Beverly Hills Very High Fire Hazard Severity Zone
Tree Related Fire Hazards

AN ASSESSMENT OF BEVERLY HILLS’ VERY HIGH FIRE HAZARD AREA PUBLIC AND PRIVATE TREES AND BEST MANAGEMENT PRACTICES FOR REDUCING FIRE RISK

DECEMBER 2019
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Street Management Program Schematic.

TABLE

1 Protected Tree Standards on Private Property.
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Tree Related Fire Hazards

This Urban Forest Management Plan (UFMP) chapter has been prepared such that it can function as a stand-alone document and as an integral component of Beverly Hills’ comprehensive UFMP. The content of this chapter focuses on evaluation, analysis, conclusions, and recommendations on tree management and policies in the Beverly Hills Very High Fire Hazard Severity Zone north of Sunset Boulevard. Because it is a component of the UFMP, this chapter also considers and integrates urban forest management strategies and presents goals, objectives and action items developed toward reducing wildfire tree related hazards, which would have a direct effect on reducing the overall wildfire risk to private and public assets and infrastructure. A glossary of terms is provided in Appendix A.
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Acronyms and Abbreviations

AMSL  Above mean sea level
ANSI  American National Standards Institute
BHFD  Beverly Hills Fire Department
BHMC  Beverly Hills Municipal Code
CAL FIRE  California Department of Forestry and Fire Protection
CFC  California Fire Code
City  City of Beverly Hills
FMZ  Fuel Modification Zone
FMZP  Fuel Modification Zone Plan
ISA  International Society of Arboriculture
UFMP  Urban Forest Management Plan
VHFHSZ  Very High Fire Hazard Severity Zone
VOC  Volatile Organic Compounds
WELO  Water Efficient Landscape Ordinance
WUI  Wildland-Urban Interface
WUIM  Wildland Urban Intermix
1 Introduction

Wildfires throughout California between 2016 and 2019 continued the progressively higher frequency, stronger intensity and larger footprint that the state’s fire environment is facilitating. These fires present a substantial hazard to life and property in communities within the wildland-urban interface (WUI), and they are reminders to all municipalities and residents, including Beverly Hills’, that wildfire will occur and that it takes diligent efforts before a fire occurs to reduce the risk, increase resiliency and properly harden the landscape against wildfire. Although wildfires may occur at any time of year and in any climate, the risk of fire increases greatly with increased drought, low humidity and higher winds, and available fuels. California’s predicted future climate of more severe droughts, higher summertime peak temperatures, and presumably lower humidity (Bedsworth et al. 2018), may equate to longer fire seasons, which could expose Beverly Hills to higher wildfire risk, particularly in the WUI areas north of Sunset Boulevard.

Beverly Hills’ inclusion of WUI areas that are characterized by steep topography, shrubland dominated landscapes (primarily to the north of the City) and adjacency to relatively dense, heavily vegetated private properties, results in potential wildfire pathways or corridors. Beverly Hills, as with the majority of Southern California, is subject to the semi-seasonal Santa Ana events, with high, dry winds which create increased likelihood of ignitions and fire spread and wildland fire threat. This extreme fire environment can facilitate what would normally be small, controllable fires to expand into large, uncontrollable fires, which can quickly overburden Beverly Hills Fire Department (BHFD) and other area fire agencies and triggering large-scale evacuations. This Tree Fire Hazard Assessment is specifically prepared to address the City areas most susceptible to wildland fire impacts, which are the foothills and mountainous areas with adjacency to vegetated areas north of Sunset Boulevard, extending north beyond the City limits (City 2019).

Within the WUI, the State of California Department of Forestry and Fire Protection (CAL FIRE) and BHFD have classified the areas north of Sunset Boulevard (and within City limits) as a Very High Fire Hazard Severity Zone (VHFHSZ) (Refer to Figure 1). This fire hazard designation is based on the hazardous fire environment, including steep terrain, continuous fuelbeds, access challenges and potential for extreme weather conditions. The Beverly Hills VHFHSZ is a densely populated area with homes embedded in natural and managed landscape vegetation in what may be more accurately described as a wildland urban intermix (WUI). WUI and WUIIM fires are high risk events in terms of resident life safety and property protection, including homes and other structures. By comparison, Beverly Hills’ “flats”, which is relatively flat land that gently slopes from north to south and is located south of Sunset Boulevard, is urbanized with predominantly ignition resistant landscapes and inclusive of the majority of the City’s residents and urban treescapes. These areas have minimal to no wildland fire exposure. However, during extreme weather conditions, airborne embers may still threaten portions of the City south of Sunset Boulevard.

It is important to note that the BHFD is aware of the wildfire threat in the WUI and WUIIM portions of the City. BHFD has performed numerous assessments and evaluations of the area, including commissioning this tree fire hazard assessment, as well as having performed hazard reduction efforts (City 2019). Due to these efforts toward reducing the vulnerability of homes and landscapes to wildfire, the area north of Sunset Boulevard, has been recognized as a Firewise Communities USA (2005) site. The Firewise Communities approach emphasizes City as well as individual homeowner responsibility for creating a wildfire safe community. This approach consists of using ignition-resistant

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1 The wildland-urban interface is the area where urban and suburban development meets the undeveloped areas containing natural vegetation.

2 In 1992, Assembly Bill-337, known as the “Bates Bill”, required all cities and counties in California to identify within their communities the VHFHSZ.
BEVERLY HILLS VERY HIGH FIRE HAZARD SEVERITY ZONE
TREE RELATED FIRE HAZARDS

home construction materials and methods and maintaining fire resilient landscapes in wildfire-prone areas. In addition, BHFSD requires the management of vegetative fuels, including trees, near homes and along roadways within the VHFHSZ areas. Although these efforts have reduced the area’s fire vulnerability, more can be done, primarily due to the existence of transitional fuels in the form of dense landscapes, including the use of tree species that are considered highly flammable in close proximity to residences and other structures.

Under clear direction of City Council and Council Priorities #32 (Public Safety) and #49 (Tree Master Plan), the BHFD consulted with David Kerr, Wildland Fire Consultant, to complete the 5-year update report3, which is titled “A Wildland Fire Hazard Assessment of Beverly Hills” (City 2018). This report describes the existing fire hazard for areas north of Sunset Boulevard within the City’s administrative boundary and up to a two mile buffer outside the City’s jurisdictional control. Based on the results of the fire spread simulation modeling (i.e., FARSITE4 fire simulations) for the wildland fire assessment report, it was empirically determined that the greatest threat to the City would be from a fire burning into Beverly Hills from a northerly jurisdiction. The primary fire hazard areas adjacent to the City are the lands east and north of Franklin Canyon Reservoir and lands west of Carla Ridge Road in Trousdale (Kerr 2018).

The wildland fire assessment report also contemplated urban forest implications, including both City-owned and private property trees contributing to the spread of fire in the City’s northern portion. The report addressed the City’s urban forest because a concern had been previously raised from some community members that the presence of certain tree species within the City represented an elevated fire risk (Kerr 2018). Therefore, it was presumed by Beverly Hills residents that these tree species are fire propagators and should be removed from the landscape. The wildland fire assessment identified species of Cypress, Eucalyptus, Juniper, Palm, and Pine as the urban trees of greatest concern from a wildfire perspective. Additionally, the City’s Tree View Restoration Guidelines for the Trousdale community considers Eucalyptus, Pine, and Italian Cypress as nuisance trees5 that should not be newly-planted in Trousdale Estates. These tree species have been widely planted within 100 feet of structures by private residents and by the City along primary travel routes that will be critical wildfire evacuation corridors from the densely populated ridgetops and three canyons (Franklin, Coldwater, and Benedict), north of Sunset Boulevard (Figure 2).

In order to evaluate the City’s urban forest, and including the extent of wildfire prone tree types, the City Council approved (April 2, 2019) the preparation of this Urban Forest Management Plan (UFMP). The UFMP is a comprehensive assessment of the urban forest, including publicly- and privately-owned trees, and was prepared in two phases. The first phase, Wildfire Hazard Evaluation and Mitigation, focuses on evaluation of fire propagators (tree species) in the northern portion (e.g., areas north of Sunset Boulevard) of the City6. This chapter (i.e., Phase One) included summarizing the urban forest-related wildfire hazard presented by certain tree species. Additionally, this UFMP chapter presents a goal for wildfire hazard reduction, objectives toward achieving the goal and recommends specific actions to provide pre-fire landscape hardening, ongoing management, hazard reduction through tree maintenance practices that result in higher ignition resistance, tree spacing, and removal and replacement strategies for both private and public trees. Further, this analysis includes recommendations for ordinance and policy updates restricting planting of certain tree species in the fire hazard zones.

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3 Firewise Communities USA requires the City of Beverly Hills to update its wildland fire assessment every 5 years.
4 FARSITE is a fire simulation modeling system that computes wildfire growth and behavior.
5 Additional private trees were also noted in View Restoration Guidelines for Trousdale: King Palm, Queen Palm, Canary Island Date Palm, and Ficus.
6 This chapter focuses on fire-prone trees solely in the VHFHSZ areas north of Sunset Boulevard, even though fires starting in the mountainous regions could burn well into the flatland of Beverly Hills.
FIGURE 2
Wildfire Evacuation Routes
Beverly Hills VFHZ Tree Related Fire Hazards

SOURCE: ESRI; COUNTY OF LOS ANGELES; CITY OF BEVERLY HILLS

Evacuation Route
City of Beverly Hills
Beverly Hills Parcels

DRAFT

SOURCE: ESRI; COUNTY OF LOS ANGELES; CITY OF BEVERLY HILLS
2 Tree Related Fire Hazard Analysis

Dudek’s fire protection planners provide independent evaluation of fire environments and recommendations and approaches to resolve issues. In order to achieve successful outcomes, Dudek coordinates with and places high value on input provided by City stakeholders. The following information reflects participation by, and input from City staff and decision-makers who agreed to participate in this tree fire hazard study. City input is critical to this process because the people who work day to day in the City understand the issues and can provide perspective on previous studies, current policies, and City-attempts to resolve them. This report also incorporates input from more than 100 (Dudek will be completing this section once the public survey is completed and the data analyzed) concerned citizens who provided fire comments via a Dudek-City prepared on-line public survey. Public input and value sharing are integral to UFMP’s and as such, this Chapter incorporates the views of Beverly Hills residents who were generous enough to share them. Additionally, Dudek’s Fire Protection Planners reviewed City tree regulation and fire policy information, conducted a visual community assessment of the WUI and WUIM areas north of Sunset Boulevard, and evaluated the locations of fire-prone tree species in the VHFHSZ using high spectral imagery analysis (See Section 4.0).

The following key elements provided valuable insight:

2.1 City Department Interviews

Key personnel from Beverly Hills Fire Department, Planning Department, and the City Manager were interviewed to help inform this analysis. The interviews had a semi-structured format along with time to freely discuss fire hazard tree and urban forestry topics relevant to the departments and their respective missions. The interviews provided a setting where the City could provide feedback to Dudek on their respective roles, experiences, background, and tree related issue history. In addition, they provided perception of what the primary tree related fire hazard issues are, what is currently working and what is not working, their opinions on the most significant impediments to success, and their greatest tree related concerns. Interviewees often expressed a conflict between fire hazard reduction efforts aimed at private property owners while the City includes fire hazardous trees under its own management. Similarly, some City staff commented on the lack of specific expertise to carry out hazard reduction planning and landscape plan reviews.

2.2 Public Survey

A robust public survey was developed by Dudek with City review and input. The on-line survey was reviewed for statistical viability before it was released for public use. The final survey was made available to the public in English and Spanish and was disseminated through the City’s Website, Beverly Hills TV channel, newspapers, events, and social media. A total of (100 and counting***) surveys were completed by the public and provided a rich data set that was statistically evaluated by specialists at the USDA Forest Service. The survey results indicate that respondents consider trees (Dudek will be finalizing this section when the survey period is over and the data has been evaluated).
2.3 City Information

The City provided a variety of documents for Dudek’s review which would ultimately be used to inform the analysis and augment understanding of the current approaches and priorities. The combined data set assisted the wildfire tree hazard analysis, with a focus on certain fire facilitator tree species that are present in the City’s urban forest. Among the resources reviewed were:

- City of Beverly Hills Local Hazard Mitigation Action Plan 2017-2022
- Wildfire Evacuation Routes – City of Beverly Hills, October 2018
- Very High Fire Hazard Severity Zones in Local Responsibility Areas as recommended by CAL FIRE, March 2018
- A Wildland Fire Hazard Assessment of Beverly Hills prepared by David Kerr, Wildland Fire Consultant, October 23, 2018
- View Restoration Ordinance and Guidelines, Beverly Hills Municipal Code (BHMC) Section 10-8-101-
- Water Efficient Landscaping, BHMC Section 9-4-401
- Landscape Design Plans in City’s VHFHSZ, BHMC Section 9-4-406
- Applicable Beverly Hills Building and Fire Codes, including but not limited to City’s Brush Clearance Program and Fuel Modification Standard (currently being developed)

2.4 Field Assessment and Observations

Dudek conducted field evaluations of the VHFHSZ which consisted of driving throughout the area and documenting general tree and fire-related observations. The evaluation did not include extensive vegetation mapping. Field evaluations focused on providing a baseline understanding of the area’s terrain, fuels, and assets (residences and other structural features) and augments and provides perspective to the available digital information that was used to map flammable tree species and inform conclusions and recommendations.

As discussed, the City’s VHFHSZ occurs north of Sunset Boulevard. This area includes terrain that slopes from the highest points in the north (just under 1,500 feet above mean sea level (AMSL)) to the lowest points in the south (approximately 370 feet AMSL) and again from higher elevations in the east to lower elevations in the west. The terrain includes steep slopes, flatter canyon bottoms, and generally fire facilitating extreme wind alignments. The VHFHSZ area is characterized by high to moderately dense residential development with primarily estate lots. Vegetation is considered to vary from moderately dense to very dense throughout the urbanized areas including very highly maintained landscapes intermixed with unmaintained native vegetation on slopes, disturbed, highly ornamental/exotic species on other slopes, and heavy tree canopy in some areas, especially along major roadways. The City’s boundary is directly adjacent to three large, north-south canyons that are dominated by unmaintained native slopes. These canyons are located at the purported geographical center of the City of Los Angeles and present the most significant wildfire threat to Beverly Hills.

Because Beverly Hills’ VHFHSZ is largely converted to urban landscapes, the corresponding risk of ignitions and subsequent wildfire spread is reduced from an unmaintained canyon condition. However, the juxtaposition of Beverly Hills’ VHFHSZ at the downwind end of these deeply incised canyons results in a potentially hazardous condition for wildfire transition into the WUI/WUIM. Red Flag Warnings, which may occur any time of the year, focus extended low humidity periods with high winds. Low humidity quickly dries out native, unirrigated
vegetation, resulting in fuel that is readily ignited. High winds exasperate the drying process and quickly spread wildfire through pre-heating vegetation and through ember spotting. Ember storms created by burning vegetation and blown by high winds can ignite downwind structures and landscape vegetation, which in turn creates new fires and ember sources. Trees represent a significant fuel source once ignited and can burn for long durations. The physical stature of trees can result in fire occurring at great heights in the tree crown and creating ember storms that can produce hundreds of thousands of small burning embers that are propelled downwind. The larger of these embers may remain viable, that is able to ignite new fires, for great distances of 1.5 miles or more.

2.5 Ember Threat Discussion

Wildfires to the north of Beverly Hills, driven by winds may produce spot fires generated by embers. These fires are a function of three elements of the wildland fire environment; firebrand sources, transport mechanism and a receptive fuelbed away from the main fire. Without all of these elements occurring within the fire environment, spot fires will not propagate and spread. A fire burning within or adjacent to Beverly Hills has ready access to fuels that will support firebrand production and the convection column of a fire influenced by the prevailing winds provides the transport mechanism. The component that offers the highest ability for human intervention and control is available fuel sources, otherwise known as receptive fuelbeds. The availability of receptive fuelbeds is highly variable. The definition of a receptive fuelbed is a fuel that will ignite and support the spread of a wildland fire when a firebrand lands on it. This may be native or ornamental vegetation, but could also be leaf litter accumulated in rain gutters, flammable furniture on a deck or a poorly positioned and maintained tree.

There is an abundance of ornamental and native vegetation associated with the residential landscapes and road rights-of-way throughout much of Beverly Hills’ VHFHSZ. This mix of native and ornamental vegetation serves as potential receptive fuels. Land owners and the City may take proactive steps to harden their structures and landscapes from the potential damage associated with spot fires. Most important of these steps is compliance with basic defensible space requirements (Beverly Hills Ordinance 16-0-2719), which defines the standards for defensible space near a structure. More details regarding this subject can be found in Section 3.0.

2.6 Specific observations from the VHFHSZ

2.6.1 Public Tree Related Fire Hazards (Benedict, Coldwater, and Franklin Canyons)

Public trees within the VHFHSZ are predominantly located along roadways. The tree types of greatest concern (pines, palms, eucalyptus, cypress, cedar, and juniper) occur throughout the VHFHSZ, but are especially concentrated along Coldwater Canyon Road, within Trousdale Estates (Loma Vista Road and Carla Ridge), along Doheny Road, Lexington Road, southern Benedict Canyon Drive, and at the Greysone Mansion (Figures 3a and 3b).
Benedict, Coldwater, and Franklin Canyons to the north of the City, represent a significant wildfire threat due to the native fuelbeds, steep terrain, wind alignment and connectivity with Beverly Hills’ VHFHSZ. Previous studies (Kerr 2018) have indicated that the greatest wildfire threat to Beverly Hills is from the north and these canyons provide the conduit through which wildfire is facilitated. Each of these Canyons extend north of Beverly Hills’ boundary, and are heavily populated with homes and people along with native vegetation on undeveloped slopes. Within Beverly Hills, the downwind end of these canyons, there is extensive WUIM including landscapes with varying tree canopy densities.

It is likely that Benedict Canyon Drive, San Ysidro Drive, N. Beverly Drive and Coldwater Canyon Drive would all be actively used for evacuation during a large, wind-driven wildfire. Of these, Coldwater Canyon Drive would potentially experience the heaviest evacuating vehicle density, and it includes the most dense tree canopy, which is dominated by large Canary Island Pine trees (Figure 4). Similar tree canopy occurs on Doheny Road, Lexington Road, and southern Benedict Canyon Drive. As previously mentioned, any tree can ignite and burn under the right conditions, but some trees, including pines, are considered, under some conditions, more flammable than others due to their leaf and crown form, litter accumulation, resinous exude, and terpenes. Although the presence of the large trees along Coldwater Canyon Drive represent a potential as wildfire fuel, Dudek’s evaluation concluded that the trees are considered to be currently maintained such that ignition and fire spread is minimized. The trees are maintained with their crowns raised substantially above ground due to their roadside location which requires a minimum of 17’ vertical clearance, per City-provided information. This along with maintenance of the ground vegetation at low heights minimizes the ability for a ground fire to “ladder” into the tree crowns. Exceptions occur where private property adjacent to the pines includes large hedges or other vegetation in close proximity to the pines (Figure 5). However, even in these locations, the adjacent landscape is highly maintained and irrigated, resulting in high internal fuel moitures and reduced risk of ignition. The Canary Island Pine trees along Carla Ridge present a potentially higher risk of ignition due to their previous topping, which resulted in denser canopies and higher stress and incidence of decline.
2.6.2 Private Property Tree Related Fire Hazards

Beverly Hills’ privately owned trees are dispersed throughout private lots which encompass the entire VHFHSZ. Whereas the public trees are primarily linear based along roadways, trees on private properties form a more uniform, although rarely dense canopy. Tree densities vary greatly from property to property with some lots devoid of trees and others heavily populated. As discussed, most urbanized landscapes are more fire resistive than native landscapes. Ornamental landscapes that are irrigated and receive maintenance (removal of dead and dying plants, trimming, thinning) are generally less receptive fuelbeds than an unmaintained native landscape. Wildfire moving through urban landscapes like those found in Beverly Hills VHFHSZ is patchy, slower spreading, and of lower average intensity, which is the nexus for and intent of fuel modification zones or defensible space. Modified fuel areas work because highly flammable species are removed, vegetation densities are reduced, plants are kept hydrated and healthy, and appropriate setbacks are provided so that if a plant ignites, it will be less likely to compromise the property’s residence.

Dudek analyzed the occurrence of the higher flammability species (pines, palms, eucalyptus, cypress, cedar, and juniper) and their distribution throughout the VHFHSZ. The first attempt included the utilization of a sophisticated mapping technique that relies on machine learning (artificial intelligence) to essentially be trained to identify the tree types’ crown signatures and identify them throughout the landscape. While image classification and remote sensing are well established technologies, sometimes the results are not as comprehensive or conclusive as anticipated. In the case of using Digital Globes World View 2 data to classify and identify the location of a variety of tree species in Beverly Hills’ VHFHSZ, the classification was not statistically conclusive and reported too many false positives. The main difficulty in this analysis was the sheer number of tree species and varieties. As this area includes a large variety of tree species, the image classification had a difficult time identifying individual trees. The tree species GIS data from the City of Beverly Hills has over 200 distinct species and varietals and the number of privately owned species, although unknown, would increase this total, potentially substantially. In addition, several of the target tree types are similar physiologically and therefore, typical classifications methods did not produce clear results.

While there was success to a fair degree, the amount of false positives made the result too unreliable for analysis. Substantially more field time to post validate the results might help remove some of the experienced “noise”. For example, regarding higher fire prone palms, the palm tree spectral signatures are not unique enough to provide a usable image classification product. Image classifications have too much spectral overlap with other features to be useful (generate a high number of false detections).

Due to the lack of success experienced, Dudek proceeded to manually digitize the higher flammability trees using a pan-sharpened multispectral image product. Using this image as the base, a trained arborist viewed the entire VHFHSZ area and digitally mapped individual tree crowns and tree grouping canopy. Each mapped polygon was classified by tree type (pine, palm, cypress, eucalyptus, cedar or juniper). The results of this effort are provided in Figures 6a and 6b. As depicted, the majority of privately owned, higher flammability trees are located in the southwest portion of the VHFHSZ, although there are occurrences as far north as the extreme northern end of Trousdale Estates. This effort was informative regarding where higher flammability trees occur in landscapes and generally being able to conclude that there are many instances where these tree types occur too close to structures/residences and may increase the potential fire risk. Not all of the mapped trees are considered highly hazardous, as many of them are setback from adjacent structures and are provided ongoing maintenance and have access to irrigation. These factors decrease the trees’ likelihood of igniting, but less clear than with the Public trees is the actual percentages of these higher flammability trees that are within proximity of private residents and other structures. A widely accepted standard is that these types of flammable trees should be no closer than 30 feet (edge of tree crown) from adjacent structures, but it is considered safer to minimize these trees within the first 100 feet, even when they are provided maintenance.
2.7 Greystone Mansion Tree Related Fire Hazards

The Greystone Mansion was evaluated in terms of its potential fire
wildfire hazard. The primary fire concern expressed to Dudek
relates to the presence of numerous Italian cypress and pine trees
within the landscape (Figure 7). Dudek’s opinion regarding the
Greystone Mansion’s overall vulnerability to fire is that the site’s
landscape is very highly maintained, plants and trees are irrigated
and maintained with high internal moisture contents, and the
vegetation is in large part appropriately setback from site
structures. The structures themselves appear to be ignition
resistant. There are some areas on the property that include dense
tree groupings, mostly eucalyptus and pine trees, such as directly
east, west and northwest of the structure, and these areas
could benefit from thinning trees and potentially removing trees to create
greater setback from the structure. There is some potential for the
Italian cypress to ignite from flying embers, but they are highly
maintained, occur in landscapes that are devoid of ground fuels that could ignite and ladder into the trees, are
setback a considerable distance from on-site and off-site structures, and are not considered to be the highest
priority for fire hazard reduction at the site.

2.8 Trousdale Estates Tree Related Fire Hazards

Trousdale Estates includes a high number of residences within a larger community. The properties vary in size, but
generally, the developed component of the lots has converted the majority of the land to the built environment.
Residences are large on most of the lots, covering approximately 50 and 75 percent of the land. Some lots include
unbuildable slopes that include unmaintained native vegetation, ornamental vegetation or a combination of the two.
Tree canopy density varies throughout Trousdale with higher densities occurring on slopes adjacent to homes and
along internal roadways. Many of the lots do not include enough room for large-stature trees due to home sizes.

Wildfire risk in Trousdale Estates includes potential for short-timeframe wildfire warning due to a nearby fire start
(such as north in the canyons), high number of residences and related population, and evacuation routes that could
be quickly congested. Wildfire vulnerable fuels throughout the VHFHSZ zone, including Trousdale Estates,
could include patchy fire with multiple spot fires, burning slope vegetation, trees and potentially structures. The
higher flammability tree types observed in Trousdale are primarily pine trees located on the slopes bordering the
eastern and western community boundaries as well as along roads, particularly Carla Ridge Drive. The City-owned
Canary Island pine trees are in moderate, but declining health. There are numerous trees with structural
maladies, including previous tree topping, which has resulted in poor structure and stressed conditions. Trees on
Carla Ridge exhibit the highest level of stress and decline. Many of the declining pines on either side of Carla
Ridge have been removed as indicated by several vacant tree planting spots and many more will require removal
in the short or mid-term due to their declining or poor overall conditions. Additionally, the slopes adjacent to much
of Carla Ridge create a circumstance where creating crown separation from understory plants is difficult or
impossible. The tree crowns are situated too close to some adjacent homes.

Since access to private lots was not possible, the health and condition of the majority of privately-owned trees in
Trousdale Estates could not be determined, but it was observed that trees, including those of the higher
flammability tree types, do occur within 30 to 100 feet of structures.
3 Codes and Standards

Sustainable and resilient urban forests can be planned and designed to perform well in catastrophic wildfires. The planting, pruning, and maintenance of the City’s and privately owned trees must be coupled with effective policies and ordinances that adhere to best fire-safe landscaping practices. Fire resistant landscapes require that fire-safe practices in the VHFHSZ area extend beyond the public space and onto private property, where a large portion of the urban forest tree canopy exists.

City Staff interviews resulted in a clear understanding that Beverly Hills aims to be proactive in urban forest fire management (both City and private trees), north of Sunset Boulevard in the VHFHSZ area. In the past, the City has taken a strong position to create a safer community from fires by adopting the Wood Roof Ordinance (#07-0-2520) in June 2007 and reducing the risk from fire damage and loss through the Firewise Community USA program for the northern portion of Beverly Hills. Similarly, many residents, for example, those in Trousdale Estates, have voiced strong concern about an elevated fire risk in their communities. The efforts the community has taken toward systematically addressing tree-related fire risk is not clear at the time of this report’s preparation. The abundance of privately owned trees within 30 to 100 feet of residences indicates that there are still fire issues to be resolved, possibly requiring policy and code changes.

This section describes existing City fire codes and standards relevant to hazardous trees that are located in the portion of the City north of Sunset Boulevard. It examines these documents for their ability to require and enforce the City and private property owners to properly wildfire harden the landscape.

3.1 General Plan Safety Element

The Safety Element of the General Plan was adopted in 1976 and amended in 2010. The purpose of a safety element is to reduce the potential risk of death, injuries, property damage, and economic and social dislocation resulting from large-scale hazards. The City’s Safety Element specifically addresses fire, flood, geologic and seismic hazards, hazardous materials, noise, and natural and man-made disaster preparedness. The fire hazards section of the Safety Element describes the City’s unique fire risks, including structural fires and wildfires, as well as goals and policies related to emergency response and fire prevention.

Fire-safe landscaping, including public and private properties with trees, is described in Policy: S1-Protection of Life and Property. This policy addresses the need for all property owners to perform regular maintenance on their properties to reduce the fire danger and maintain a fire-safe landscape. In addition, defensible space is expanded to 200 feet of fuel modification for structures in the City’s VHFHSZ area.

The key to protecting life and property from fire begins from the structure outward, rather than from the wildland inward. Policy S.3.1 Safety Standards, describes proactive and preventative fire protection measures for existing and new development and redevelopment. This Safety Standard provides for regular updates and enforcement of the City’s building, which includes WUI Building Standard Chapter 7A for new construction in wildfire-prone areas, and fire codes.

Note: Chapter 7A of the California Building Code correlates the ability of a structure to survive a wildfire with in VHFHSZ areas, maintenance of the defensible space which includes hazardous trees, and building materials used
on the outside of the structure. Some highlights of the Chapter 7A building standards regarding exterior materials and construction methods includes the following:

- The required fire rating of **roof covering** (Class A) and assembly is defined.
- Gaps between the **roof covering** and **roof deck**, such as clay barrel tile roofs, must be plugged at the ends (i.e., bird stops).
- Energy-efficient dual-pane **windows** must include at least one pane of tempered glass.
- **Vents** used in eaves and soffits or roof must resist the intrusion of embers and flames.
- Exterior **Siding** must be classified as noncombustible or ignition-resistant.

### 3.2 Municipal Code

#### 3.2.1 Protected Trees

Beverly Hills Municipal Code (BHMC, Section 5-6.1001) was enacted to protect and preserve trees by regulating their removal, to prevent unnecessary tree loss and minimize environmental damage during construction-related activities, and to effectively enforce tree preservation regulations on public property. Trees on public property are regulated by the Department of Public Works. The City defines protected trees, which are located on public property, as trees that are indigenous to the Beverly Hills area. Protected trees include Big Leaf Maple (*Acer macrophyllum*), California Alder (*Alnus rhombifolia*), Foothill Ash (*Fraxinus dipetala*), Arizona Ash (*Fraxinus velutina*), Southern California Black Walnut (*Juglans californica*), California juniper (*Juniperus californica*), California sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii*), Black cottonwood (*Populus trichocarpa*), Coast live oak (*Quercus agrifolia*), Blue oak (*Quercus douglasii*), Mesa oak (*Quercus engelmannii*), Valley oak (*Quercus lobata*), Red willow (*Salix laevigata*), Mexican elderberry (*Sambucus mexicana*), and California bay (*Umbellularia californica*). Although California juniper is a protected tree, it is considered highly flammable due to its thin, shredded bark and aromatic, scale-like leaves that contribute to its ignitability.

Trees on private property are regulated by the Community Development Department. The City’s municipal code (Section 10-3-2900) defines protected trees on private property as any native tree, heritage tree, or tree within an urban grove as detailed in Table 1, below.

**Table 1. Protected Tree Standards on Private Property**

<table>
<thead>
<tr>
<th>Protected Tree Type</th>
<th>Tree Specifications and Requirements$^1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Tree</td>
<td>Local native trees found on the City’s Official Protected Tree list with a circumference of 24 inches or more, measured at a height of four feet six inches or diameter at 4.5 feet above natural grade. This applies to trees in a street side yard or front yard.</td>
</tr>
<tr>
<td>Heritage Tree</td>
<td>Any tree not listed on the City’s official list of native trees with a primary trunk circumference of 48 inches measured at 4.5 feet above natural grade.</td>
</tr>
<tr>
<td>Urban Groves</td>
<td>50 or more trees where the branches of each tree are within six feet of the branches of one of the other trees in the grove. Individual trees in an urban grove can be of any size and are not subject to any circumference limitations.</td>
</tr>
</tbody>
</table>

**Note:**

$^1$ Identification of tree species is required to be determined by a certified arborist.
A tree removal permit is required only for trees meeting the tree specifications in Table 1. Prior to issuance of a tree removal permit, the Community Development Department may request that a protected tree report be submitted by a licensed arborist.

### 3.3 Fire Code

BHMC Chapter 2 (Fire Code- Ordinance 16-0-2719, effective 1-20-2017) and its amendments to the 2016 California Fire Code (CFC) establish regulations regarding the hazard of fire and explosion arising from the storage, handling, or use of structures, materials or devices; conditions hazardous to life, property or public welfare in the occupancy of structures, or premises; fire hazards in the structure or on the premises from occupancy or operation; matters related to fire suppression or alarm systems; and conditions affecting the safety of firefighters and emergency responders during emergency operations. The City adopts new changes to its Fire Code every three years.

The Fire Code also includes Section 4902, which defines the City’s VHFHSZ and outlines requirements for defensible space and hazardous vegetation management. Specifically, Section 4906.3.1 of the Beverly Hills Fire Code states that vegetation around all applicable buildings and structures within the VHFHSZ shall be maintained within 200 feet (Note: At the time of preparing this report, BHFD is updating the Fire Code and creating a new Fuel Modification Standard). This Section also addresses requirements to reduce fire spread within the defensible space zone for property owners in the VHFHSZ by disrupting the vertical and horizontal continuity of plants, including eliminating ladder fuels. BHFD provides vegetation maintenance guidelines through its City-wide brush clearance program (http://www.beverlyhills.org/departments/firedepartment/brushclearanceprogram/).

### 3.4 Water Efficient Landscape Ordinance

Since 2015, all landscapes are required to comply with California’s Executive Order No. B-29-15 and BHMC. These requirements are commonly referred to as the Water Efficient Landscape Ordinance (WELO). Per Section 9-4-405 of BHMC, prior to issuance of a building permit for any project that involves landscaped areas or altered landscaped areas, the project applicant must submit a landscape documentation package for review and approval by the Community Development Department. As part of the submittal package, the landscape design is supposed to address fire safety and prevention, if the project is located in the VHFHSZ. However, the landscape drawings are currently not being reviewed by BHFD staff for compliance with City’s defensible space requirements (Note: BHFD is developing a Fuel Modification Standard that provides fuel modification landscape plan review and approval by the Fire Code Official for new construction or 2,500 square feet of re-landscaping subject to the WELO).

### 3.5 Trousdale View Restoration Ordinance

The Trousdale View Restoration Ordinance (Ord. 11-0-2616, effective 1-6-2012), which is a part of the BHMC, Sections 10-8-101 to 10-8-110, was initially adopted by the City Council in 2011. The primary intent of the ordinance is to encourage Trousdale neighbors to reach early resolution when addressing restoration of views that have been substantially disrupted by foliage growth on neighboring properties. It also provides landscape standards in a view restoration guidelines document (BHMC Section 10-8-109) for Trousdale property owners in planting trees that will not result in current or future obstruction of neighbor’s views. Although these landscape
standards for Trousdale should not be construed to apply to City trees, the City has provided the following guidelines for newly planted trees on hillside view areas:

- Grow to maximum height (e.g., 14 to 15 feet) that would not likely result in disruption of view
- Can be easily and repeatedly pruned to maintain appropriate heights
- Are appropriate to the climate and water conditions of Beverly Hills
- Would not negatively impact slope stability

In addition, the City has emphasized the importance for planting trees that are fire resistant and not in close proximity to the homes in accordance with the City’s Brush Clearance Program.
4 Fire Hazard Trees – Description

It is important to note that, given certain extreme fire conditions, all trees can burn during a wildfire, regardless if they are classified as fire resistive. Whether a tree species will ignite, sustain the ignition, and spread is determined by characteristics that make them more flammable than others. Flammability can be defined as a combination of ignitability, combustibility, and sustainability, where ignitability is the ease of or the delay of ignition, combustibility is the rapidity with which a fire burns, and sustainability is a measure of how well a fire will continue to burn with or without an external heat source (White and Zipperer 2010). Flammability is influenced by several factors, which can be classified into two groups: physical structure (e.g., branch size, leaf size, leaf shape, surface-to-volume ratio, and/or retention of dead material) and physiological elements (e.g., volatile oils, resins, and/or moisture content) (Moritz and Svihra 1998; UCCE 2016; UCFPL 1997; White and Zipperer 2010). Trees that are less flammable have low surface-to-volume ratios, higher stored moisture contents, and minimal dead material or debris, while those that are more flammable have high surface-to-volume ratios, exhibit low moisture contents, contain volatile oils, and have high levels of dead material or debris (Moritz and Svihra 1998; UCFPL 1997; UCCE 2016; White and Zipperer 2010). Tree condition and maintenance is also an important factor in flammability. Some tree species that have more flammable characteristics can become less flammable if well maintained and irrigated, but can also be more flammable when poorly maintained, or situated on south-facing slopes (high sun and heat exposure), in windy areas, or in poor soils (Moritz and Svihra 1998). In general, most trees north of Sunset Blvd. in the City are regularly irrigated or maintained for the purposes of promoting overall plant health.

Research into plant flammability has resulted in the development of plant lists in many California fire jurisdictions intended to promote the planting and retention of less flammable plants in defensible space zones, the WUI, or areas where vegetation management aims to reduce fire hazard (UCCE 2016; UCFPL 1997; Nader et al. 2007, Moritz and Svihra 1998). Plant lists typically identify recommended lower flammability (or firewise) trees that are acceptable in fire hazard areas, or, conversely, highly flammable trees that are not recommended for retention or planting. Although these lists can be useful for tree selection in the urban forest, it should be noted that there are no fireproof tree species, especially if not provided proper care and maintenance.

4.1 Higher Flammability Trees

Some tree species are more flammable than others and may propagate the spread of a wildfire. In relation to this study of urban trees, the tree type, such as Cedar, Cypress, Eucalyptus, Juniper, Palm, and Pine, were identified as more susceptible to burning, due to rough or peeling bark, production of large amounts of litter, vegetation that contains oils, resin, wax, or pitch, or tree canopies that inherently include a high dead to live fuel ratio (e.g., large amounts of dead material in the tree canopy). These trees are widely considered by fire agencies as undesirable and deemed less resistant to ignition. A recommended list of trees that are prohibited for new planting north of Sunset Boulevard is provided in Appendix B.

These tree types, where they already exist along roadways or on a private property, would be retainable, but that would be subject to it meeting best management practices for maintenance (pruning, thinning, irrigation, litter removal and ground plant maintenance), setbacks from structures, and spacing from other trees. The goal is to minimize the likelihood of individual trees resulting in direct heat and flame on a structure by setting back

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7 High flammable tree species are also referred to as pyrophytes or pyrophytic.
8 It should be noted that tree species within the same genus do not always have the same flammability.
Beverly Hills Very High Fire Hazard Severity Zone
Tree Related Fire Hazards

Distances where these trees occur and breaking any fuel chains that may facilitate fire toward a structure. The above list of tree types is intended as a guide only for trees found in the City's urban forest north of Sunset Boulevard and does not incorporate all flammable tree species outside of the VHFHSZ. The following are characteristics for each identified genus of tree which makes them less desirable and deemed less resistant to wildfire within 100 feet of a structure or along primary emergency vehicle or evacuation routes.

4.1.1 Conifers

Conifers are evergreen tree species that have needles instead of leaves. Typical examples of conifer genera that are located north of Sunset Boulevard in the City are pine, juniper, cedar, and cypress. Conifers have characteristics that may make them highly flammable, such as the production of needle or leaf litter and peeling bark, or the presence of volatile oils and resins.

- **Cedars** – Of the two species of the genus Cedrus north of Sunset Boulevard, Deodar cedar (*Cedrus deodora*) is predominant (figure 8). It is a large evergreen coniferous tree developing a pyramidal form reaching 80 feet and higher. The leaves are needle-like and contain a highly flammable resin. Cedars typically have a conic crown with level branches and drooping branchlets which could encourage maximum updraft during a surface fire.

- **Cypress** – Per the City’s tree inventory, the Italian cypress (*Cupressus sempervirens*) is the most common cypress tree north of Sunset Boulevard. (Figure 9) Italian cypress is a tall, upright tree, reaching 40 to 60 feet high and is trimmed or grown into many forms, ranging from broad and open, to narrow and columnar. Italian cypress has been widely used in ornamental landscapes as screens, hedges, and individual plantings with their full canopy extending to the ground. The tight, columnar growth form of the tree allows for retention of dead material in the canopy, which is more likely to ignite. As such, Italian cypress are known to become tall torches during wildfires.

![Figure 8. Typical Deodar cedar.](image)

![Figure 9. Typical Italian Cypress at Greystone Mansion](image)
• **Juniper** – Commonly thought of as a propagator of wildfire, juniper is a landscape large shrub or tree in Beverly Hill. Several juniper varieties, including the Hollywood Juniper (*Juniperus chinensis* ‘Torulosa’) (Figure 10) that is found in the VHFHSZ area, contain highly flammable resins in the scale-like foliage. As they age, junipers can accumulate dead leaves and branches within the tree crown, which makes them more prone to easily ignite. Junipers were not present at high densities in the VHFHSZ, but do occur sporadically. They are not considered to be a significant issue, but should not be included in landscapes as new plantings.

• **Pines** – The majority of the genus *Pinus* north of Sunset Boulevard consist of Aleppo Pine (*Pinus halepensis*) and Canary Island Pine (*Pinus canariensis*) (Figure 11). Most pines are highly flammable; the fine, pine needles produce a volatile organic compound (VOC) or flammable gasses (Gabbert 2014) that could be released and ignited. Additional features that promote ignition are heavy litter fall, flammable oils in the foliage, and retention of dead needles that promote ignition in the canopy (USFS 2013). Pine trees are common throughout the VHFHSZ, on both private and public property. Pine trees are considered among the top priorities for reducing fire hazards, particularly on private properties, but also on public properties including evacuation corridors.
4.1.2 Palms

Following the 2007 wildfires in San Diego County, it was observed during County damage assessment surveys that certain species of palms increased the fire hazard due to tree-form and lack of maintenance. It was discovered that species of palms that have fibrous tissue or leaf stem bases along the trunk can quickly ignite and consume the rest of the palm tree (Figure 12). Additionally, dried palm fronds that persist on the trunk, will form a “skirt” or petticoat of brown thatch. Such leaf-base skirts can present a high fire hazard. Once ignited, the dried palm fronds can also detach from the trunk and be carried by a strong wind for great distances igniting anything combustible. Palm trees result in significant ember production that can ignite additional fires downwind. Palms occur throughout the VHFSHZ and after Pines, are considered the highest priority in terms of higher flammability tree types.

The City’s tree master inventory identifies 1,121 palms north of Sunset Boulevard in the City of which eight genus are known to be fire-prone. Some examples of genus with fibrous tissue are Chamaerops spp., Phoenix spp., Trachycarpus spp., and Trithrinax species. Washingtonia spp. is an example of a genus that has leaf bases and can form a persistent petticoat around the trunk.

4.1.3 Eucalypts

Per the City’s tree inventory, there are two genera of eucalypts (Corymbia spp. and Eucalyptus spp.) north of Sunset Boulevard. Privately owned eucalyptus trees occur throughout the VHFSHZ in small groupings and are considered moderately high priorities. Eucalyptus stands and individual trees north of Sunset Blvd. are predominantly blue gum (Eucalyptus globulus) (Figure 13) and desert gum (Eucalyptus rudis). Eucalyptus trees tend to promote fire, because they produce a volatile (Gabbert 2014), highly combustible oil, and VOC or flammable gasses may be released from trees at very high temperatures, further increasing the fire hazard (Gross 2013). Fire promotion also occurs with the production of large amounts of litter, which is high in phenolics, preventing its breakdown by fungi (Reed and Potts 2005). This allows the accumulation of large amounts of dry, combustible fuel.

The leaves of blue gum trees may be moderately resistant to combustion under some circumstances (Dickinson and Kirkpatrick 1985). However, these trees are still considered highly flammable as the bark catches fire readily and deciduous bark streamers tend to carry fire into the canopy, which tends to produce embers that can be carried by strong winds. These...
flying embers are carried downwind and result in the development of spot fires that have ignited in receptive fuel beds in advance of the fire’s leading edge (Ashton 1981; USFS 2015). Peeling bark is typical of many other eucalyptus species and contributes to ground-based fuels (litter) when it falls. Peeling bark is also retained for a period of time on tree trunks, where it can facilitate ground to canopy fire transition (e.g., ladder fuel). Eucalyptus litter has a moderate surface area to volume ratio, requiring moderate heat to remove fuel moisture and raise fuel to ignition temperature. Eucalyptus litter is subject to seasonal drying in the late summer and fall, but solar shading and windbreaks provided by the eucalyptus canopy can sustain high fuel moisture contents.

4.2 Fire Related Tree Hazards North of Sunset Boulevard

Figures 14a and 14b display the combination of public and private fire-prone tree types throughout the VHFSHZ area north of Sunset Boulevard. As previously mentioned, the public trees are primarily linear based along roadways in contrast, tree densities for fire-prone trees on private properties vary greatly from property to property with the majority of privately owned, higher flammability trees located in the south-southwest portion of the VHFSHZ. The exception would be the occurrences as far north as the extreme northern end of Trousdale Estates.
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4.2.1 City-Managed Trees in VHFHSZ

The City is responsible for the proper care and maintenance of approximately 24,000 trees under their master tree care program. Approximately, 32% (7,619 trees) of the City’s total tree inventory are located along the streets and on City-owned properties north of Sunset Boulevard. Of the total number of trees in the City’s VHFHSZ Area, 45% (3,458 trees) of the tree inventory is categorized as those tree types considered to exhibit higher flammability.

4.2.2 Privately Managed Trees in VHFHSZ

Privately owned trees are difficult to estimate in any city because of the overlapping canopies and smaller trees beneath larger trees. Typically, in Dudek’s experience, there are between 5 and 9 times the number of private trees as there are city trees. Assuming a similar ratio for Beverly Hills, it is estimated that citywide, there may be between 120,000 and 216,000 privately owned trees. This equates to approximately 38,400 to 69,120 privately owned trees in the VHFHSZ. Based on Dudek’s previously described fire hazard tree mapping analysis, the presence of these higher flammability trees is estimated to be slightly lower than the City’s 45% level, at approximately 25%. Given this estimate, there may be as many as 9,600 to 17,280 trees in the higher fire hazard category.

4.3 Fire Resistant Trees in VHFHSZ

Fire-resistant is a relative term used to describe trees that are “more resistant” to ignition than other tree species. For example, generally, deciduous trees are less flammable than conifers. Wildfire can damage or even cause tree mortality. Trees considered less-flammable there are less prone to ignite and sustain fire because of their physical characteristics. Following is a list of general plant characteristics that contribute to their fire-resistance:

- High moisture content in leaves\(^9\) (e.g., ignite and burn more slowly)
- Broadleaf trees are less flammable than those with needle and bladelike leaves
- Non-resinous material on the tree\(^10\) (i.e., stems, leaves or needles that are not resinous, oily, or waxy)
- Thick tree leaves are less flammable than fine or thin leaves
- Trees with sap that looks more like water are less flammable than trees with thick, gummy, or resinous sap
- Trees with open branching habits or fewer total branches with leaves (i.e., provide less fuel for fires)
- Trees with little or no seasonal accumulation of dead plant material
- Trees that produce a low amount of litter are less flammable than those that produce large quantities of litter

4.4 Selecting Appropriate Trees

Tree selection for public and private properties in the City’s VHFHSZ areas should be carefully considered. Sound fire preparation includes the proper selection of fire resistant tree species in the landscape, suitable locations away from protected assets, and a plan for maintaining the trees throughout their lifespan. Fire resistant trees, like drought-tolerant plants, should be able to withstand low water (drought) and high temperature conditions

\(^9\) Deciduous trees are generally more fire resistant than evergreens, because they have higher moisture content when in leaf.

\(^10\) Junipers, pines, spruces, firs, and cypresses are resinous or oily and therefore highly flammable.
while still maintaining their overall health, aesthetic and functional qualities. When selecting trees for a landscape, the following guidelines are recommended:

- Select fire resistive tree species from a preferred tree list, such as the sample provided in Attachment C for street tree replacements.
- Group trees according to their irrigation needs
- Consider proper setbacks from structures, roadways, and other trees
- Provide regular tree care, especially to ensure fire resistance (see section 5.0 for arboriculture care guidelines)

4.4.1 Hillsides

The risks of fire and erosion, along with the costs of installation and maintenance, rise for every degree of a hill’s incline (Kent 2005). The best trees for hillsides produce minimal fuel, grow shorter in height, and are easier to maintain on steeper, erodible slopes. As such, these tree species survive and thrive under the site’s natural conditions, including soil type and depth, sun exposure, and water availability. Likewise, these trees will not result in current or future obstruction of neighbor’s views

4.4.2 Fuel Modification Zones

Providing a fuel modification zone reduces the non-ember related risk of wildfire caused structural damage in the VHFHSZ areas. Fuel modification zones, within 200 feet and up to 250 feet on slopes greater than 25 percent (B.H.M.C. Chapter 4903), is the area between a structure and natural vegetation where drought-tolerant, fire-resistant plants are planted and maintained in a way that decreases the wildfire-threat. In addition to protecting structures, fuel modification should occur within 10 feet of the outer edge of usable road surfaces. Fuel modification reduces radiant and convective heat, which reduces the amount of heat exposure on the roadway or structure and provides an area for wildland fire suppression operations to safely occur.

It is recommended that fire resistive/lower flammability tree species be planted in fuel modification areas. Fire resistive trees are acceptable in fuel modification zones as long as they are properly spaced horizontally and are not subject to ladder fuels. If a wildfire occurs, horizontal and vertical separation between plants and trees minimizes the spread of fire between the vegetation and structures. Additionally, it reduces the potential hazard associated with roadside vegetation that when fully involved in fire, can result in traffic flow interruption along evacuation routes.

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11 Attachment C: Recommended Street Trees was developed for trees to be planted on public property and include individual species that can be planted in VHFHSZ areas. A separate fire resistive tree list should be developed by BHFD to recommend approved trees that can be planted on private property.

12 Ladder fuels are flammable plant material that can transmit fire burning in low-growing vegetation into a tree crown. Examples of ladder fuels include low-lying tree branches and shrubs, climbing vines, and tree-form shrubs underneath the canopy of a large tree.
5 Annual Maintenance

Trees in the VHFHSZ (northern portion of Beverly Hills) require maintenance practices that are intended to increase the horizontal spacing between retained trees to reduce the potential for crown fire spread. These practices are also intended to remove fuel ladders by increasing the vertical spacing between surface fuels (shrubs, grasses) and tree crowns to reduce the potential for surface to crown fire transition. Creating more fire resilient trees involves a three-part process: 1) reducing surface fuels, 2) reducing ladder fuels (i.e., fuel that can facilitate fire spread from ground fuels into tree crowns), and 3) reducing tree crown density through crown thinning (USFS 2013). As noted by Nunamaker et al. (2007), surface and ladder fuels should have the highest priority for management to reduce fire intensity, rate of spread, and crown fire potential. Active crown fires are initiated with torching, but are ultimately sustained by the density of the overstory crowns. Reduction in potential surface fire behavior plus an increase in canopy base height minimizes torching potential (Agee and Skinner 2005).

The vegetation management and/or tree maintenance standards presented in this section are intended to reduce fire hazard by rearranging and maintaining the fuels’ spatial distribution. As noted by Reinhardt et al. (2008), all vegetation, including trees, will burn, given the right conditions. Therefore, the goal of fuel treatment is not to remove all of the trees or vegetation, but to minimize the potential for ignitions, crown fires, and extreme fire behavior by reducing fuel loads and altering the retained vegetation’s structure, composition, and spacing (horizontal and vertical).

5.1 Tree Arrangement

Fire spreads both horizontally (from shrub to shrub or treetop to treetop) and vertically (from understory vegetation to tree). Greater fire hazard exists where the spacing between trees and between shrubs and lower branches are close enough for fire to preheat vegetation and ignite across the gap, either horizontally or vertically. If a fire transitions into tree canopy, it will quickly spread from one tree to closely adjacent trees. The primary goal of fuel arrangement is to breakup the continuity of the fuelbed through proper tree spacing. To accomplish this, the following recommendations are provided:

1. For slopes that are less than 20 percent, trim or space trees so that there is 10 feet of space between the tips of their limbs. Trees should be limited to groupings of 2-3 trees with each grouping separated horizontally as described herein.
2. Increase the space to 20 feet for slopes that are 20 to 40 percent.
3. For steep slopes over 40 percent, 30 feet of spacing is needed. When planting individual or small groupings of trees, allow for future growth by spacing them 20 to 30 feet apart.

The key is keeping the fire on the ground and preventing it from spreading into a tree canopy. To reduce the fire-spreading potential of trees taller than 18 feet, it is recommended to prune the lower limbs up to a height of 6 feet. If the tree is shorter than 18 feet, all branches and foliage should be removed from the lowest 1/3 of the tree. In addition, other ladder fuels, such as shrubs, should be removed around the base of the trees.

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5.2  Pruning Practices

Lack of attention to tree crowns can result in trees accumulating dead twigs, leaves, and branches, whether or not they are characterized as “fire resistant.” This buildup of dead fuels in the canopy can easily result in trees that are very flammable. In general, keep trees cleaned of dead limbs and branches adjacent to or overhanging any building or structure. Prune branches to remove flammable vegetation within 10 feet from a chimney outlet. It is recommended that an International Society of Arboriculture-Certified Arborist conduct all pruning according to American National Standards Institute A300 standards (ANSI 2017).

Special Pruning Standards for Palms: If not properly pruned, certain genus of palms, such as Mexican Fan Palms (Washingtonia robusta) can hold on to their large collars of dried and highly flammable fronds. For established palms in the landscape, maintaining them by removing dead material and skinning their trunks minimizes ignition potential. Removing or reducing flammable vegetation adjacent to or growing along any palm eliminates an ignition source. Watch for signs of disease or stress to ensure that the palm is healthy.

5.3  Tree Removal & Replacement Recommendations

5.3.1  Tree Removals

All trees have a lifespan within the landscape they occur and the length of that lifespan depends, at least partially, on the care and maintenance it receives. When a tree’s related costs (maintenance, watering, pruning, or hazard level) outweigh its benefits (aesthetics, energy conservation, air quality, etc.) then it is time to consider tree removal. Dead, declining and diseased or insect infested public or private trees should be removed from the urban forest well before they represent a hazard. However, tree removals should be justified based on a condition assessment, a cost-benefit analysis, a hazard evaluation, or by other fact-based methods that justify removal as being the best approach. Removing large trees results in a loss of valuable benefits/services that are not easily or quickly replaced.

5.3.1.1  Evacuation Corridor Tree Management Recommendations

As previously discussed, residents have expressed concern for potential fire hazards along important evacuation corridors within the VHFHSZ. Residents have focused attention on the publicly owned trees that line roadways including Coldwater Canyon, Carla Ridge, and Benedict Canyon, amongst other lesser connecting roadways. For Coldwater Canyon and Carla Ridge, specifically, publicly managed trees are predominantly Canary Island pines, which, as previously described, is a type that is considered to be potentially more likely to ignite from wildfire and/or embers. However, fuel receptivity to embers is a key for determining the likelihood of ignitions, and in this case, potential for compromising the ability to evacuate residents along the evacuation routes, including Coldwater Canyon Drive. Fuel receptivity in trees increases when there is a high proportion of dead plant material in the crown or in branch crotches, dry, light and airy foliage, shaggy or peeling bark, very fine leaves, low moisture levels in foliage, high levels of internal gums, terpenes, oils, or resins available to embers and/or accumulated dead, dry material beneath the trees. Based on Dudek’s observations and analysis, the publicly owned trees along the evacuation routes vary in their overall condition. The trees exhibit some of the characteristics that could elevate their potential flammability. For instance, the trees are pine trees, which include
BEVERLY HILLS VERY HIGH FIRE HAZARD SEVERITY ZONE
TREE RELATED FIRE HAZARDS

fine needle foliage and include internal oils and resins. However, the trees are maintained at a very high level, which minimizes available fuels for embers.

The trees' crowns are also raised approximately 20 feet above the ground and they are situated in irrigated landscapes, resulting in a high internal moisture level within the foliage twigs, and branches. Further, Beverly Hills' VHFHSZ is within a highly developed/disturbed condition that does not include large expanses of unmaintained wildland fuels. Wildfire spreads most easily through uninterrupted fuels, such as late dry season chaparral covered slopes. This condition is limited within Beverly Hills and irrigated, high moisture level landscapes dominate the VHFHSZ.

Wildfire can spread from areas north, toward the City, driven by Santa Ana winds and available fuels, but would behave with reduced spread rates once they encroached into Beverly Hills due to the conversion of unmaintained fuels to urban landscapes. The highest risk would be to the homes that have not been hardened against flying embers and that included receptive vegetative fuels within close proximity to structures. Note that pines, eucalyptus, and other trees considered more flammable do not automatically burn in a wildfire, particularly, when they have been maintained. For example, as illustrated in Figures 15 and 16, numerous wildfire after action reports document structure losses while the surrounding landscape, including pines and eucalypts, remained

Figure 15. 2018 Camp Fire in Northern California’s Butte County home losses amongst standing pine forest. Homes burned due to ember penetration vs. from pine treesburning and igniting the homes.
virtually unscathed. This is a common occurrence and can be explained because the maintained landscape was resistant to ignition, while the homes were vulnerable to ember penetration.

Dudek’s evaluation of the publicly owned trees along evacuation routes indicates that the Canary Island pine trees along Carla Ridge have been previously topped, presumably related to the Trousdale community’s tree height restriction, and many of them have developed poor structure and/or stressed health conditions (Figures 17 and 18). Conversely, the Canary Island pine trees along Coldwater Canyon, and its secondary routes, are predominantly in good apparent health, while some exhibit structural issues (excessive lean, poor branch attachment angles, trunk deformities). These trees are large, spaced approximately 20 to 30 feet on center, and include 5 to 10 feet of spacing between crowns.
Figure 17. Carla Ridge Canary Island Pine Trees with poor structure and small size, not considered highly valuable trees.

Figure 18. View of topped Pine Trees along Carla Ridge. Note leaning trees, misformed crowns, and because of the slopes, inability to raise crowns well above and away from adjacent homes.
Also based on our evaluation of the evacuation corridor trees, it is recommended that the City continue its high level of tree maintenance currently provided to trees along evacuation routes and consider further reducing the potential fuel receptivity, where needed. This can be accomplished by providing additional pruning/crown raising where trees occur in close proximity to private property vertical vegetation.

Dudek recommends that the City consider a short and long range tree removal program. The pine trees along Coldwater Canyon Drive, along with the other higher flammable species the City manages within the VHFHSZ, should be considered for short-term management actions that increase the maintenance levels, resulting in even more reduced fuel receptivity than currently provided. City pines, palms, cypress, eucalyptus, cedars, and junipers should be provided inspections on at least a twice-annual basis and provided maintenance as-needed, which could increase the maintenance cycle to every year for some trees. Because the trees are along critical evacuation corridors, it is recommended that trees that are noted to include health or structural maladies should be removed and replaced with an appropriate species.

This short and long term effort is recommended because it enables short term removal of trees considered the most likely to cause issues based on their exhibited maladies, removal of trees on Coldwater Canyon due to pipeline replacement and hardscape issues, and preservation of trees for an extended time period while the highest priority trees are being phased out and replaced with appropriate trees species that consider diversity goals, climate adaptability, fire and pest resistivity, and return on investment, amongst others.

The Coldwater Canyon Drive pine trees, for example, are large trees that may have very long lifespans. Therefore, it is recommended that an active tree replacement plan be contemplated. It is advisable to phase tree removals over a longer timeframe so that the change is less impactful visually, but also from a tree benefit perspective. It is Dudek’s understanding that planned trenching for water main replacement, paving, and/or curb/gutter work will require the removal of a to-be-determined percentage of the roadside pines along Coldwater Canyon Drive, Loma Vista and San Ysidro. Additionally, some of the trees are causing hardscape damage to curb and gutter and even the paved road surface, and these trees are planned for removal. The combined removals associated with these efforts will result in tree removals and the exact number of trees would be determined during pre-construction tree safety evaluations to determine structural impacts from said work. This effort can be part of the overall tree removal and replacement program, and should be followed by replanting with trees from the approved species list for the VHFHSZ. Where possible, the remaining pine trees along Coldwater Canyon Drive and similarly tree-lined streets can be replaced over a 15 or 20 year timeframe, as desired by the City. By the time the last pines were being removed, there would be reduced potential tree and tree part failure hazard, reduced aesthetic impacts and significant replacement tree growth, minimizing visual impacts related to removal of large stature trees.

Conclusions

As previously mentioned, the City-owned Canary Island pine trees are in good health, but there are numerous trees with structural maladies, some minor, others more significant, with those on Carla Ridge exhibiting the
highest level of stress and decline. It is Dudek’s opinion that the City trees do not represent a significant fire risk in their current conditions. The biggest identified risk is associated with tree or tree part failure which could conflict with an evacuation effort by blocking key roadways. For example, large wildfires that often result in evacuations occur during Red Flag Warning weather conditions. A key component of a Red Flag Warning is high wind, which is also an important factor for vulnerable tree or tree part failures. Wind creates a load on trees and branches. High winds can create a load, like a sailboat’s sail, within the trees’ crowns, placing high stress levels on the supporting structural tree components (University of Florida 2019 Webpage: https://hort.ifas.ufl.edu/woody/blowvideos.shtml). Large branches and whole trees can topple under these conditions and if it were to occur during an evacuation event, could result in interruptions and the inability to move large numbers of people to the south, out of the City’s VHFHSZ. Dudek’s analysis indicates that the risk of a City-managed tree or tree part large enough to impact evacuation along Coldwater Creek Drive, Carla Ridge, and their intersecting feeder routes is considered a higher risk than the risk of these highly maintained trees impacting an evacuation because they are facilitating fire spread. As mentioned, fire spread in the City’s populated VHFHSZ areas will be spotty, will include homes that are unprotected from embers, and will include landscapes that have not been maintained at high levels. The City-managed trees are not considered to be high on the list of fire hazards.

**Very High Fire Hazard Severity Area Evacuation Route Recommendations:**

- Trees with deformities/maladies of any type to be removed (lean, poor branch attachments, stressed health condition, or others).
- Tree crowns are recommended to be lifted even higher than their current approximately 20 feet above ground where necessary, to create separation from adjacent private trees and landscaping.
- Increase maintenance levels and provide crown thinning to further reduce wind sail.
- Elevate tree monitoring levels to occur more frequently (at least twice per year and after major storm events) for structural issues.
- Aggressive inspection program during higher extreme fire periods of May through November to occur weekly.
- City emergency management program is recommended to prepare an internal evacuation plan with documented PACE (primary, alternative, contingency, and emergency) plans should evacuation corridors be impacted by a fallen tree or tree part, vehicle accident, or other unforeseen event.
- In house crews with back up reliable tree contractor should be on-call and ready during wind events and during elevated fire risk periods so that fast downed tree removal response is possible.

**Coldwater Canyon Drive, Loma Vista Drive and San Ysidro Drive Specific Recommendations**

- Tree removal specifically for fire hazard reduction is not considered necessary
- Tree removal is planned to occur based on tree-caused hardscape issues (curb and gutter, pavement, sidewalk).
- Tree removal is planned to occur based on water main installation, paving and curb-gutter repairs, which will be determined during pre-construction tree safety evaluations
- Monitor preserved trees following tree removals as they may be more susceptible to failure, due to new exposure to wind loads.
- Do not replace removed trees with any of the trees on the higher flammability tree type list
Carla Ridge Specific Recommendations

- Remove all topped Canary Island pine trees with a condition rating of less than good and exhibiting decline.
- Remove all trees with any structural issues including excessive lean, poor branch attachments, deformities, etc.
- Remove all trees causing hardscape damage to curb and gutter, street pavement, sidewalk, or other.
- Tree replacements should be from the acceptable tree list for the Trousdale Community to respect both fire ignition resistance and tree height restrictions.

Benedict Canyon Drive and San Ysidro Drive Specific Recommendations

- Prune tree crown’s hanging over roadways back to provide clear to the sky access (trees hanging over these streets have wide crowns that create potential issues due to extreme branch end weights).
- Consider removal of trees overhanging the road travelways. The tree crowns hanging over the road travel way and represent a potential issue during evacuation and may not be able to be corrected through pruning.

5.3.1.2 Private Property VHFHSZ Tree Treatment Recommendations

As previously discussed, the occurrence of higher flammability tree types within the VHFHSZ and the potential hazard that they represent is based on:

1. The location on the private property in relation to the residence or other structures and to the neighboring property’s residence or other structures
2. The level of maintenance the trees are receiving.
3. The number and configuration of higher flammability trees and the overall density on the property

Depending on these factors, the fire risk associated with a particular tree or tree group may be very high or within an acceptable level. The overall approach to managing the higher flammable tree types on private property is recommended to include a layered approach. This approach would include:

1. Enforce fuel modification zone/defensible space policies that progressively restrict the occurrence of higher flammability tree types in the area within 100 feet of structures.
2. Require higher flammability tree types that are outside of the 30’ structure protection area to be maintained in a condition that reduces ember receptivity. This would include keeping the trees hydrated, crowns thinned and raised above adjacent vegetation, and kept in a healthy condition.
3. Where groupings of higher flammability tree types occur, it is recommended that the distance from structures is increased to at least 50 feet and that the grouping of trees is separated from nearby vegetation by similar distances. All trees in the group to be maintained at high levels.
4. There should be no uninterrupted tree fuel chains from these species to the structure(s). Where necessary, trees and other vegetation should be removed to provide breaks (minimum 10 feet) between tree crowns and/or large shrubs.
5. New homes and remodels with landscape updates are recommended to be reviewed such that they meet the City’s fuel modification requirements and do not include higher flammability tree types. A physical site inspection should occur upon completion of landscape construction.
6. If a property includes a higher flammability tree type that is within a neighboring property’s structure’s 30 or 50 feet structure protection zone, the property owner where the tree occurs is responsible for providing the required clearance.

7. The City may need to provide training, hire expertise, or contract with a qualified consultant to perform these landscape reviews and inspections and to routinely inspect the VHFHSZ areas for use of undesirable/prohibited tree types.

5.3.1.3 Greystone Mansion Tree Recommendations

It is recommended that tree groupings on the west, northwest and east sides of the structure are thinned and greater setback provided between them and the structure. It is also recommended that the City’s fuel modification requirements be implemented throughout the site and consider off-site properties’ clearance in addition to on-site. Once tree setbacks are provided from the structure, the immediate threat from direct flame and heat would be substantially mitigated. The Italian cypress that occur on site are set back far enough from the structure, are within an ignition resistant landscape, receive irrigation and maintenance, and do not represent a significant fire threat to the structure or off-site structures. However, because they are of a tree type that is not recommended for the VHFHSZ within which they occur, it is recommended that as the trees are lost to age, disease, or other factors, their replacement with a similar appearing tree that is not considered highly flammable be considered.

5.3.1.4 Trousdale Estates Tree Recommendations

It is recommended for properties in Trousdale Estates that the City’s fuel modification requirements are applied and enforced. Because many of the structures on the lots are less than 60 feet apart, the entire sideyards should be considered the structure protection zone. Trees in the first 30 feet may be allowed if they are not of higher flammability types, are highly maintained, and are provided at least 10 feet of vertical and horizontal separation from the structures. If there is not room on the lot for a tree to be adequately set back from the structure(s), then a smaller stature planting would be appropriate. This would also be consistent with Trousdale Estates view preservation requirements, which limit trees to those that do not exceed 15 feet height at maturity.

5.3.2 Tree Replacement

Replacement or newly planted trees should be selected from the recommended tree list for VHFHSZ areas (Appendix C).

5.4 Watering

Deep watering tree roots is one of the best ways to keep trees hydrated during dry periods and prolonged drought. Deep watering slowly percolates water 12 or more inches into the ground on a longer rotation (i.e., deep watering every 2 to 3 weeks during the summer and less or none during the rainy season), instead of daily short irrigation periods where the applied water doesn’t soak below the upper soil layer. This type of frequent and short timeframe watering results in trees producing shallow root systems. During dry periods and drought, trees with shallow roots struggle to intake enough water from the top of the soil, which dries out first (Davey Research 2016). Deep watering stimulates trees to produce broad and deep root systems, resulting in trees that are better able to survive drought and are more solidly anchored and able to withstand significant winds. This technique also uses less water, which provides greater security that the tree can survive through extended drought conditions where water restrictions might be in place.
Beverly Hills Very High Fire Hazard Severity Zone
Tree Related Fire Hazards

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6 Specific UFMP Fire Hazard Tree Goal, Objectives and Action Items

6.1 Goal: Reduce Tree Related Fire Hazard Potential in the Very High Fire Hazard Severity Zone

The primary goal of this chapter is to, over time, reduce the public and private tree contribution to wildfire hazard in the VHFHSZ. The City has the ability to manage its trees so they are in a lower risk category through maintenance and species selection. Existing City trees, particularly those along road rights of way, including primary evacuation routes, are high priorities. Higher flammability trees on private property cannot be managed by the City, but property owners have the responsibility to conform to City fire protection requirements, which includes avoiding identified tree types and providing ongoing maintenance to minimize ignition, sustained fire and fire spread.

6.1.1 Objective 1. Reduce the City Managed Trees’ Potential Fire Hazard in the VHFHSZ

- **Action Item 1.** Continue public Fire Hazard Tree management to include raised crowns, thinned branch architecture, minimal leaf litter accumulation, and crown separation from neighboring trees.

- **Action Item 2.** Evaluate the ability to provide additional crown raising where adjacent private vegetation provides ladder fuels into City trees. Conversely, where further crown raising is not possible (i.e., would leave too low of a live crown ratio), then evaluate the efficacy of working with the private land owner to reduce the height and/or remove fire hazard trees directly adjacent to the City trees, specifically along evacuation corridors (e.g., Coldwater Canyon Drive, Benedict Drive, etc.)

- **Action Item 3.** Remove City trees along Carla Ridge that are stressed, declining, exhibit poor branch architecture or other maladies. Many of the trees will require removal under this approach, which is the result of previous tree topping and the harmful effects this practice has on trees for the remainder of their lifespan. Trees that are not removed are recommended for annual maintenance, including canopy thinning to reduce wind-sail effect, canopy heights at least 17 feet above the road, and removal of understory plants that could cause a fire ladder affect. Any tree planting provided following tree removals will be from the acceptable tree species list for the Trousdale Community.

- **Action Item 4.** Provide details for the planned water pipeline project along Coldwater Canyon Drive and the hardscape damage that will result in tree removals so that the effects on the overall tree canopy can be evaluated. Tree removals will result in additional gaps between trees, resulting in positive fuel continuity interruption. Tree removals may also predispose retained trees to new stresses from wind exposure that can increase the likelihood of tree failure. This situation would need to be evaluated and additional tree removals provided, as needed. Tree replacements should be from the acceptable tree species list for VHFHSZ areas.

- **Action Item 5.** It is not considered critical for the City trees along evacuation corridors to be removed for fire purposes, but the potential for a downed tree or tree part could interrupt an evacuation effort. Therefore, increased monitoring is recommended of retained trees so that they are inspected at least twice per year and after significant storm events. City trees that exhibit structural or health maladies are
BEVERLY HILLS VERY HIGH FIRE HAZARD SEVERITY ZONE
TREE RELATED FIRE HAZARDS

recommended for removal. Poor branch architecture that cannot be corrected through traditional arboricultural methods should be removed to avoid large branch failures that could interrupt an evacuation. Trees that are leaning, stressed, declining, or otherwise inferior are recommended for removal as a proactive evacuation safety approach.

- **Action Item 6.** It is recommended that the City develop a short term tree management plan that increases tree maintenance and inspections while the longer term management focus would be removing and replacing the trees not removed by pipeline and hardscape damage over a 15 or 20 year timeframe and in a manner that resulted in the least urban forest lost benefit and visual impact. This removal and replacement method is described in Section 5.3.1.1 and illustrated in Figure 19.

- **Action Item 7.** The City must monitor the public and private WUI and WUIM areas to help achieve the goals of reducing potential landscape fire threat. Specialists who understand fire behavior and vegetative fuels should be involved in landscape plan/fuel modification plan reviews. This will help ensure that new landscapes do not include higher flammability tree species. Site inspections should occur throughout the private areas identified in Figure 6b such that recommended tree setbacks from structure requirements are achieved and that over time, as trees are lost due to health, age, hazard

Consider preparation of a City Landscape Manual which would provide details for City landscapes with a section focusing on the VHFHSZ and specific related to developing fire adaptive/hardened landscapes

6.1.2 Objective 2. Reduce Private Property Fire Hazard Trees’ Potential Fire Hazard in the VHFHSZ

- **Action Item 1.** Assess BHFD Landscape Review Process for MWELO and New Construction Trigger points. The City is advised to evaluate their internal policies regarding when a landscape review is triggered. During that review, a site inspection and plan check is recommended and the property would need to come into compliance with VHFHSZ fuel modification requirements. The BHFD should be integrated into this review process as the lead for plan checks and/or field inspections

- **Action Item 2.** BHFD staff currently have minimal tree and plant identification background and would need training to be able to perform review functions. Alternatively, a BHFD urban forester, City forester, or third party could perform the reviews and plan checks for conformance with the City’s new fuel modification standard concerning approved or undesirable tree species. Similarly, the City requires staff training or additional staff for public and private property tree inspections. It is recommended that the City consider adding a Public Works inspector for fire hazard work/tree protection issues OR retain a 3rd party ISA Arborist/urban forester with wildfire experience or use City forester to evaluate diseased or dying trees on private property for potential removal or trimming. BHFD does not currently employ trained staff in tree care (arboriculture) and species identification.

- **Action Item 3.** Evaluate the following City policy updates regarding private trees:
  - Update or create a new local ordinance and/or polices to restrict planting of certain species in VHFHSZ or high fire threat areas.
  - The Municipal Code Chapter 4902 should be updated to address private property landscaping within VHFHSZs.
  - The BHFD is preparing a Fuel Modification Standard which will significantly address the private property landscape issues. This should include landscape plan review by a fire expert along with site
verification after install. Ongoing inspections should also occur to avoid fire hardened landscapes reverting to fire-vulnerable landscapes over time.

- **Action Item 4.** Provide educational outreach to homeowners and landscape and tree contractors regarding the importance of properly maintain trees. The priority for VHFHSZ homeowners trees is recommended to include:

  o Maintain trees on your property – trees that are more ignitable must be highly maintained at all times to avoid accumulations of leaf litter, twigs, and dead components. Trees that are not considered higher fire hazard species, must also be maintained at a higher level because of their location in a VHFHSZ. Any tree will burn if it is receptive to embers or direct flame.
    a. Raise tree crowns to provide separation from understory (see details herein)
    b. Thin crowns and remove overly “twiggy” growth and leaf litter buildup
    c. Trim crowns away from roofs (horizontal and/or vertical separation)
    d. Trim trees away from overhead electrical distribution lines so that windy weather would not cause vegetation to come in contact
    e. Keep trees hydrated with high internal leaf moisture
    f. Avoid overly fertilizing trees as it can lead to stimulated over growth or to stress and decline, raising susceptibility to ignition
    g. Monitor for pest/disease presence and treat as necessary
    h. Provide an inspection at least annually, and after wind/rain storms and have maintenance provided as needed to result in low likelihood of ignition
  o Break up continuous fuel chains that lead from wildlands to structures or even from the non-wildland edges of a property to structures. Trees provide a significant wildfire fuel source. When trees are positioned close enough that their crowns overlap or are within several feet, it is easier for fire to become a crown fire, which generates significant ember storms (which make your home vulnerable) and can burn like a wick toward your home. Break up fuel chains by strategically removing trees that would have minimal impact on tree benefits like shade, erosion, and others, while having a large impact on separating tree crowns and breaking the fuel chain.
    o Evaluate your property (or have it evaluated) and create an overall fuel modification zone plan (FMZP). It is recommended that the FMZP creates zones where less vegetative and other fuels sources occur in the first 30 feet from structures/residences. This zone is critical for minimizing direct flame impingement

- **Action Item 5.** Enhance City staff through training, hiring, or contracting so that the expertise to review landscape plans (whether for new projects or remodels) and enforce fuel modification requirements is available. This should include the ability to perform ongoing site inspections throughout the VHFHSZ areas on both public and private property trees. Expertise would include tree and plant species identification, fuel hazard identification, basic fire behavior knowledge, and comprehensive fuel hazard mitigation measure knowledge.

- **Action Item 6.** Perform tree removals and thinning at the Greystone Mansion, specifically focusing on tree groupings to the east, west and northwest of the primary structure. Create defensible space by removing fire hazard tree species within 100 feet of the structure. Continue to maintain Italian cypress in healthy, vigorous condition with no ground fuels that could act as ladders into the tree crowns.

- **Action Item 7.** Evaluate the following City policy updates regarding public trees:
  o Update local ordinance and polices to restrict planting of certain species in VHFHSZ or high fire threat areas.
Currently, BHFD is updating this code to address these issues and is developing a new Fuel Modification Standard. This update should include specific planting, spacing, and approved and prohibited tree species.
Street Tree Management Program Example

FIGURE 19

Beverly Hills VHFHSZ Tree Related Fire Hazards

Original Street Tree Profile

Tree Profile After Removal of Trees to Provide Minimum 60 Feet Horizontal Spacing

Tree Profile With Removal of Remaining Trees

Tree Profile With Entire Tree Replacement

TREES REPLACEMENT TIMEFRAME

0 Yr.

0 - 3' on center

Typical

20' - 30' on center

Typical

1-5 Yrs.

60' on center

Typical

10'

Typical

6-10 Yrs

30' Height

30' Wide

10' Min.

Canopy Separation

Typical

30' Height

30' Wide

15' Min.

Canopy Separation

Typical

11-20 Yrs

DRAFT


Beverly Hills Very High Fire Hazard Severity Zone
Tree Related Fire Hazards


General Wildfire Glossary of Terms

Authority Having Jurisdiction (AHJ) – The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure (NFPA, NFPA 1144, 2002, p. 4).

Aspect – Compass direction toward which a slope faces (NFPA, NFPA 1144, 2002, p. 4).

Building – Any structure used or intended for supporting or sheltering any use or occupancy (NFPA, NFPA 1144, 2002, p. 4).

Combustible – Any material that, in the form in which it is used and under the conditions anticipated will ignite and burn or will add appreciable heat to an ambient fire (NFPA, NFPA 1144, 2002, p. 5).

Community Wildfire Protection Plan (CWPP) – Address issues such as wildfire response, hazard mitigation, community preparedness, or structure protection. The process of developing a CWPP can help communities clarify and refine their priorities for the protection of life, property, and critical infrastructure in the wildland-urban interface (Source: Preparing a Community Wildfire Protection Plan. March, 2004).

Condition Class – Describes fire-related risk to ecosystems and relates current expected wildfires to their historic frequency and effects. Condition class ranks are defined as the relative risk of losing key components that define an ecosystem. Higher ranked areas present greater risk to ecosystem health. Condition class is a measure of the expected response of ecosystems to fire given current vegetation type and structure that often is far different from that historically present.

Defensible Space – An area as defined by the AHJ (typically a width of 30 feet or more) between an improved property and a potential wildland fire where combustible materials and vegetation have been removed or modified to reduce the potential for fire on improved property spreading to wildland fuels or to provide a safe working area for fire fighters protecting life and improved property form wildland fire (NFPA, NFPA 1144, 2002, p. 5), or as defined by PRC 4291.

Disaster – Disaster is characterized by the scope of an emergency. An emergency becomes a disaster when it exceeds the capability of the local resources to manage it. Disasters often result in great damage, loss, or destruction (Greene, R.W., Confronting Catastrophe, ESRI Press, 2002, p. 110).

Dry Hydrant – An arrangement of pipe permanently connected to a water source other than a piped, pressurized water supply system that provides a ready means of water supply for fire-fighting purposes and that utilizes the drafting (suction) capability of fire department pumpers (NFPA, NFPA 1144, 2002, p. 5).

Dwelling – One or more living units, each providing complete and independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking, and sanitation (NFPA, NFPA 1144, 2002, p. 4).

Emergency – A deviation from planned or expected behavior or course of events that endangers or adversely affects people, property, or the environment (Greene, R.W., Confronting Catastrophe, ESRI Press, 2002, p. 110).
**Evacuation/Escape Route** – A route away from dangerous areas on a fire; should be preplanned (FIREWISE Communities, 2009, http://www.firewisewiki.org/main/index.php/Escape_Route).


**Fire Frequency** – A broad measure of the rate of fire occurrence in a particular area. For historical analyses, fire frequency is often expressed using the fire return interval calculation. For modern-era analyses, where data on timing and size of fires are recorded, fire frequency is often best expressed using fire rotation (CDF FRAP 2003 Forest and Range Assessment, p. A-12).

**Fire Hazard** – A fuel complex, defined by volume, type condition, arrangement, and location that determine the degree of ease of ignition and of resistance to control (FIREWISE Communities, 2009, http://www.firewisewiki.org/main/index.php/Fire_hazard).

**Fire Hydrant** – A valved connection on a water supply system having one or more outlets and that is used to supply hose and fire department pumper with water (NFPA, NFPA 1144, 2002, p. 5).

**Fire Lane** – A means of access or other passageway designated and identified to provide access for emergency apparatus where parking is not allowed (NFPA, NFPA 1141, 1998, p. 4).

**Fire Protection** – All measures taken to reduce the burden of fire on the quality of life. Fire protection includes measures such as fire prevention, fire suppression, built-in fire protection systems, and planning and building codes (NFPA, NFPA 1141, 1998, p. 4).

**Fire Protection System** – Any fire alarm device or system or fire extinguishing device or system, or their combination, that is designed and installed for detecting, controlling, or extinguishing a fire or otherwise alerting occupants, or the fire department, or both, that a fire has occurred (NFPA, NFPA 1141, 1998, p. 4).


**Fire Regime** – A measure of the general pattern of fire frequency and severity typical to a particular area or type of landscape: The regime can include other metrics of the fire, including seasonality and typical fire size, as well as a measure of the pattern of variability in characteristics (CDF FRAP 2003 Forest and Range Assessment, p. A-12).

**Fire Rotation** – An area-based average estimate of fire frequency, calculated as the length of time necessary for an area equal to the total area of interest to burn. Fire rotation is often applied to regionally stratified land groupings where individual fire-return interval across the variability of the strata (i.e., the fine scale pattern of variation in timing of fires) is unknown, but detailed information on fire size is known. Hence, fire rotation is a common estimate of fire frequency during periods of recorded fire sizes (CDF FRAP 2003 Forest and Range Assessment, p. A-12).

**Firebreak** – A natural or constructed barrier used to stop or check fires that may occur, or to provide a control line from which to work (FIREWISE Communities, 2009, http://www.firewisewiki.org/main/index.php/Firebreak).

**Fuelbreak** – An area, strategically located for fighting anticipated fires, where the native vegetation has been permanently modified or replaced so that fires burning into it can be more easily controlled. Fuel breaks divide fire-prone areas into smaller areas for easier fire control and to provide access for firefighting (FIREWISE Communities, 2009, http://www.firewisewiki.org/main/index.php/Fuelbreak).

**Fuels** – All combustible material within the wildland/urban interface or intermix, including vegetation and structures (FIREWISE Communities, 2009, http://www.firewisewiki.org/main/index.php/Fuels).


**Fuel Models** – Description of the types of vegetative combustible material:

- **Light Fuels** – grasses, forbs
- **Medium Fuels** – short light brush and small trees
- **Heavy Fuels** – tall dense brush, timber and hardwoods
- **Slash Fuels** – logs, chunks, bark, branches, stumps, and broken understory trees and brush.

**Fuel Modification** – Any manipulation or removal of fuels to reduce the likelihood of ignition or the resistance to fire control (FIREWISE Communities, 2009, http://www.firewisewiki.org/main/index.php/Fuel_modification).

**GIS** - See Geographic Information Systems

**Geographic Information Systems** – The combination of skilled persons, spatial and descriptive data, analytic methods, and computer software and hardware – all organized to automate, manage, and deliver information though geographic presentation (i.e., maps) (Zeiler, M., Modeling Our World, ESRI Press, 1999, p. 46).

**Ground Fuels** – All combustible materials such as grass, duff, loose surface litter, tree or shrub roots, rotting wood, leaves, peat or sawdust that typically support combustion (FIREWISE Communities, 2009, http://www.firewisewiki.org/main/index.php/Ground_fuels).

**Hazard** – Refers generally to physical characteristics that may cause an emergency. Earthquake faults, flood zones, and highly flammable brush fields are all examples of hazards (Greene, R.W., Confronting Catastrophe, ESRI Press, 2002, p. 110). Also see Fire Hazard.

**Healthy Forests Restoration Act (HFRA), 2003** – Gives incentives for communities to engage in comprehensive forest planning and prioritization. This legislation includes statutory incentives for the US Forest Service (USFS) and the Bureau of Land Management (BLM) to give consideration to the priorities of local communities as they develop and implement forest management and hazardous fuel reduction priorities. The Act emphasizes the need for federal agencies to work collaboratively with communities in developing hazardous fuel reduction projects, and it places priority on treatment areas identified by communities themselves in a CWPP (Source: Preparing a Community Wildfire Protection Plan. March, 2004).
**Improved Property** – A piece of land or real estate upon which a structure has been placed, a marketable crop is growing (including timber), or other property improvement has been made (NFPA, NFPA 1144, 2002, p. 5).

**Intermix** – An area where improved property and wildland fuels meet with no clearly defined boundary (NFPA, NFPA 1144, 2002, p. 5).

**Ladder Fuels** – Fuels that provide vertical continuity allowing fire to carry from surface fuels in the crowns of trees or shrubs with relative ease (FIREWISE Communities, 2009, http://www.firewisewiki.org/main/index.php/Ladder_fuels).

**Mitigation** – Action that moderates the severity of a fire or risk (NFPA, NFPA 1144, 2002, p. 5).


**NFPA-1144 Standard for Protection of life and Property from Wildfire** – Standard developed by the NFPA to be used to provide minimum planning, construction, maintenance, education, and management elements for the protection of life, property, and other values that could be threatened by wildland fire. The standard shall be used to provide minimum requirements to parties responsible for fire protection, land use planning, property development, property maintenance, and others responsible for or interested in improving fire and life safety in areas where wildland fire could threaten lives, property, and other values (NFPA, NFPA 1144, 2002, p. 4).

**Noncombustible** – Any material that, in the form in which it is used and under the conditions anticipated will not ignite and burn nor will add appreciable heat to an ambient fire (NFPA, NFPA 1144, 2002, p. 5).


**Risk** – The potential or likelihood of an emergency to occur. For example, the risk of damage to a structure from wildfire is high if it is built upon, or adjacent to, a highly flammable brush field or other area deemed to have a high Fire Threat (Greene, R.W., Confronting Catastrophe, ESRI Press, 2002, p. 110).

**Safe Zone** – An area cleared of flammable materials used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations, crews progress so as to maintain a safety zone close at hand allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuelbreaks; they are greatly enlarged areas which can be used with relative safety by firefighters and their equipment in the event of blowup in the vicinity (National Wildfire Coordinating Group, 2009, http://www.nwcg.gov/pms/pubs/glossary/s.htm).

**Slope** – The variation of terrain from the horizontal; the number of feet rise or fall per 100 feet measured horizontally, expressed as a percentage (FIREWISE Communities, 2009, http://www.firewisewiki.org/main/index.php/Slope). Upward or downward incline or slant (NFPA, NFPA 1144, 2002, p. 5).

**Turnaround** – A portion of a roadway, unobstructed by parking, that allows for a safe reversal of direction for emergency equipment (NFPA, NFPA 1144, 2002, p. 5).
APPENDIX A
GLOSSARY OF TERMS

Turnouts – A widening in a travelway of sufficient length and width to allow vehicles to pass one another (NFPA, NFPA 1144, 2002, p. 5).

Understory – Low-growing vegetation (herbaceous, brush or reproduction) growing under a stand of trees. Also, that portion of trees in a forest stand below the Overstory (FIREWISE Communities, 2009, http://www.firewisewiki.org/main/index.php/Understory).


Wildfire – Any fire occurring on undeveloped land; the term specifies a fire occurring on a wildland area that does not meet management objectives and thus requires a suppression response. Wildland fire protection agencies use this term generally to indicate a vegetation fire. Wildfire often replaces such terms as forest fire, brush fire, range fire, and grass fire (CDF FRAP 2003 Forest and Range Assessment, p. A-17).

Wildland – A region with minimal development as evidenced by few structures; transportation networks may traverse region. Region typically contains natural vegetation and may be used for recreational or agricultural purposes (CDF FRAP 2003 Forest and Range Assessment, p. A-17).

Wildland-Urban Interface (WUI) – Commonly described as the zone where structures and other human development meet with undeveloped wildland or vegetative fuels. In the absence of a CWPP, Section 101 (16) of the HFRA defines WUI as “(I) an area extending ½ mile from the boundary of an at-risk community; (II) an area within 1 ½ miles of the boundary of an at-risk community, including any land that (1) has a sustained steep slope that creates the potential for wildfire behavior endangering the at-risk community; (2) has a geographic feature that aids in creating an effective fire break, such as a road or ridge top; or (3) is in condition class 3, as documented by the Secretary in the project-specific environmental analysis; (III) an area that is adjacent to an evacuation route for an at-risk community that the Secretary determines, in cooperation with the at-risk community, requires hazardous fuels reduction to provide safer evacuation from the at-risk community.” A CWPP offers the opportunity to establish a localized definition and boundary for the wildland-urban interface (Source: Preparing a Community Wildfire Protection Plan. March, 2004).

Wildland Urban Intermix - The intermix is an areas undergoing a transition from wildlands to urban land uses. As its name implies, this type of interface involves a mixing of rural and urban land uses with vegetative fuels in the same area.
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Prohibited Tree List
For Beverly Hills VHFHSZ Area

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Comment¹</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acacia melanoxylon</em></td>
<td>Blackwood acacia</td>
<td>L</td>
</tr>
<tr>
<td><em>Archontophoenix cunninghamiana</em></td>
<td>King palm</td>
<td>M</td>
</tr>
<tr>
<td><em>Cupressus sempervirens</em></td>
<td>Italian cypress</td>
<td>H</td>
</tr>
<tr>
<td><em>Eucalyptus camaldulensis</em></td>
<td>Red river gum</td>
<td>H</td>
</tr>
<tr>
<td><em>Eucalyptus globulus</em></td>
<td>Blue gum</td>
<td>H</td>
</tr>
<tr>
<td><em>Eucalyptus rudis</em></td>
<td>Desert gum</td>
<td>H</td>
</tr>
<tr>
<td><em>Juniperus chinensis ‘Torulosa’</em></td>
<td>Hollywood juniper</td>
<td>H</td>
</tr>
<tr>
<td><em>Phoenix canariensis</em></td>
<td>Canary island date palm</td>
<td>H</td>
</tr>
<tr>
<td><em>Pinus canariensis</em></td>
<td>Canary island pine</td>
<td>H</td>
</tr>
<tr>
<td><em>Pinus eldarica</em></td>
<td>Afghan pine</td>
<td>H</td>
</tr>
<tr>
<td><em>Pinus halepensis</em></td>
<td>Aleppo pine</td>
<td>H</td>
</tr>
<tr>
<td><em>Syagrus romanzoffianum</em></td>
<td>Queen palm</td>
<td>M</td>
</tr>
<tr>
<td><em>Washingtonia robusta</em></td>
<td>Mexican fan palm</td>
<td>H</td>
</tr>
</tbody>
</table>

Notes:
A. H = High Fuel Plants, M = Moderate Fuel Plants, L = Low Fuel Plants
B. VHFHSZ = Very High Fire Hazard Severity Zone area north of Sunset Blvd. in the City of Beverly Hills

Information:
1. Certain plants are considered to be undesirable in the landscape due to characteristic that make them highly flammable. These characteristics can be either physical or chemical. Physical properties would include large amounts of dead material retained within the plant, rough or peeling bark, and the production of copious amounts of litter. Chemical properties include the presence of volatile substances such as oils, resins, wax, and pitch. Plants with these characteristics should not be planted close to structures in fire hazard areas. These species are typically referred to as “Target Species” since their complete or partial removal from the landscape is a critical part of hazard reduction. These target species are typically referred to as High, Moderate, or Low Fuel Plants. High Fuel Plants are highly flammable trees and should not be planted within 50 feet of a structure. Moderate Fuel Plants are considered moderately flammable and should be avoided when only slow burning/low fuel species are permitted within a given fuel modification zone. Low Fuel Plants (i.e., trees) could be planted and maintained with mature tree canopy at least 30 feet from a structure. Many of these species, if existing on the property and adequately maintained (e.g., pruning, thinning, irrigated, litter removal and weeding), could remain as long as the potential for spreading a fire has been reduced or eliminated.

2. This prohibited list was developed with the assistance of wildland urban-interface fire consultant in relation to the Beverly Hills Tree Hazard Study of urban trees. As such, tree types including Cedar, Cypress, Eucalyptus, Juniper, Palm, and Pine, were identified as more susceptible to burning. Commonly planted trees for the area north of Sunset Blvd. have been included in this “trees not to be planted” list.

3. The absence of a particular tree from this list does not necessarily mean it is fire resistive and does not imply that a particular tree will be approved by the Beverly Hills Fire Code official for landscaping in the VHFHSZ north of Sunset Boulevard.

4. Notwithstanding the type of tree included or not included on this list, tree maintenance, spacing, and configuration of plantings, which are critical to stopping fire spread, shall be in accordance with Beverly Hills Fire Departments Fuel Modification Standard and Fire Code.
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### Sample Desirable Street Tree List for North of Sunset Boulevard

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Type</th>
<th>Height (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Arbutus marina</em></td>
<td>Strawberry Madrone</td>
<td>E</td>
<td>20-35</td>
</tr>
<tr>
<td><em>Albizia julibrissin</em></td>
<td>Silk Tree</td>
<td>D</td>
<td>20-40</td>
</tr>
<tr>
<td><em>Cercis candensis</em></td>
<td>Eastern Redbud</td>
<td>D</td>
<td>&lt;20</td>
</tr>
<tr>
<td><em>Cercis occidentalis</em></td>
<td>Western Redbud</td>
<td>D</td>
<td>&lt;20</td>
</tr>
<tr>
<td><em>Chilopsis linearis</em></td>
<td>Desert Willow</td>
<td>D</td>
<td>20-40</td>
</tr>
<tr>
<td><em>Chitalpa tashkentensis</em></td>
<td>Chitalpa</td>
<td>D</td>
<td>20-40</td>
</tr>
<tr>
<td><em>Handroanthus avellandaedae</em></td>
<td>Pink Trumpet</td>
<td>D</td>
<td>20-40</td>
</tr>
<tr>
<td><em>Lagerstroemia indica</em></td>
<td>Crape Myrtle</td>
<td>D</td>
<td>&lt;20</td>
</tr>
<tr>
<td><em>Laurus nobilis</em></td>
<td>Sweetbay</td>
<td>E</td>
<td>15-40</td>
</tr>
<tr>
<td><em>Ligustrum japonicum</em></td>
<td>Japanese Privet</td>
<td>E</td>
<td>10-15</td>
</tr>
<tr>
<td><em>Parkinsonia aculeata ‘Cercidium hybrid’</em></td>
<td>Palo Verde</td>
<td>D</td>
<td>20-30</td>
</tr>
<tr>
<td><em>Pistacia chinesis</em></td>
<td>Chinese Pistache</td>
<td>D</td>
<td>40+</td>
</tr>
<tr>
<td><em>Prosopis chilensis</em></td>
<td>Chilean Mesquite</td>
<td>D</td>
<td>30</td>
</tr>
<tr>
<td><em>Prunus ilicifolia</em></td>
<td>Hollyleaf Cherry</td>
<td>E</td>
<td>10-30</td>
</tr>
<tr>
<td><em>Tristania laurina</em></td>
<td>Water Gum</td>
<td>E</td>
<td>20-35</td>
</tr>
</tbody>
</table>

**Notes:**

A. D = Deciduous, E = Evergreen

**Information:**

1. This tree list was developed with the assistance of an urban forestry consultant in relation to the Beverly Hills Tree Hazard Study of urban trees.
2. The absence of a particular tree from this list does not necessarily mean that a particular tree will not be approved by the Beverly Hills Fire Code Official for landscaping in the VHFHSZ north of Sunset Boulevard.
3. Notwithstanding the type of tree included or not included on this list, tree maintenance, spacing, and configuration of plantings, which are critical to stopping fire spread, shall be in accordance with Beverly Hills Fire Departments Fuel Modification Standard and Fire Code.
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