in color, and subtended by roundish hairy bracts. The sepals are green with glandular-ciliate margins, and there are five petals, 1/8" long, and five stamens. The fruit is a sticky, flattish drupe that is covered with a fine reddish-brown down, inside of which is a hard stone about 1/4" long. Lemonadeberry blooms from February to May below 2600' in coastal sage scrub and chaparral on dry, mostly ocean-facing slopes from Santa Barbara Co. to Baja. It is said that the berries can be added to water to make a somewhat bitter lemonade-like drink, but I haven't tried this. *Rhus integrifolia* hybridizes with *Rhus ovata*.

CHAPARAL SCRUB

Southern Mixed Chaparral

Similar to Northern Mixed Chaparral but typically not quite so tall (1.5-3m) or dense. Occasionally with patches of bare soil or forming a mosaic with Venturan Coastal Sage Scrub or Riversidean Sage Scrub . Divisible into Granitic (37121) and Mafic (subtypes based on substrate, but floristic distinctions between these two subtypes remain unknown.Similar to Northern Mixed Chaparral but somewhat lower precipitation and more moderate temperatures. Often adjacent to and on moister sites than Chamise Chaparral Transitional from the chaparral habitats of California to the coastal semi-desert of Baja California Norte.

Appendix 5: Vegetation Mapping Notes

Id	Vegetation Community	Plant Species	Notes
Southern Hazard Reduction Zone			
0	dMEW	CAREDU (dom) RHUINT, PINspp, MALLAU, SAMMEX	
1	dSMC	HEDHEL (dom) CAREDU (dom) CYNCAR RHUINT ELYCON ARCA	
2	dSMC	HEDHEL (dom) CAREDU (dom) CYNCAR RHUINT ELYCON ARCA	
3	SBCB	ARTCAL (dom) RHUINT BACPIL GRASS (dry)	
4	SMC	RHUINT (dom) ARTCAL MALLAU	
5	SMC	SAMMEX (dom) ACAspp (dom) QUEDUM CAREDU RHUINT HEDHELTOXDIV	
6	DH	CAREDU (dom)	
7	ORN/SMC	EUCspp CAREDU RHUINT	
8	dSMC	CAREDU(co-dom) RHUINT(co-dom) SAMMEX (co-dom) Jade ORN succulent	
9	DH	PINspp PLARAC SAMMEX MALLAU	ornamental plantings avocado and agave, abundant invasives
10	SMC	RHUINT(dom) SAMMEX(dom) VINMAJ CAREDU	
11	CSSB		
Northern Hazard Reduction Zone			
12	ORN		
13	dCBS		
14	CBSS	BACPIL ERIFAS	
15	SBCB	BACPIL ARTCAL	
16	CSS	BACPIL SAMMEX ARTCAL MYOLAT	
17	dCBS	BACPIL SAMMEX MYOLAT ANNGRAS SCHMOL	
18	ORN		
19	dAGL		
20	dCBS	BACPIL(dom) SALTRA	BG 60%
21	dAGL	ANNGRA SALTRA ISOMEN RHUINT	
22	CSS	BACPIL ARTCAL ERIFAS	
23	ORN	JUNspp CUPspp PINspp	planted trees 24-72 inches
24	ORN		
25	dCBS	ATRSEM(dom) BACPIL ERIFAS	
26	DH	CARCHI(dom) SAMMEX	
27	dSBCB	CARCHI SAMMEX	
28	DH	CARCHI(dom)	~100% CARCHI cover
29	CSS	ARTCAL(dom) BACPIL RHUINT SAMMEX	
30	ORN		
31	dLBS	RHUINT CARCHI	
32	CSS	ARTCAL OPUspp	
33	DH	PENCLA(dom) RHUINT	
34	ORN		
35	dSBCB	CARCHI(dom) AVEspp RHUINT BACPIL MALLAU	
36	DH	CARCHI(dom)	~100% CARCHI

37	DH	CARCHI	CARCHI 60%, BG 40%
38	ORN	PINspp	
39	CSS	OPPspp ARTCAL	
40	dAGL	MALSAX(dom) AGL	
41	MEW	SAMMEX	
42	DH	CARCHI CYNCAR MALSAX	CARCHI 60% 20ft x 10ft eroded slope
43	CSS	ARTCAL(dom) SAMMEX	
44	ORN		
45	ORN		
46	DH	CAREDU(dom) RHUINT AGAspp	CAREDU 80%
47	dAGL	AGL(dom) MALSAX(dom) CAREDU	
48	DH/ORN	CAREDU(dom) AGAspp HEDHEL	
49	ORN		
50	DH		erosion/ground slump
51	ORN		lawn and viney ground cover
52	DH		
53	AGL	AGL	
54	ORN	PINspp	
55	dAGL	AGL BACPIL BRANIG NICGLA ECHCAN	AGL 20-30% BG 60% abundant invasives
56	ORN		
57	CSS		
58	dAGL/dCSS		
59	CSS		
60	LBS		
61	ORN		
62	dAGL		mowed grass
63	DH		>50% BG
64	dAGL	AG RHUINT	grass mown 10% cover, 90% BG or dead grass
65	dAGL/dLBS	RHUINT MALSAX ARTCAL SCHTER	AG 30% RHUINT 20%
66	SCS	OPUspp	
67	dAGL	MALSAX(dom) AG CYNCAR RHUINT	30% annual grasses, BG 10%
68	ORN		
69	dAGL	MALSAX BG AG	mowed dead annuals, 80% BG, AG 40-50%
70	MEW	SAMMEX	One tree
71	CSSB/ORN		
72	dAGL		
73	CSS	BACPIL ARTCAL RHUINT	
74	dAGL	MALSAX(dom) AG BG OPUspp	AG 30%, MALSAX 80%, BG 10%, shrubs cleared to HRZ
75	CSS	RHUINT ARCA ERIFAS	
76	dAGL/SCS	MALSAX(dom) AG RHUINT OPUspp	Grass 6-8 inches 40-50%, MALSAX 70%, patchy RHUINT
77	CSSB	ARTCAL RHUINT ERIFAS	

78	SCS	OPUspp ARTCAL RHUINT ERIFAS	OPUspp 60-70%, small patches of bunchgrass, juv. ARTCAL plants, RHUINT 5-10%, OPPspp becomes patchi*
79	SCS	OPPspp	
80	SCS	OPPspp NASLEP ERIFAS	Large patches of OPPspp, NASLEP 15%, BG 15% veg cleared to HRZ
81	ORN		
82	SCS	OPPspp RHUINT CYNCAR AG MALLAU	OPPspp 40-50% RHUINT 30% signif CYNCAR, CSS dense outside HRZ
83	ORN		
84	LBS/SCS	OPPspp RHUINT NASLEP ARTCAL ERIFAS MALLAU BACPIL MALLAX	RHUINT 50% OPPspp 20-30% burned/dead OPP NASLEP 10%
85	LBS/SCS	OPPspp RHUINT AG ERIFAS ARTCAL ISOMEN	OPPspp 40% RHUINT 20-30% AG 10%
86	LBS/CSS		
87	ORN		Planted orchard with ornamentals and fruit trees
88	ORN	HEDHEL	HEDHEL and ornamental vine on slope
89	LBS/SCS	RHUINT OPPspp SAMMEX HEDHEL	RHUINT(co-dom) 40% OPPspp(co-dom) 4-5ft tall 30% SAMMEX HEDHEL BG 40%
90	ORN		
91	dAGL	MALLAX(dom) AG BG OPPspp RHUINT ERIFAS	heavily distrubed 70-80% BG, OPPspp 10%
92	CBS	BACPIL ARTCAL SAMMEX CYNCAR	BACPIL 60% abundant CYNCAR
93	AGL	AG MALLAX(dom)	AG 80-90% MALLAX(dom)
94	ORN	ECHCAN	
95	dAGL/SCS	OPPspp RHUINT CYNCAR AG NICGLA SAMMEX ARTCAL BACPIL	small patches of OPPspp, RHUINT tree forms, patchy AG, large SAMMEX, small patches ARTCAL
96	ORN		
97	AGL	AVEspp BRODIA MALSAX NICGLA MALLAU CORspp BACPIL	AG 50%, patchy MALSAX
98	CSS		
99	AGL	AG PINspp	
100	CSS		
101	CSS		
Fuel Modification Zones			
102	CSS		
103	SMC		
104	ORN/SMC	ERIFAS RHUINT OPUspp ARTCAL	OPUspp 75-85%, mulch/BG 15-25%, bunch grass
105	CSS	SALMEL(dom) MALLAU RHUINT ARTCAL ENCCAL	BG and mulch, ornamentals, and natives
106	ORN		
107	ORN		Rocky BG
108	LBS	RHUINT(dom) ERIFAS SALMEL ENCCAL	ERIFAS 10-20%, SALMEL 10%, ground is soft w mulch
109	LBS/ORN	RHUINT(dom) ERIFAS ENCCAL SALMEL EUCspp	RHUINT 60%, BG/mulch 10-30%, ORN 5%

110	CSSB	ERIFAS RHUINT LIMPER	
111	CSS/LBS	RHUINT ARTCAL SALMEL PHAspp	Rocky CSS
112	LBS	RHINT(dom) SALMEL ERIFAS	RHINT >50% SALMEL 30-40% ERIFAS
113	ORN		
114	LBS	RHUINT(co-dom) ENCCAL(co-dom) MALLAU EUCspp	RHUINT 40% ENCCAL 20-30% BG/mulch 40-50% low-lying ORN
115	LBS/ORN	ACARED MALLAU	ACARED 60-70%, 12-24 in height planted ORN 10-20%
116	CSS	ERIFAS RHUINT ARTCAL	
117	LBS/ORN	RHUINT ACARED	RHUINT 30-40% ACARED 12-24 inches, low-lying ornamentals
118	ORN	ACARED	BG 20%, landscapers are taking out ACARED
119	LBS	RHUINT(dom) ERIFAS ARTCAL ACARED	RHUINT 60% ORN flowers 5-10%
120	ORN	ACARED	ACARED ~100%
121	CSS		
122	CSS/LBS		
123	dAGL	AVEspp BRASYL RHUINT PICECH FOEVUL PULPAL	PICECH 30% BG 30% above drainage. 10% below drainage
124	CSSB/LBS	RHUINT(dom) BACPIL ERIFAS MALLAU SAMMEX AGL	BACPIL abundant ERIFAS abundant AGL perforates btw shrubs
125	dAGL/LBS	RHUINT(dom) AG AVEspp MALLAU ERIFAS	RHUINT 60-70% AG 30-40% mown to 3 inch height ERIFAS 5%
126	dAGL/LBS	AG AVEspp RHUINT MALLAU	AG mown to 3 in height 50% RHUINT tree form 50% BG 10-20% bougenvillia near fence line
127	SBCB/WR	ELYCON	
128	SWS	SALLAS MALLAU	Large tree(s)
129	WR	ELYCON(dom) BACPIL RHUINT MALLAU ARTCAL	BACPIL 20%
130	SBCB	ARTCAL(dom) BACPIL MALLAU	BACPIL 15%
131	LBS	RHUINT MALLAU	
132	LBS/ORN	MYOPAR ELYCON RHUINT AG	
133	dAGL	AG PICECH BRANIG RHUINT	Mowed dead grass PICECH 40-50% sporadic BRANIG large RHUINT shrubs
134	SWS	SALLES MALLAU	Large trees
135	SBCB	BACPIL(co-dom) MALLAU(co-dom) ELYCON ARTCAL	BACPIL 40-60% MALLAU 40% ELYCON 15%
136	LBS/ORN	MYOPAR ELYCON RHUINT	
137	dAGL	AG PICECH BRANIG MALLAU RHUINT	Mown AG 2-3 inches PICECH 20% BRANIG 15%, MALLAU and RHUINT above
138	dAGL/ORN	MYOPAR RHUINT AG ELYCON MALLAU QUEAGR	MYOPAR growing in patches, scattered RHUINT shrubs, mown AG intrudes into area
139	SBCB	BACPIL(co-dom) ARTCAL(co-dom) RHUINT	Dense veg, large RHUINT shrubs intrude into FMZ

140	ORN	QUEAGR PINspp	6 large QUEAGR abun leaf litter but not sig fuel source disturbed AG grass PINspp in retaining wall
141	dAGL	AVEspp(dom) PICECH BRANIG RHUINT MALLAU	More AVEspp less BRANIG
142	WR	ELYCON	
143	SBCB	BACPIL ELYCON RHUINT MALLAU	BACPIL 30% ELYCON 20% RHUINT primarily shrubs along FMZ border MALLAU, very dense
144	dAGL	AVEspp(dom) PICECH BRANIG RHUINT MALLAU PLARAC	More AVEspp less BRANIG
145	ORN	ACARED EUCspp	Thick ACARED shrubs w/in 3 in of fenceline 4-6 ft high, EUC 20-30ft high
146	SMC	RHUINT(dom) ERIFAS BACPIL MALLAU HETARB	RHUINT(dom) tall shrubs very dense comes within 3 ft of home
147	AGL	AG POLMON BRORUB BROHOR PICECH	AG 70% BG 20% some PICECH
148	ORN	ACARED RHUINT HETARB	ACARED >95% cover 1-2ft high, scattered RHUINT and HETARB
149	SMC	RHUINT SALspp ARTCAL HETARB	
150	ORN	ACARED RHUINT MALLAU	Acacia is 2-3 ft high very dense
151	dLBS	RHUINT AGL PICECH POLMON BRORUB VULMYU PLARAC	RHUINT understory trimmed to approx 5-7 ft tall AGL in understory dom bb PICECH
152	LBS/SMC	RHUINT(dom) MALLAU HETARB	Dense veg
153	AGL/dLBS	RHUINT AGL	
154	dAGL	PICECH(dom) AG CYNCAR MIMspp	BG 60% patchey AG
155	CSS	RHUINT(dom) ARTCAL ELYCON BACPIL SAMMEX TOXDIV	dense veg
156	dAGL	AG PICECH CYNCAR SAMMEX RHUINT	Mown dead AG
157	CSS	MALLAU(co-dom) BACPIL(co-dom) ARTCAL RHUINT	
158	ORN	ACARED EUCspp QUEAGR PINspp	ACARED 2-4 feet tall
159	dAGL	AG CYNCAR FOEVUL SALTRA	BG 10-20% mown AG abundant invasives
160	ORN	ACARED	ACARED 12-36 inches high
161	LBS	RHUINT(dom) SALMEL	
162	ORN	ACARED	ACARED 6-36 inches high, spotty RHUINT shrubs
163	DH	SALGLA ACARED RHUINT SAMMEX	BG 90-95% SALGLA 5-10% ACARED 2% spotty trimmed RHUINT and SAMMEX understory 8-12ft high
164	CSS	ARTCAL(co-dom) RHUINT(co-dom) BACPIL	
165	dAGL	SALGLA CYNCAR CROSET CALspp	
166	dAGL	BRANIG(dom)	BRANIG 4-6ft high dry
167	ORN	ACARED	ACARED 1-2ft
168	ORN	ACARED	
169	ORN	ACARED	
170	CSS/GRASS	ARTCAL BACPIL RHUINT MALLAU BRANIG	Patches of CSS and grassland
171	DH	SALTRA	BG 60% dead weeds 40%, erosion control waddles,different plants around drainage

172	DH	SCHMOL DATWRI	Abundant dead weeds~80% Large drainage w 2-4 ft of erosion feeding SCHMOL
173	dAGL	BRANIG(dom) SAMMEX MALLAU BACPIL MALSAX SALTRA	Steep slope, mid FMZ is 80% BG or dead grass, occasional small BACPIL
174	ORN	ACAspp	10 ft high tree form, 2-3 inches of leaf litter
175	DH	SALTRA(dom) NICGLA AG	Dead AG SALTRA and other dead weeds abundant, NICGLA 20%
176	dCSS	BRANIG BACPIL SAMMEX	Fairly dense dead/dry BRANIG, patches of BACPIL and SAMMEX
177	ORN	ACARED RHUINT SALspp	ACARED 90% patches of RHUINT one SALspp tree
178	ORN	SALspp RHACAL RHUINT BACPIL	
179	DH	SALTRA CYNCAR	SALTRA 40-50% some living mostly dead or low lying
180	CSS	ARTCAL(dom) RHUINT BACPIL ATRLEN	
181	DH	AG SALTRA	Patches of dead AG SALTRA 40%, patches of dead weeds
182	CSS	ARTCAL(dom) SAMMEX BACPIL RHUHINT MALLAU	

Appendix 6: City of Newport Beach Urban Wildland Interface Area Standard for Hazard Reduction Undesirable Plant Species & Combustible Plant List

City of Newport Beach
Urban Wildland Interface Area
Standard for Hazard Reduction

UNDESIRABLE PLANT SPECIES

Certain plants are considered to be undesirable in the landscape due to characteristics that make them highly flammable. These characteristics can be either physical or chemical. Physical properties that would contribute to high flammability include large amounts of dead material retained within the plant, rough or peeling bark, and the production of copious amount of litter. Chemical properties include the presence of volatile substances such as oils, resins, wax, and pitch. Certain native plants are notorious for containing these volatile substances.

Plants with these characteristics shall not be planted in any of the fuel modification zones. Should these species already exist within these areas, they shall be removed because of the potential threat they pose to any structures. They are referred to as target species since their complete removal is a critical part of hazard reduction. These fire-prone plant species are (but not limited to):

COMBUSTIBLE PLANT LIST (MANDATORY REMOVAL)

Common Name	Botanical Name
Artichoke Thistle	Cynara cardunculus
Castor Bean plant	Ricinus commons
Wild Artichoke	Cirsium vulgare
Black Mustard	Brassica nigra
Milk Thistle	Silybum marianum
Russian Thistle/Tumbleweed	Salsola australis
Indian Tabacco	Nicotiana bigelovii
Tree Tobacco	Nicotiana glauca
Prickly Lettuce	Lactuca serriola
Horseweed	Conyza canadensis
Telegraph Plant	Heterotheca grandiflora
Mayweed	Anthemix cotula
Burning Nettle	Urtica Urens
Noary Cress, Perennial Peppergrass	Cardaria draba
Wild Turnip, Yellow Mustard, Field Mustard	Brassica rapa
Chamise	Adenostoma fasciculatum
Red Shanks	Adenostoma sparsifolium
Pampas Grass	Cartaderia selloana
California Sagebrush	Artemisia californica
Common Buckwheat	Eriogonum fasciculatum
Black Sage	Salvia mellifera
Pampas Grass	Corraders
Cypress	Cupressus sp
Eucalyptus	Eucalyptus sp
Juniper	Juniperus sp
Pine	Pinus sp