

A Wildfire Assessment Report for Beverly Hills July 27, 2021



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**WILDFIRE
DEFENSEWORKS**

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EXECUTIVE SUMMARY

Large, destructive wildfires are growing in severity, intensity, and frequency. This statement seems obvious to even the casual observer based on an unprecedented series of wildfires across California in the past five to ten years. The real question behind this statement is what do we do about it? The answers to that question will be explored in this Report.

Since the Camp Fire largely destroyed the town of Paradise, CA on November 8, 2018, many communities have asked themselves if they could suffer from a similar fate. The City of Beverly Hills has been among those who recognize their vulnerability to a wildfire, and have asked themselves how they can be better prepared for this type of impact. We will discuss these questions with a focus on the holistic impacts of wildfires on the City of Beverly Hills. To begin, we must acknowledge the proactive steps that Beverly Hills has already taken to address their wildfire vulnerabilities. These include early participation in the Firewise/USA® Recognition Program since 2005, the foresight of engaging in previous studies related to wildfire impacts, and the proactive efforts of the Beverly Hills Fire Department to improve wildfire prevention through public education and information. Collectively, these proactive efforts are all positive steps – yet still more can be done.

This Report will be looking at all of these efforts, and focus on how they interact with one another. It will also identify some conflicts that prevent the highest level of wildfire resiliency to be achieved. It is important to acknowledge that this Report is not a formal scientific research paper. This Report will study the latest research available in conjunction with previous reports that Beverly Hills has taken to address its' wildfire issues. It will discuss information related to trees in public rights-of-ways, but will also look at this issue in a more holistic manner by acknowledging the adjacent impacts of private landscaping and home ignition factors. There will be sections devoted to evacuation issues, smoke impacts, and insurance challenges. Overall, it will recognize that contradictions exist not only within the global scientific community, but within the City of Beverly Hills itself. We have utilized the most current predictive analysis tools available using machine learning and artificial intelligence to help identify where we believe the highest vulnerabilities lie, and how to prioritize prevention efforts. Not everything about wildfire impacts is fully understood today. Yet we know far more about these wildfire impacts than we did only five years ago, and it is guaranteed that we will know even more five years from now. As such, it is acknowledged that our efforts to understand the wildfire environment itself is a work in progress, and this Report may be looked at as a snapshot in time.

Once the wildfire environment and history around Beverly Hills has been studied, there will be a section focused on redefining the issues. This will include looking back at previous studies related to wildfires such as the Wildfire Hazard Assessment written by David Kerr in 2018, the Dudek Report, which focused on public trees, and the achievements of the BHFD, particularly in relation to their wildfire prevention efforts. We will then present a series of maps that provide predictive analysis of potential fire impacts, and how they relate to future planning processes.

And finally, after the analysis of all of these efforts are evaluated, a list of strategies to “Connect the Dots” will be provided to focus on five broad topics. They include:

1. Focus on Structure Ignitions
2. Improve the Firewise Program
3. Reach Consensus on Trees
4. Evacuation Assessment
5. Additional Impacts

Once these strategies have been discussed, a list of ten conclusive points will be presented. They are as follows:

1. It is not a question of whether a wildfire will occur, but only a question of when.
2. Strengthen the Firewise /USA® Program by reorganizing it more closely with the neighborhoods it will affect, and encourage more active participation from residents.
3. Recommend creation of one or more Neighborhood Fire Safe Councils to augment and support the Firewise USA® program.
4. Provide a more robust education and information program for home hardening and retrofitting, enhancing defensible space enforcement efforts including the immediate “non-combustible zone” concept, and update local ordinances to enforce decisions.
5. Continue developing the Urban Forest Management Plan, with a robust maintenance and replacement program for trees throughout the City.
6. Provide better understanding of wildfire impacts beyond just trees and the VHFHSZ areas north of Sunset Blvd. The entire City will be impacted and must be prepared.
7. Effectively utilize information from the Wildfire Predictive Analysis maps to help with prevention actions and priorities.
8. Create a robust evacuation plan – and practice it – to maximize the likelihood of a safe and effective evacuation when it is needed.
9. Engage in conversations with neighboring land managers to explore common prevention goals and activities to help reduce wildfire impacts adjacent to the City.
10. Plan for holistic impacts from a wildfire, including smoke issues, effects on businesses and tourism, housing impacts, recovery processes, and psychological effects.

This Report will address the collective actions taken by the City of Beverly Hills to address their wildfire vulnerabilities up to now. It will provide a cohesive overview to identify gaps from these efforts, while building consensus and initiating actions on how to move forward based on the most appropriate and effective steps possible. The focused goal is to help the City of Beverly Hills, and its citizens, be better prepared when – not if – a wildfire threatens this community.

INTRODUCTION

This Report will tackle today’s challenges faced by many jurisdictions, and specifically by Beverly Hills, when it comes to current wildfire threats. In many instances, there are competing

agendas focused on addressing individual elements of the wildfire problem. When studied independently, it may be possible to find plausible solutions for a particular element. Yet collectively, these solutions may create controversy due to conflicting information and opposing recommendations. Beverly Hills is not immune from these types of conflicts.

Beverly Hills should be commended on the actions they have taken to address wildfire threats to their community. This Report has been requested by the Fire Chief to provide a cohesive overview of these actions, identifying both the positive elements as well as gaps or contradictions that may exist within the body of these actions. To meet these goals, this Report will provide an overview of the wildfire environment as it currently exists both in and around the City of Beverly Hills. It will provide an analysis and historical perspective of previous wildfire incidents, and the leading factors that have contributed to the significant impacts we are witnessing today. This Report will also utilize the most current, state-of-the-art wildfire modeling and data software to examine how a wildfire may impact neighborhoods in Beverly Hills. This model will predict where the highest vulnerabilities may exist, and how to best prioritize the City's prevention actions.

The Report will look at the significant contributions provided by the work of community members through their efforts with the Firewise USA® Program, and recognize the honor of receiving the designation of Tree City USA by the American Arbor Foundation for more than three decades. It will highlight the important prevention education elements offered by the Beverly Hills Fire Department (BHFD) on their website, and stress the importance for residents to utilize this critical information. In addition, the Report will provide an overview of the Wildfire Hazard Assessment presented by Wildfire Consultant David Kerr in 2018. While his assessment provided valuable information using available technology at that time, more advanced predictive modeling software available today will expand this assessment with a more in-depth focus on structure-ignition data and its impacts in the developed areas. The Report will also provide an overview of the Dudek Report, which primarily focused on trees in the areas north of Sunset Blvd. The Dudek Report and the Kerr Report both provide some mention of broader wildfire impacts. But both reports leave significant gaps in how they tie together to improve wildfire resiliency for the overall landscape and the structures that reside in that landscape.

This Report will provide a broader view of impacts beyond the area north of Sunset Blvd., and talk about potential smoke impacts and evacuation challenges in the event of a large wildfire. Furthermore, it will provide some insight into the current struggle with insurance related to wildfire risks, and provide a perspective on where these issues may be headed.

When it comes to wildfires, it must be acknowledged that no single "silver bullet" exists to solve all the potential problems. Wildfires remain one of the most complex of all natural disasters, and despite recent advances in our understanding of these complexities, there is still much to learn. We do know that there is no such thing as a "one size fits all" approach. We must be surgical in our application of solutions, while understanding the big picture of how our environment is impacted by wildfires. This Report does not "point fingers" nor suggest any sort

of “blame” for any situation the City finds itself in today. Wildfire impacts have been expanding exponentially in the past several years, and our understanding of who might be at risk has changed dramatically. This is not a problem that can be solved by governmental agencies alone, particularly fire departments. Wildfires are non-discriminant in their impacts. They do not recognize jurisdictional boundaries, lines separating public versus private lands, nor even property lines between neighbors. Individual residents have a responsibility of knowing their role in helping with solutions, and actively engage by initiating proactive prevention efforts. In some cases, this may involve altering entrenched perceptions and beliefs. But in every sense, the actions, or non-actions, that every resident takes has a real impact on wildfire behavior and how it affects the entire community. A complete and holistic approach must be enacted in order to truly reduce the impact of future wildfires to the community as a whole. It is clear that we simply do not have the luxury of continuing to do what we have done in the past. One need only observe the catastrophic impacts from recent wildfires to understand this. This Report is not the first to suggest that we must aggressively pursue paradigm shifts in order to be successful, and it will not be the last. Everyone has a role to play, and everyone must be encouraged to participate if we are to succeed and reduce these wildfire risks together.

In essence, this entire Report can be summarized into three primary elements:

- 1. Structure Resiliency**
- 2. Vegetation Management**
- 3. Evacuation Safety**

With these “**Big Three**” in mind, let’s now launch into all the details to better understand them.

WILDFIRE ENVIRONMENT IMPACTING BEVERLY HILLS

In recent years, the frequency and severity of wildfire events are unlike anything we have experienced in the recent past, requiring reexamination of our land use practices and fire management policies. This has become increasingly important when creating any current or long-term wildfire strategies across a large landscape. In established urban communities such as Beverly Hills, the primary challenge is how to incorporate changes that help reduce the impacts of a wildfire when they do occur. Recent trends indicate that wildfires are becoming worse. Between 2015 and 2020, wildfires in California have shown a progressively higher frequency, stronger intensity, and larger footprints than in recorded history. Unfortunately, the loss of lives and the destruction of entire communities has become all too real, as has been witnessed over the past several years. As 2020 drew to a close, a number of disturbing new wildfire records were established. This includes 5 of the top 6 largest wildfires in California’s recorded history, more than 4 million acres burned, at least 32 lives lost, and more than 10,000 structures destroyed.

These fires represent a substantial hazard to life and property in communities within the “Wildland Urban Interface” (WUI) zones, which are defined by the U.S. Fire Administration as

areas where human-made structures and infrastructure are in or adjacent to areas prone to wildfires. They are reminders to all jurisdictions and neighborhoods, including Beverly Hills, that wildfire will occur and that it requires proactive and aggressive actions before a wildfire ignites to help reduce the risk. These efforts are intended to increase resiliency, and appropriately harden both structures and the landscape against the ravages of wildfires. Although wildfires can occur at any time of year, and in any climate, the risk of wildfires is greatly increased due to drought conditions, low humidity, high winds, and available fuels – which include both vegetation and man-made elements such as structures, vehicles, and other types of infrastructure.

To more fully understand the totality of wildfire impacts, it is important to not lose sight of the variables that wildfires have come to represent. Today, the public has become witness to large, devastating wildfires such as the Camp Fire that virtually destroyed the town of Paradise, CA, on November 8, 2018, or the previous year from the Tubbs, Nuns, and Atlas Fires that ravaged communities throughout Napa and Sonoma Counties on October 8, 2017. The Thomas Fire, in December 2017 grew to become the largest wildfire in California’s history at that time – only to be eclipsed by the larger Mendocino Complex just 6 months later, and even larger fires in 2020. The unfortunate reality is that the scientific and wildfire communities all agree that these types of large, devastating wildfires will continue for the foreseeable future. Yet overall, these large catastrophic wildfires collectively represent under 5% of the total number of wildfires that ignite during any given year.

Although these large, devastating wildfires certainly gain the most attention, we cannot lose sight of the other 95% of wildfires, which are smaller, more frequent events that occur virtually every day. It is important to point out the distinction of the two extremes, because in planning for wildfire prevention efforts, both extremes must be addressed. It is a natural reaction to focus on the larger, more destructive wildfires, if for no other reason than these are the ones that gain the most attention. And yes, they are also the most impactful. But while it is necessary to have a dialogue about the potential of a large, devastating wildfire, you cannot forget to address the more frequent lower intensity fires that occur on a daily basis. The focus and planning for wildfire prevention must address both of these scenarios.

Figure 1 at right identifies the Very High Fire Hazard Severity Zone (VHFHSZ) areas as adopted within Beverly Hills. This zone encompasses all areas north of

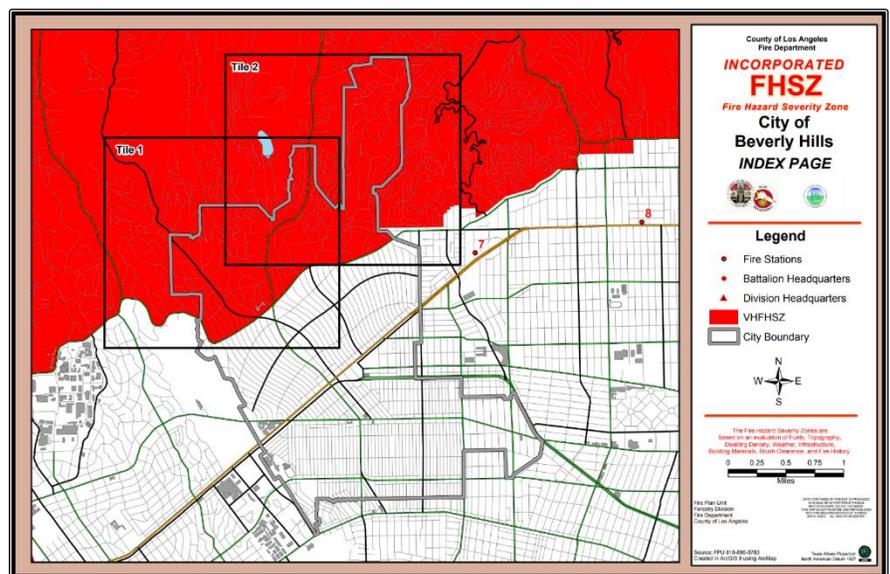


Figure 1: VHFHSZ Map Adopted by Beverly Hills in June 2009

Sunset Blvd. We will next provide a short history of why these maps were created, and how they influence Beverly Hills today. In 1991, the Tunnel Fire destroyed approximately 3,000 structures and killed 28 people in the Oakland Hills. At the time, it was the most deadly and destructive fire in California history, and remained as such until the Tubbs Fire in 2017. There was an urgent need to better understand where those same hazards existed in the State which could lead to similar devastating wildfires. In 1992, the California Legislature passed the Bates Bill, which directed the California Department of Forestry and Fire Protection (CAL FIRE) to study wildfire hazards across the state, ignoring jurisdictional boundaries. The resulting Fire Hazard Severity Zone Maps (FHSZ) were published in early 2008, and identified wildfire hazard areas in three categories: Moderate, High, and Very High Hazards. Only the Very High Hazard areas were identified in local city jurisdictions across the State, and the City of Beverly Hills formally adopted these maps by ordinance in June, 2009, as shown in Figure 1 above. These maps also coincided with the establishment of Chapter 7A within the California Building Code, which is also referred to as the Wildland Urban Interface (WUI) Code. These codes provide a higher level of wildfire resilience to new structures being built within the FHSZ areas across the State, and they continue to be updated as new materials are created, and new research helps us better understand structure ignitions.

The FHSZ Maps have been in the process of being updated by CAL FIRE for several years now in order to incorporate updated information, as well as address the more significant wildfire behavior we are witnessing today. It is hoped these new maps may become available in 2021, which could shed more light on how to further address the wildfire problem within cities across the State, including Beverly Hills.

Beverly Hills has used these maps to provide input on emergency management and wildfire planning for the City, with a focus on increasing fire prevention activities and regulations. These include such things as better fire-resistant building materials and landscape management goals of reducing fire-prone vegetation where possible. There has been some speculation that these maps are being used by insurance companies to determine where and how much to charge for residential premiums. It is possible that some insurance companies may incorporate these maps into their risk management analysis, as this information is publicly available to anyone. But determinations by insurance companies include a vast amount of data that goes far beyond these maps alone. Therefore, this information is only one piece of data used by insurance companies to make a final determination on rates and coverage.

As previously mentioned, the FHSZ Maps were created to identify wildfire hazards across the entire landscape within California, and were not solely targeted at those areas within city jurisdictional boundaries. Therefore, it is important to have a larger perspective of these zones that surround the City. Figure 2 below shows the VHFHSZ areas surrounding the entire

landscape north of Sunset Blvd. This map provides an important context to wildfire threats in Beverly Hills that is critical to fully understanding the wildfire environment.

As discussed previously, a complete wildfire prevention strategy must include discussions on both the more typical wildfires that burn at a lower intensity and with slower spread rates, as well as larger, more devastating wildfires. The northern portion of Beverly Hills is

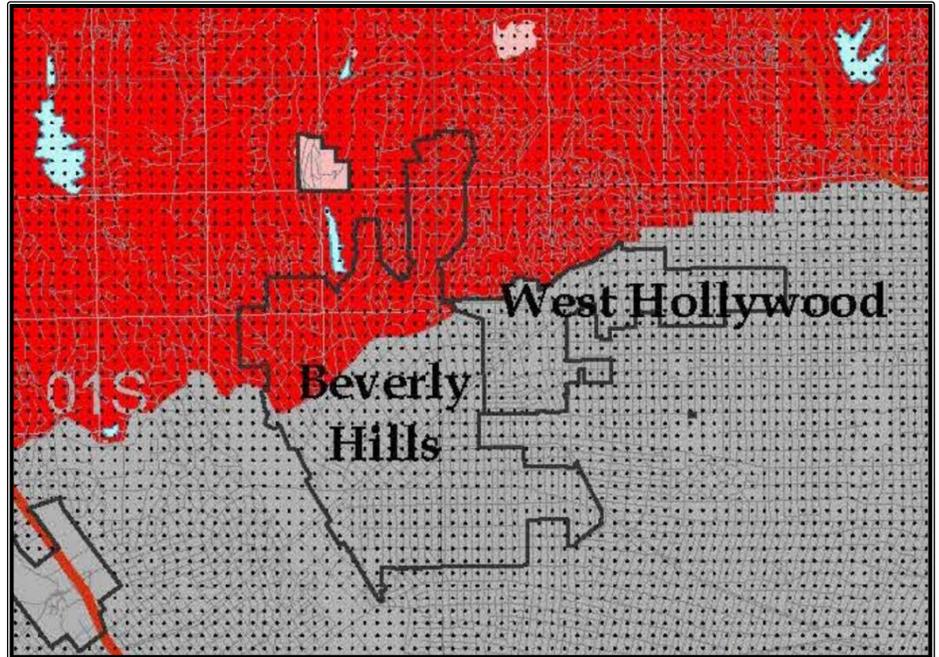


Figure 2: VHFHSZ areas surrounding the Northern portion of Beverly Hills

surrounded by areas designated as VHFHSZ which indicates that the highest risk of a wildfire impacting the City is likely to be generated from these areas. As will be discussed shortly, the landscape surrounding the northern portion of the City has steeper hillsides and deeper canyons, which can increase the intensity of wildfires. However, the City of Beverly Hills has no jurisdictional authority to dictate the land management decisions in those VHFHSZ areas around the northern portion of the City. Yet those decisions have a very direct impact on potential wildfire behavior in that area. This is one of the complications related to large, land management issues from the perspective of vegetation treatment and other factors that influence wildfire behavior. To help bridge these jurisdictional boundaries, the Fire Chief and other emergency officials have communicated about shared responsibilities and emergency planning with neighboring counterparts for many years. The resulting plans at least partially identify this limitation, and both automatic and mutual aid agreements exist to help minimize these impacts. This will be discussed in more detail later in this Report.

By recognizing that a significant portion of Beverly Hills is surrounded by areas designated as a VHFHSZ, the urgency to fully understand the wildfire environment, and the resulting impacts, is critical. The primary influences that determine wildfire behavior include topography, weather, and fuels. We will discuss each of these as they relate to the City of Beverly Hills.

Topography: Beverly Hills consists of varied topography, ranging from a relatively flat landscape in the central and southern areas of the City, which then transitions to a gently sloping terrain up to approximately Sunset Blvd. Moving to the north of Sunset, the topography

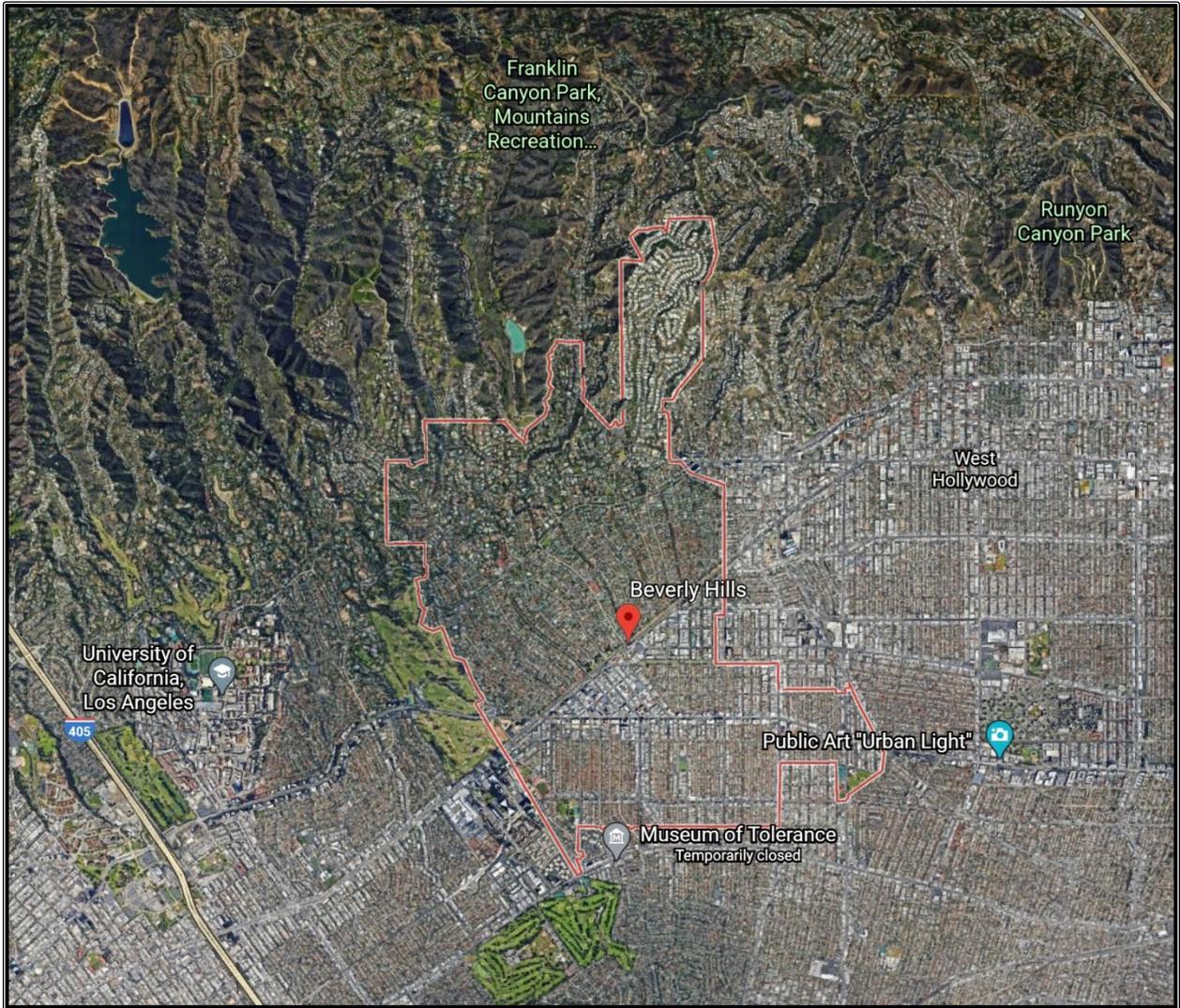


Figure 3: Geographic terrain around Beverly hills as seen on Google Earth

changes into steeper slopes and deep canyons, creating a more rugged landscape. These canyons are primarily oriented in a north-south direction, which adds to the vulnerability in the City. During high wind events, such as the typical Santa Ana conditions that occur every fall, these canyons can funnel the wind in a more forceful manner, adding to a fire's speed and intensity. In addition, the slopes that make up the sides of these canyons can add to the speed at which a fire burns uphill, specifically on southern facing slopes that are exposed to more sun and heat. This aspect of the landscape causes vegetation to typically dry out more, which contributes to lower moisture content and is therefore more susceptible to ignition or fire spread. While this complicates the intensity of wind driven events, the southern facing slopes are also more susceptible to rapid fire spread even on normal days with very little wind. The drier vegetation will contribute to a higher rate of spread upslope due to the lower moisture content in the vegetation. Therefore, fires may burn with more intensity in these canyons with or without a wind event.

Weather: Weather has the most significant influence on the local vegetation to determine its ignition and burning potential. Weather is a natural environmental factor that we can do little to change, with winds being the single most important weather factor contributing to fire spread and intensity, especially when relative humidity is low. Winds exceeding 10 to 15 miles per hour combined with low relative humidity often produces catastrophic wildland fire behavior, as previously discussed. Typical weather patterns in this area are breezes that flow onshore from the Pacific Ocean, bringing higher moisture and cooler wind patterns than are present in areas further inland. However, as is well known, the later months of the year bring annual “Foehn” wind events, which are locally known as Santa Ana Winds. These are dry, warm, down-slope winds that blow opposite of the normal wind patterns. There is a long list of catastrophic Santa Ana wind events throughout history in Southern California. In such a situation, the fire intensity exceeds the capacity of fire suppression personnel, rendering fire suppression efforts to be largely ineffective during these wind events. Embers produced by the fire may be transported downwind up to several miles. When these embers land on a susceptible fuel bed, they often ignite and further exacerbate the fire spread.

Fuels: Outside of the city limits of Beverly Hills, the steep hillsides to the north are predominantly covered with shrubland and grassy fields, with few trees. The predominant vegetation is highly flammable, and can burn with a high intensity. With a moderate amount of wind, a wildfire can spread at a critical rate of spread. The resulting embers being produced by a wildfire in these conditions can carry for a mile or more in front of the main fire, igniting new spot fires well ahead of the main fire. These fuels are highly susceptible to



Figure 4: Hillside vegetation in Franklin Canyon



Figure 5: Vegetation in Franklin Canyon

drought conditions, and typically contain very low fuel moistures as early as mid-summer. Due to continuing climate change impacts, these fuels are typically drier and more susceptible to ignition for a longer period of time throughout the year than in the past. Within the neighborhoods themselves, the landscaping that has been planted around homes is often more dense than natural vegetation on the nearby hillsides. Over the decades of development in this part of the City, there has not been a predominant effort to ensure that fire

resistive landscaping was installed. Typically, these landscaped yards are well watered, and thereby tend to have a higher moisture content than the surrounding natural vegetation. But landscaping around and near structures has been determined to be a significant contributor to structure ignitions. It is important to understand that fire resistive landscaping does not mean fire proof – all plants will burn given the right conditions. The most important determinations are the location and type of landscaping, and how these choices play a critical role in structure ignitions.

California's Mediterranean climate provides growing conditions for plants that are able to sustain long dry summers. Native plant species are either annuals that grow during wet winter and spring then die in summer, or perennials with high oil content in order to withstand these annual summer droughts year after year. Many of these plants are also "fire adapted," meaning they expect natural fire to be part of their lifecycle and have therefore developed some level of resiliency to wildfires. The dead annuals and high oil content of perennial plants are typically very flammable during late spring, summer, and fall. The burning intensity of these plants is directly related to ambient weather conditions and local topography.

It is also important to note the significance of fuels amongst the three primary influencers for wildfire behavior. On a broad scale, we have no ability to alter topography nor weather in a way that would influence wildfire behavior. We do, however, have the ability to alter the fuels that surround our environment, we can choose where and how to build in a wildfire environment, and we can choose the landscaping that surrounds our living spaces. Understanding this critical element forms one of the primary focuses of this Report – a discussion on fuels that includes both the natural and built environments within Beverly Hills. topography and weather are still important factors that we are forced to recognize, but it is the fuels component that offers us the opportunity to alter wildfire impacts.

Wildfire, overall, is a very natural part of the environment in this region, and the vegetation in this area has evolved over millenniums with periodic fires burning across the landscape. With the influx of development over the past 100 to 200 years, these periodic fires have largely been suppressed as quickly as possible in order to avoid impacting the built environment. This has resulted in an overgrowth of vegetation that is denser and covers more of the landscape than would have been normal in the past. In addition, individual homeowners have planted vegetation for landscaping purposes, as well as privacy shields from neighbors and the public, resulting in even higher fuel loads than may have existed prior to the development of subdivisions. Therefore, when fires do occur in these areas today, fire activity has a tendency to exhibit more active fire behavior, accompanied by intense heat and aggressive fire spread due to the increased vegetation and structures in the area. One statistic that has become well documented is the fact that approximately 95% of all wildfire ignitions are the result of human intervention. The statistics also point out that most ignitions are accidental in nature. But

accidental ignitions are also often accompanied by sometimes underlying negligent factors. Someone may not have intended to ignite a fire, but their lack of knowledge about the dry fuels and weather conditions led them to an action that may inadvertently cause a fire. The simple fact remains that the increased density of people in WUI zones, coupled with a likelihood of wildfire occurrence, continues to increase the potential of a wildfire ignition.

WILDFIRE HISTORY

Beverly Hills does not have a significant wildfire history within its immediate boundaries during modern times. However, there are historical fires that have burned nearby. Some may raise an argument that because there has not been a high occurrence of wildfires in this specific area in the past, it could be seen as being alarmist to raise these concerns now. But we have seen that the frequency of large, more destructive fires is now occurring at a higher rate than we have recorded in the past. Therefore, the absence of recent wildfire activity cannot be used as an argument to assume wildfire events in this area are unlikely.

One element of wildfires that is well understood today is the fact that fires often have a tendency to repeat themselves in areas where past fires have been recorded. We have seen this occur in many areas of the state with devastating consequences. One recent example is the Tubbs Fire, which burned from the town of Calistoga to Santa Rosa the night of October 8, 2017. The perimeter of this fire bore an eerily similar footprint to the Hanley Fire, which burned much of the same landscape in 1964. However, some stark contrasts stand out when comparing these two events. In 1964, there were very few homes built in the 53,000 acre footprint of the Hanley Fire, compared to thousands of structures that existed in 2017. While the Hanley Fire did destroy 84 homes, 24 summer cabins and numerous farm buildings, there were no lives lost. Some of this is attributed to the fact that not only were there fewer people in the path of the fire, but it moved at a much slower pace than the 2017 Tubbs Fire. The devastation in 2017 made the Tubbs Fire, at that time, not only the deadliest fire in California history, but also the most destructive. Unfortunately, both of these records were surpassed only one year later by the Camp Fire in Paradise.

The fires recorded during 2020 have set new records for the largest fires in California's recorded history, as well as the total acreage burned. And these fires were not exclusive to California. Other states in the Western United States, such as Oregon, Washington, and Colorado also established new records. These fires provide further evidence of wildfires impacting communities that had not been impacted in recent history. The fact remains that these, and numerous other examples of recent wildfires, show a preponderance of burning the same or nearby landscapes, but with much higher intensity and speed.

Wildfire history around Beverly Hills includes the following incidents:

Date:	Location:	Acreage:	Area Near BH:
1. August 6, 1929	Coldwater Canyon #48	212 Acres	North of BH

2.	September 23, 1944	Summit Ridge	248 Acres	North of BH
3.	July 9, 1955	Unknown	10 Acres	North of BH
4.	December 24, 1956	Unknown	10 Acres	North of BH
5.	December 30, 1958	Unknown	384 Acres	West of BH
6.	December 12, 1959	Unknown	56 Acres	North of BH
7.	July 4, 1960	Unknown	50 Acres	North of BH
8.	November 6, 1961	Bel Air/Brentwood	6,152 Acres	West of BH
9.	August 5, 1974	Unknown	3.4 Acres	North of BH
10.	July 26, 2006	Benedict Canyon	15 Acres	West of BH
11.	April 11, 2007	Beverly (Franklin Canyon)	12 Acres	North of BH

The above list is a partial summary of ignitions near Beverly Hills dating back to 1929. There have been additional ignitions during this time, but they did not spread to a significant size, and therefore have been omitted. However, this list clearly indicates that wildfires have occurred nearby over time.

The most significant of these is the 1961 Bel Air/Brentwood Fire, which started on a warm November morning at a construction site in Sherman Oaks. The fire was fanned by strong Santa Ana winds, and quickly grew out of control. Almost 500 homes were destroyed, many of them from embers igniting the popular wood shake roofs that were common for homes at that time. This fire contributed to establishing regulations that eventually eliminated the use of wood shake roofs in Los Angeles. Fortunately, no lives were lost during this fire. The photo in Figure 6, copied from the archives of the Los Angeles Times, highlights the wood shake roof problem. Because this material was primarily responsible for the fire traveling from structure to structure, much of the surrounding vegetation was left intact. If surrounding vegetation did burn, it was likely a result of radiant heat from the burning structures nearby. This is an important issue related to defensible space, and will be discussed in more detail later in this Report.



Figure 6: Homes burning in the 1961 Bel Air Fire. Note that very little of the vegetation is burning - primarily the structures.

The list of fires from recent history above does not shed light on any particular pattern or “return interval,” which is how frequent a wildfire can be expected to burn in any given area. In fact, this list only goes back to 1929, less than 100 years ago. And the next fire listed does not occur until 1944. Most likely, there were other fires during these times, but reports of these incidents were not collected in the manner we take for granted today, and therefore, we do not have a full picture of wildfire history within the past 100 years. What we do know is that wildfires have been a natural part of this environment for millennia, and despite the fact

that there is a lack of wildfire activity directly impacting the City in recent history, it must be assumed that wildfires can occur on this landscape, and should be expected – but likely with far greater speed and intensity than in the past. While there is currently no ability to predict with any certainty when or where a wildfire may strike, the trajectory that has unfolded over the past several years indicates that wildfires will burn in areas that may not have seen a wildfire recently. Unfortunately, the sort of fire behavior we are now seeing may result in more destruction and potentially a higher loss of lives. The argument that there have not been recent wildfires in the area no longer have any merit to resist changes in wildfire prevention actions.

A recent structure fire that occurred during the evening of January 9, 2021, provides a stark reminder of the potential risk of fires to neighborhoods. This fire broke out around 8:30 PM on Beverly Drive, and was reported as totally involved when firefighters arrived at scene. The fact that this fire ignited in January, and there were no significant winds in effect, allowed the fire to be contained to that single piece of property. Despite these advantages, several nearby palm trees were ignited from the exposure to this structure fire, and firefighters were forced to deal with significant ember showers emanating from these burning trees. Had this fire ignited during a different time of year, under even modest wind conditions, the outcome may have been far different. We can use these types of incidents to increase our awareness and urgency to address ongoing wildfire threats on a year-round basis.

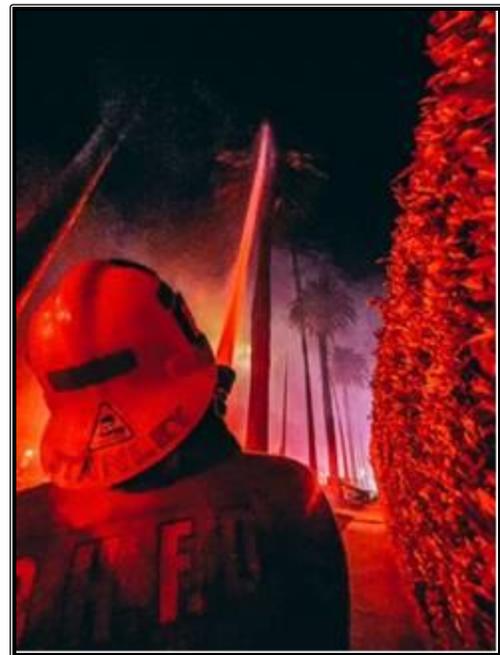


Figure 7: Efforts to extinguish palm tree from structure fire exposure on 1-9-21.

One important observation is the changing risk factors from wildfires over time. In 1961, wood shake roofs were identified as the primary culprit that contributed to so many homes igniting from the blowing embers during the Bel Air/Brentwood Fire. In response to this realization, more stringent building codes were introduced that largely eliminated wood shake roofs from new construction, specifically to combat wildfire impacts. Today, wood shake roofs have largely been eliminated, which has reduced the risk of wildfire ignitions from that source. There are fewer than 30 wood shake roofs still in existence in Beverly Hills today, and that number will continue to drop as wood shake roofs are replaced. Today, the growing research on wildfire vulnerabilities point directly to the ignition of structures from embers. Findings from the Insurance Institute of Business and Home Safety (IBHS) and other research labs now agree that up to 90% of all structure ignitions from a wildfire are the result of either direct or indirect ember exposure. While we have largely eliminated wood shake roofs as the primary ignition source, homes remain at extremely high risk of ignition from embers due to other aspects, such as combustible building materials, lack of long-term maintenance, and the immediate landscaping around structures. These and other contributing factors are our “wood shake roof problem” of today. But just as we have been

largely successful in eliminating the wood shake roof problem through building codes and regulations, it is possible to enact similar responses to address the known ignition factors we see today. New building materials and construction techniques that are highly wildfire resistant are being developed, along with more knowledge on how to create more fire resistive landscapes. These ideas will be discussed in more detail in the Structure Ignition Section under the chapter on Connecting the Dots.

GENERAL ASSESSMENT, RISK ASSESSMENT, AND VALUES AT RISK

In order to more fully understand the wildfire environment discussed above, it is important to differentiate some commonly used terms such as risk, threat, and vulnerability. It is also important to understand how they interact to provide a more comprehensive risk assessment. These terms are described as follows:

- **Risk:** A risk is the statistical probability of an event occurring. From a wildfire standpoint, risk is defined as the chance of a fire starting from any cause, and the danger is defined as the combination of the potential fire to start (i.e. the risk) and the hazard presented should the fuel become ignited. Our prevention efforts cannot control this probability.
- **Threat:** Anything that can exploit a vulnerability causing damage or destruction. The physical effects (or forces) of an event on people, property, and/or infrastructure. For example, heat from a fire.
- **Vulnerability:** A weakness in a system or physical asset. This is the one variable that can be minimized through planning and coordination, hardening of assets, and response force capabilities.

Together, these terms can be viewed in the context of any emergency as follows:

$$\text{Threat} + \text{Vulnerability} = \text{Risk} \quad (\text{T} + \text{V} = \text{R})$$

The risk of a large, uncontrollable wildfire within Beverly Hills is low, but it would likely occur during occasional severe weather conditions, such as a red flag warning or significant wind event. However, the consequences are high as they pose a risk to hundreds of homes within the City of Beverly Hills, as well as to many other homes adjacent to this community. Depending on which direction the wind might push such an event, the impacts could disrupt businesses, various elements of infrastructure, traffic, and air quality, among other things.

Generally, the threat of a fire does not change regardless of other factors besides weather, which cannot be controlled. Physical damage from the fire will increase depending on weather conditions because in extreme conditions the fire can create so much energy that forward

progress of the fire cannot be stopped, it becomes uncontrollable, and even structures with adequate defensible space and upgrades that provide “hardening” from ember and other fire impacts, may not be able to resist the heat and energy of the fire.

Vulnerability is the area where mitigations can help reduce the risk. Principally, this can be accomplished by slowing the spread of a fire during its early stages until sufficient firefighting forces can arrive. However, with an established community such as Beverly Hills, there are limited opportunities to improve the vulnerability of the community, meaning roads, infrastructure, and home sites will not change. Those efforts that can make a difference, such as “hardening” structures against wildfire impacts and changes in landscaping and vegetation, will be discussed as part of the recommendations for mitigation.

Risk management within Beverly Hills includes the analysis of the chance of an event occurring and the resulting damage that could occur as a result of the event. The challenge of risk management does not lie solely in the work necessary to assess the probabilities of an emergency, but also with policy-makers, who must decide how to address budgetary needs and regulatory policies to minimize or eliminate vulnerabilities.

The evaluation of fire risk must take into account the frequency and severity of wildfire potential. Determining risk by analyzing past statistical information, changing climate impacts, and changes to the existing landscape and built environment is an essential component of this analysis. It is represented in the following “Frequency-Consequence” matrix below.

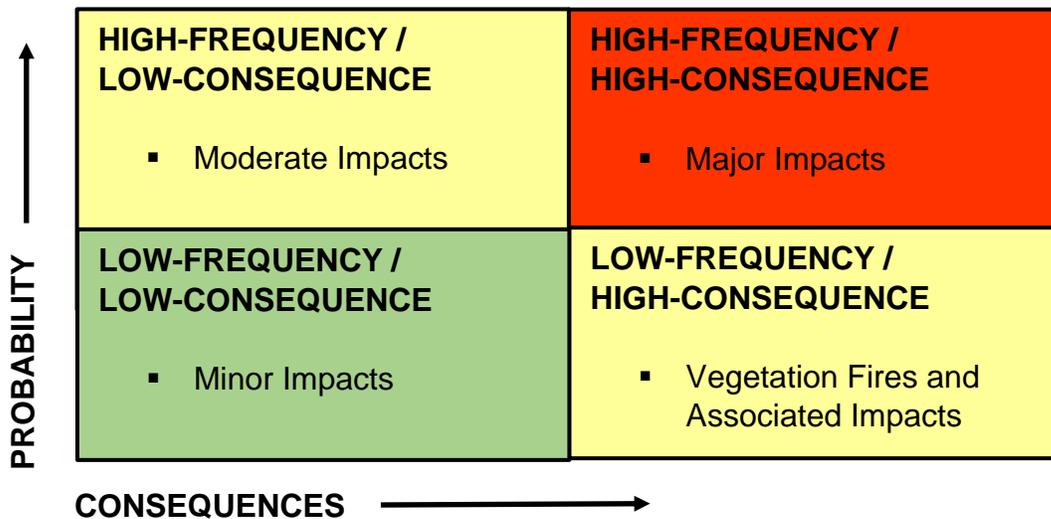


Figure 8: Frequency - Consequence Matrix

In terms of wildfires and the WUI areas represented by Beverly Hills, a hazard is defined by the kind, arrangement, volume, condition, and location of the fuel complex, with these factors determining the ease of ignition and/or the resistance to fire control. Although the risk of ignitions around Beverly Hills is low, the consequences related to structure loss, evacuation challenges, smoke impacts, and injury or death from the fires is extremely high.

REDEFINING THE ISSUES

The information above has been provided to address the current status and past history of wildfire issues in Beverly Hills. This portion of the Report will visit a number of actions and previous documents that collectively address various issues related to wildfires in and around Beverly Hills. They have all addressed particular topics that need attention, and individually provide valuable information for that specific issue.

Yet there have been some unintended consequences from these actions as a result of the growing visibility of wildfire impacts, and the increasing scientific knowledge surrounding the wildfire environment. The complexity of how this information is understood, and how it all relates together in a holistic manner can easily allow for misinterpretation and sometimes misguided, if unintentional, statements and beliefs. Therefore, it is important to take a step back and review the totality of the information available, and how it can collectively be utilized in the most productive and efficient manner.

As mentioned earlier in the Report, the City of Beverly Hills has recognized their vulnerability to wildfires and taken proactive steps to reduce the risks for some time now. The very steps they have taken have inadvertently contributed to some of the current public perceptions associated with wildfire mitigation strategies. One of the primary goals of this Report is to help provide some clarity on how current wildfire science and technology, and the proactive strategies by Beverly Hills can be tied together and provide a more comprehensive vision to continue forward progress and maximize their wildfire prevention actions.

To most effectively provide a more comprehensive overview, this Report will address four elements that are currently in place, and add a new wildfire predictive analysis element:

1. Wildland Fire Hazard Assessment by David Kerr, dated October 23, 2018
2. Tree Related Fire Hazards Report by Dudek, dated December 2019
3. Beverly Hills Fire Department – Education and Information
4. Firewise USA® Recognition Program
5. Wildfire Predictive Analysis

To expand on the fifth item, this Report is including an updated wildfire modeling analysis utilizing state-of-the-art technology. FlameMapper, a company dedicated to understanding wildfire behavior, prediction, and structure vulnerabilities, has created a number of maps that are included as part of our analysis. These maps will help identify more precisely where the highest risks exist, and how the City may choose to prioritize their efforts.

By reviewing these five primary elements of Beverly Hills' wildfire programs and activities, we will be able to bridge some of the gaps that currently exist. The goal will be to provide an overview of how these various reports and programs compliment and support one another. This, in turn, will allow both residents and policy-makers the ability to more fully understand

how these layers can be used to better understand wildfire behavior and resulting impacts on the City. We will begin by looking at each of these five elements individually, after which we will discuss how all five interact and complement one another.

1. Wildland Fire Hazard Assessment by David Kerr, dated October 23, 2018

Wildfire Consultant David Kerr produced a Wildland Fire Hazard Assessment Report for Beverly Hills in October of 2018. The BHFD proactively requested this report to be created to respond to City Council Priorities #32 (Public Safety) and #49 (Tree Master Plan). The Assessment provides a thorough analysis and provides five recommendations to address wildfire hazards in the VHFHSZ areas to the north of Sunset Blvd. The intent was to support the City Council’s Priorities and maintain the Fire Department’s goals for continued fire Safety.

The Assessment satisfies the goals as set out by the BHFD. Briefly, the Assessment provided three different wildfire simulations to predict a wildfire impact in the areas north of Sunset Blvd. One of the simulations reflected an ignition point west of the City during a typical summer day with “normal” onshore breezes. The other two simulations took into account the fact that the greatest threat from a wildfire is from the north of the City. These two simulations were run with ignitions to the north, but with high wind components simulating a typical Santa Ana wind event. While the simulations were run using the most widely used software at that time, the results reflect the single largest flaw in wildfire simulation modeling. The report acknowledges that ember cast represents the most significant impact from a wildfire, but provides little expansion on this important detail. However, due to the limitations of the modeling software, the outcomes reflect the inability of the software to recognize structures as flammable. Therefore, the models indicate the fire intensity and spread would significantly be reduced as it encounters the built-up neighborhoods and irrigated landscaping. This, however, does not correspond with the reality of how fires have impacted numerous communities over the past several years. To be fair, this result is not a failure of Mr. Kerr’s simulations. The limitation resides within the software program itself.

Wildfire modeling software can calculate a wide range of inputs, such as topography, weather, and various fuel types. The reality is that wildfire science has not been able to create a standard “input” for structures. In other words, the model can react to a burning pine tree or field of grass, but when the model encounters structures in neighborhoods, the software does not “read” this data as combustible, and therefore, the typical wildfire scenarios in the past seem to indicate that fires slow down significantly once they come in contact with neighborhoods. However, we have clearly seen that this is not necessarily the case. Entire neighborhoods consisting of hundreds, if not thousands, of homes and businesses have been

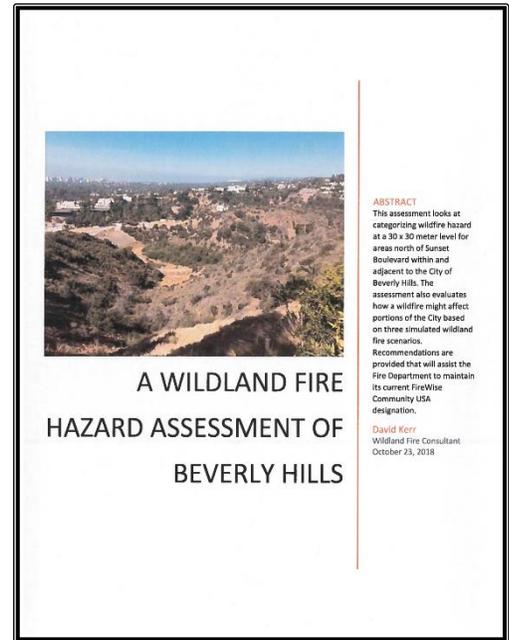


Figure 9: David Kerr Report, October 2018

lost to wildfires in recent years. Much of this destruction may not have appeared in traditional wildfire simulation models because of the limitations of structural inputs. Yet as Mr. Kerr points out, it is the embers that cause the majority of issues with structural ignitions. New modeling software has come closer to understanding these limitations, and through intensive artificial intelligence that runs millions of analyses with many inputs, there are some programs that are now better able to inform us on the highest vulnerabilities within a built community. The wildfire simulation maps that have been modeled by FlameMapper will highlight these advances in wildfire prediction, and provide a more accurate picture of where these risks occur.

Mr. Kerr's report also identifies four species of trees that propagate the highest ignition potential to help spread and endanger Beverly Hills. These species are Pines, Eucalyptus, Cypress, and Acacia trees. In total, the report states that collectively there are 2,110 of these types of trees in public rights-of-way that the City manages north of Sunset Blvd. It is estimated this represents approximately 25% of all trees in this area. Mr. Kerr's Assessment goes on to recommend the City create a replacement plan for these trees with more fire resilient species. The proposed replacement plan for public trees is an important element to help reduce the City's vulnerability to wildfire, and is highly supported by this Report. However, it is also important to note that trees and other vegetation on private property contribute to a higher level of wildfire spread than the street trees alone.

While the Kerr Assessment does an excellent job of focusing on the wildfire risk in the VHFHSZ area north of Sunset Blvd, it does not expand on this impact. This bears some additional discussion. As stated above, the simulation models of a wildfire exposure indicate the fire will have a greater impact on the areas outside the city limits, but this may not necessarily be the case, and certainly does not tell the entire story. One of the assumptions made in these simulations is that firefighters would be able to bring the fire under control relatively quickly based on the model telling us that the fire spread and propagation is reduced once it hits the more densely developed neighborhoods. One flaw in this model is the assumption that firefighters will be readily available. In the presence of a Santa Ana wind event, it is highly likely that other ignitions may occur within the region. This is a reality that has happened on an annual basis for many years. This also translates into the likelihood that firefighters from Beverly Hills may already be engaged in other wildfire events. It also means that the full force of mutual aid resources, including helicopters and air tankers, may not be readily available. This will of course exacerbate the ability of emergency resources to combat a fire event of a large scale. Therefore, the City's plans must include the scenario of limited resources on hand to fight a large, fast-moving wildfire.

2. Tree Related Fire Hazards Report by Dudek, dated December 2019

On the heels of the Kerr Report, Beverly Hills made the decision to hire the firm Dudek in April 2019 to prepare a comprehensive Urban Forest Management Plan (UFMP), with an emphasis on wildfire hazard evaluation and mitigation. The Dudek Report was completed in December of 2019, and served as Phase I of the UFMP. Ultimately, Phase II will incorporate a broader and more comprehensive portion of the UFMP to address the entire Urban Forest areas of Beverly Hills, including both public and private trees.

Largely, a great deal of information from the Dudek Report corroborated the findings from the Kerr Report, which also identified a list of hazard trees susceptible to propagate a wildfire. The report did identify that the Beverly Hills UFMP would consider goals, policies and programs that address the entire urban forest – both public and private trees. This is a unique perspective that is highly appropriate when looking at the entire wildfire environment. As part of their research, public presentations were conducted, and an online survey gathered public opinions on a range of urban forestry issues. Although it should be noted that the survey results were intended as a tool for preparation of the overall UFMP project, and were not specific to the wildfire hazard assessment chapter or any particular geographic area of the City.

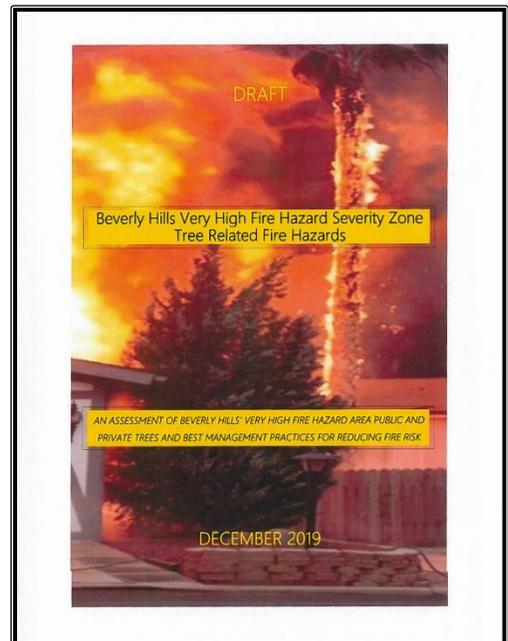


Figure 10: Dudek Report, December 2019

As with the Kerr Report, the Dudek Report focused primarily on the VHFHSZ areas north of Sunset Blvd., with a goal to develop a framework for future actions to reduce the threat of wildfires in the VHFHSZ. The report acknowledges the fact that any tree can ignite and burn under the right conditions, but some trees are more flammable than others due to their leaf and crown form, litter accumulation, resinous exudate, and terpenes.

In addition to the above conclusions, the report goes on to provide more specific data on private trees, public trees, trees on the Greystone Property, and addresses specific issues of tree fire hazards within the Trousdale neighborhood. In the areas north of Sunset Blvd., there are an estimated 40,000 to 70,000 private trees, and just over 7,600 public street trees, of which approximately 3,500 exhibit higher flammability. However, the report also points out that the progressive City maintenance practices have minimized the wildfire risk to these trees overall, and the risk of ignition and fire spread is minimized. Specifically, it was pointed out that the trees are maintained with a typical 17-foot vertical clearance. This, along with maintenance of ground vegetation at low heights limits the ability for a ground fire to spread into the tree crowns. As these trees continue to age, a higher risk will be that of large limbs falling during wind events, potentially blocking evacuation paths for the public in the event of an emergency.

However, while the Dudek Report presents a balanced overview of the public trees, there is little connection to the adjacent landscaping on private property. The relationship between the City's maintenance program and private property landscaping is one of the most significant risks facing Beverly Hills today. A more in-depth discussion with proposed solutions to this conflict will be addressed in the third section of "Connecting the Dots," entitled, "Reach Consensus on the Trees."

The Dudek Report goes on to provide a proposed list of recommendations, which will not be repeated here. However, in summary, the recommendations suggest continuing high maintenance of these trees, removal of trees when they become ill or stressed, and most importantly suggested the City create a long-range replacement plan for the entire street tree inventory. As part of this replacement plan, the City should consider eliminating all high fire hazard trees with more fire-resistive species in the future, as recommended in the Dudek Report.

The recommendation for a long-term tree replacement plan is a critical component to a long-term wildfire management plan. Currently there is a heightened fire risk presented by some of the existing street trees. This is primarily due to their density and interconnected, or contiguous, canopies, which can allow wildfire to easily spread from tree to tree. The resulting fire intensity could likely render access or egress along these roads impassable, hampering evacuation efforts and emergency response access. And while these trees provide a strong identity to Beverly Hills neighborhoods, many of the current species have already exceeded half of their expected lifespans and some are now reaching the end of their lifespan. This inevitable march of time dictates that a replacement plan is essential to maintain the character of the neighborhoods into the future, while allowing for new species that are more fire-resistant to help reduce the risk of wildfires into the future when they occur.



Figure 11: Trees remain after Camp Fire in Paradise, CA

While the Dudek Report does provide an excellent overview of the tree status and plans north of Sunset Blvd., once again there are certain gaps when addressing the broader wildfire impacts on Beverly Hills. As both the Kerr Report and the Dudek Report point out, embers are a significant contributor to wildfire spread and create additional ignition sources. In that context, the trees may not be the most significant problem when it comes to the tremendous impacts from wildfires we have recently seen. There are many recent examples of entire communities being devastated from a wildfire, while the surrounding trees remain largely intact, as seen in Figure 11 above. Figure 12, below, presents an even more typical scenario. The home that survived in this photo is surrounded by unburned vegetation, while much of the other landscaping immediately around the destroyed structures was burned. While suppression forces may have had an influence on this house and landscape surviving the fire, it more typically points out the reality that when wildfires encounter communities, the homes themselves are often ignited directly by embers or from vegetation immediately surrounding

the structure. The evidence has become clear that many times, trees are ignited from nearby burning structures, and not the other way around. This does not diminish the contribution that trees can play in structure ignitions, especially from high fire hazard trees such as Pines or Eucalyptus. These species can contribute significantly to the embers being generated from a wildfire simply because of their needles and bark which are highly flammable. The resulting increase in embers can in turn threaten even more homes downwind.

The Dudek Report provides a guide to the existing tree situation in Beverly Hills, specifically focusing on public street trees north of Sunset Blvd. The public street trees can add to ember propagation as well as increased congestion during evacuations. This can occur not only from the possibility of intense fire behavior or extreme heat generation, but also from the possibility of large limbs falling, or even an entire tree falling and blocking a road. But it must be pointed out that these trees may not be the largest contributor to the overall wildfire risk in this area. Wildfire vulnerabilities to the community include many additional pieces of the landscape besides street trees alone. There are many more trees on private property than on public streets, in addition to the landscaping and other vegetation on private property that will be a significant contributor to fire propagation and spread during a fire. It is the close proximity of this vegetation on both public streets and private properties that make each element vulnerable to the other. As mentioned earlier, the relationship between the public trees in Beverly Hills and private landscaping may be one of the most significant wildfire threats today.

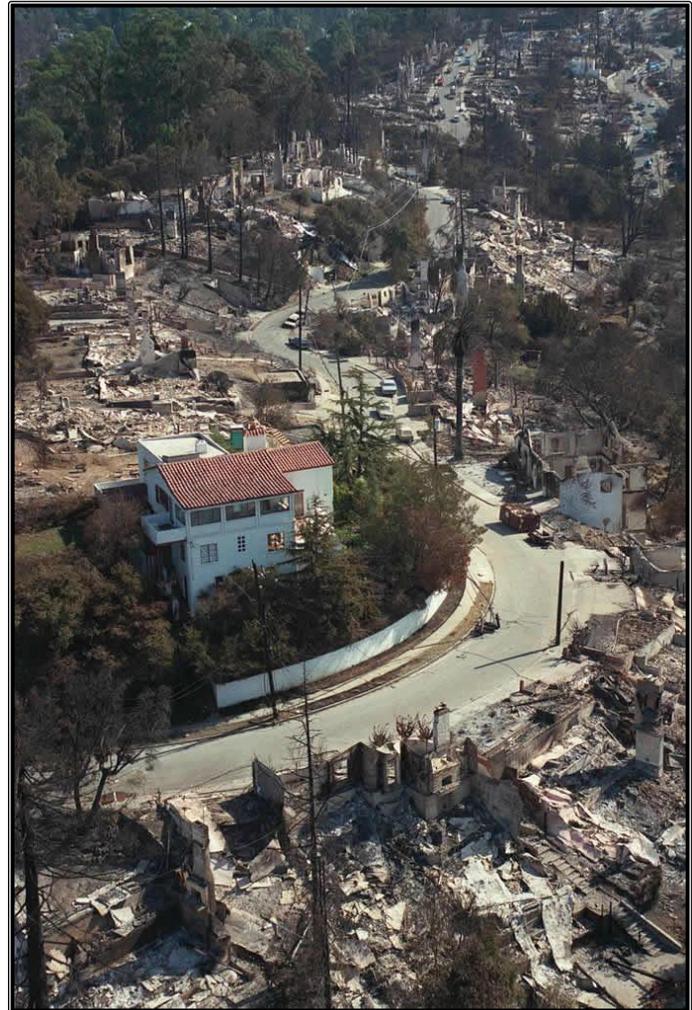


Figure 12: Unburned vegetation around home that survived the 1991 Tunnel Fire in Oakland

3. Beverly Hills Fire Department – Education and Information



Figure 13: BHFD Equipment in front of Headquarters

Citizens of Beverly Hills should rightly be very proud of their Fire Department. BHFD has achieved the rare designation of a Class 1 Fire Department, which puts them in a category of fewer than 1% of all fire departments across the United States. While this achievement alone indicates the exceptional service they provide, it is essential to identify the proactive steps they are taking to address the City’s wildfire potential.

BHFD has done an outstanding job of posting fire prevention education and information related to wildfire preparedness on their website at:

<http://www.beverlyhills.org/departments/firedepartment/web.jsp>

Residents can access up-to-date fuel reduction information, brush clearance, and landscaping guidelines. There are links that provide information on how to prepare for evacuations, and what people should have available when asked to leave. In addition, they directly link to sections of the Dudek Report for information on high fire hazard trees, and additional guidelines that the public can look at. They also provide video clips that explain in more detail about the “Ready, Set, Go!” Program, and a number of video clips to help provide basic information on aspects of home hardening to reduce your home’s vulnerability to wildfire.

The rapidly changing wildfire environment, and its impacts on our communities, has generated the development or updates on a number of reference documents. These can serve as guides for decision-making processes by the Chief and BHFD to help provide elected and appointed officials, city departments, and residents choose the most appropriate prevention activities and planning elements to achieve their goals and objectives. The list below provides a selection of those documents that help support the recommendations within this Report, and will help with a better understanding of wildfire impacts and prevention efforts. The City’s own 2017-2022 Local Hazard Mitigation Action Plan has an excellent chapter on Wildfire, and is also referenced below. This is by no means a complete list of everything available today, but offers some of the most suitable documents that coordinate with this Report.

1. California Strategic Fire Plan: This plan is produced by the California Board of Forestry and Fire Protection (BOF) and provides an overarching vision to deal with wildfire issues across the entire State of California.

<https://osfm.fire.ca.gov/divisions/wildfire-planning-engineering/fire-plan/>

2. City of Beverly Hills Local Hazard Mitigation Action Plan, 2017-2022: The chapter on Wildfire provides more detailed historical data, and broad information that the City has adopted to deal with wildfire emergencies.
<https://www.beverlyhills.org/cbhfiles/storage/files/308161150947855524/BeverlyHillsFinalLHMAP5.29.pdf>
3. Los Angeles County Fire Department Strategic Fire Plan 2020: This plan, which is updated annually, provides wildfire planning goals, objectives, and additional data for areas immediately surrounding Beverly Hills.
<https://osfm.fire.ca.gov/media/uf5joh2s/2020-lac-fire-plan.pdf>
4. SAFER (Sustainable And Fire Resistant) Landscapes from the Los Angeles and Ventura County Cooperative Extension: Although published in 2009, it provides valuable references and information to create fire resilient landscapes.
<https://ucanr.edu/sites/SAFERLandscapes/>
5. IBHS Guide for California: This document from the Insurance Institute for Building and Home Safety provides important information on home hardening and retrofitting.
https://disastersafety.org/wp-content/uploads/2019/03/Wildfire-Retrofit-Guide-California_IBHS.pdf
6. Guide from Nevada Counties; University of Nevada, Reno; and the U.S. Department of Agriculture: Another excellent document for home hardening guidelines.
https://naes.agnt.unr.edu/PMS/Pubs/2020-3810.pdf?utm_source=publications&utm_medium=pub-download&utm_campaign=pub-link-clicks&utm_content=3810&fbclid=IwAR0D-Z6H7sMe1HxEmNizm5RC6V8zFf0k_toQhQFOE7INgLofpqvygKDIvc0

One of the most impactful decisions initiated by BHFD has been the appointment of a full-time inspector assigned to the VHFHSZ areas in the City to help educate residents through the Brush Inspection Program. This inspector not only works with residents to gain compliance, but also provides suggestions for vegetation management and home hardening issues related to wildfire resiliency. Fire Inspectors also respond to residents who alert the fire department to unknown hazards and possible code violations, which can be generated from BHFD’s Fire Code Complaints page on their website. This position works year-round on these issues, in recognition of the fact that wildfires are no longer relegated to a “season” - they can occur any time throughout the year.

BHFD has also made impressive efforts to help address the issue of structure ignitions in the VHFHSZ, recognizing the vulnerabilities posed by landscaping and building materials. As with almost all new codes and regulations, jurisdictions do not make them retroactive to address existing conditions, but may impose them when upgrades or changes are made in the future. These steps will help reduce the current risks over time, and the City will have to weigh the potential benefits of more aggressive code requirements to reduce these wildfire impacts with potential resistance or opposition to these changes.

In addition, the City has enacted local ordinances that place restrictions on parking during Red Flag designations along evacuation routes with highly visible signage to help reduce congestion during emergencies. Strict enforcement of these parking restrictions must be a high priority. As mentioned previously, the addition of full-time personnel focused on connecting with residents and helping with wildfire awareness will continue to add dividends. A further enhancement can be to better understand the public's access of their website and general understanding of the resources they do have available. These and other issues will be discussed in more detail in the chapter on Connecting the Dots.

Because vegetation management is one of the factors under our control to help reduce wildfire impacts, every option to maximize this tool must be explored. As discussed earlier, some of the highest threats to Beverly Hills comes from canyons and hillsides that are outside of the City's control. Previous discussions have taken place with these neighboring land managers to identify fuel reduction activities. These conversations must continue to explore every option available. While mechanical treatments to reduce fuel loads are most common in urban areas, other options such as grazing and limited prescribed fires should not be discounted. A growing urgency to increase use of these and other methods are providing opportunities that may not have existed in the past. BHFD can be a leader in utilizing these opportunities where appropriate and safe to do so.

4. Firewise USA® Recognition Program

The Firewise USA® Recognition Program was initiated by the National Fire Protection Association (NFPA) in 2002. Beverly Hills recognized the potential benefits this program could provide for its residents early on, spurred by the devastating fire siege in Southern California in late 2003. The City completed their community assessment and received their official recognition as a Firewise USA® site in 2005. They have maintained this recognition from NFPA since then. The Wildfire Hazard Assessment written by David Kerr in 2018, in fact, also served as the updated assessment for the Firewise USA® recognition, which is required every 5 years.

The basis behind the Firewise USA program is focused on voluntary citizen participation to take responsibility of achieving wildfire prevention activities to reduce the vulnerabilities of wildfire impacts to their community. It is not a regulation imposed by governing bodies, nor required by codes. Currently there are almost 1800 communities around the country who have received this recognition. The prevention work employing Firewise principles that has been completed by residents in these communities has provided positive benefits during recent wildfire events. Primarily, this focuses on residents identifying ways they can reduce the vulnerability of their own homes when a wildfire hits their neighborhood by "hardening" their homes, and improving their landscaping immediately surrounding their homes and neighborhoods in a more fire resistive manner.

The boundary for the Beverly Hills Firewise Program mirrors the same area as the VHFHSZ, which includes all incorporated lands north of Sunset Blvd. This area is comprised of approximately 1640 parcels, and includes approximately 1535 residential structures. Over the

past 15 years, residents in the Beverly Hills Firewise Program have recorded more than \$250,000 in fire prevention activities. It is likely that the actual amount of work that has been completed exceeds this number. This figure is compiled using a standard dollar amount established by NFPA by calculating direct costs of project work, as well as time devoted by residents in prevention actions around their homes. Yet more can be done. A recommendation would be to revisit the current boundary, and potentially break it down into smaller neighborhoods that could more appropriately engage in this communal activity of wildfire preparedness. Engaged citizens could then work together to increase their own contributions for fire prevention activities while simultaneously reducing the risk of wildfire impacts on their own homes and neighborhoods.

One final recommendation is to consider creating one or more Neighborhood Fire Safe Councils. Guidelines to create these groups can be obtained from the California State Fire Safe Council, and can be used as a non-profit organization to help secure grant funding for the many fire prevention activities that will be taking place. The Fire Safe Councils and Firewise Programs can coexist and compliment one another to achieve even more prevention goals, and allow BHFD to focus on more technical goals and objectives.

5. Wildfire Predictive Analysis

In order to provide the most comprehensive analysis possible, this Report has included one of the most up-to-date wildfire predictive modeling services available today. This modeling analysis has been provided by FlameMapper, a company that specializes in geospatial predictive analytics for wildfire spread and impacts. Their state-of-the-art artificial intelligence data provides clients with the ability to analyze wildfire impacts based on large scale data across the landscape, including inputs from topography, weather, fire history and existing vegetation. Their models can then be altered to show proposed wildfire prevention activities, and allow the simulations to identify where these activities can make the most significant difference. This allows viewers to choose the most critical needs and prioritize prevention efforts over time.

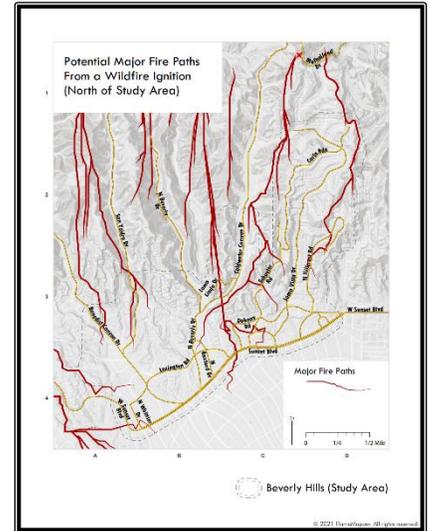
For this Report, FlameMapper has produced a total of nine maps. These maps identify potential wildfire spread and impacts within the City of Beverly Hills, with modeling analysis based on existing vegetation data, across the entire study area. The purpose of these maps is to highlight the location of wildfire risks, vulnerabilities, and opportunities for intervention with preventative activities. The results of these analyses are intended for informational and planning purposes so that both elected officials and residents are better informed as to where the highest threats exist, and provide information to help plan for prevention actions that can reduce the wildfire risk to Beverly Hills. Each of these maps tell a specific story, yet they also intertwine to provide a number of data layers to show how a significant wildfire event could threaten Beverly Hills. For this predictive analysis, multiple scenarios were modeled, some of which are shown on the following pages. One such scenario was an ignition source along Mulholland Drive, to the east of the intersection of Coldwater Canyon Drive. This places the ignition source approximately one-half mile to the north of the Trousdale Estates

neighborhood. The weather is assumed to be hot, dry and windy, as would be typical during a Santa Ana weather event. A roadside ignition from a car driving along this well-traveled route is a likely scenario. These weather assumptions form the basis for the predictive analysis that follows. Each of these maps will be described in detail below, with full-page maps provided on the pages immediately following these descriptions.

Map #1: Potential Wildfire Paths

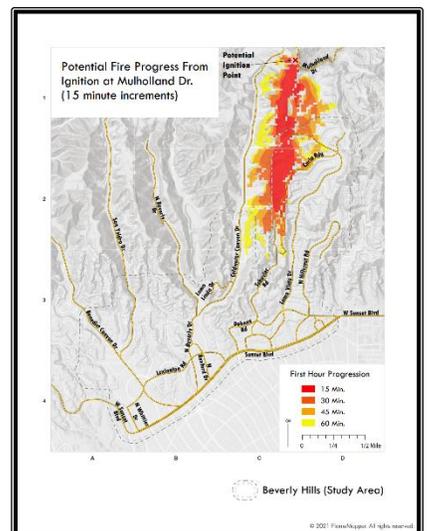
The first map in the sequence indicates the expected paths, shown with red lines, that a wildfire would take after an ignition during a typical Santa Ana wind event. As discussed earlier in the Report, the north-south orientation of the canyons to the north of Beverly Hills would influence a fire in these conditions to travel south through the canyons, likely with a critical rate of spread.

This map also shows a number of additional red paths for wildfire in an effort to highlight the existing threat that exists from any number of potential ignition sources to the north of the City. These paths are consistent with the descriptions in the Wildfire Environment section earlier in this Report, and would likely travel with great intensity straight toward Beverly Hills. Showing these paths is not intended to “scare” residents, but rather offer a snapshot of where a number of potential fire ignitions would pose a threat to the City, which then allows for better prevention planning and prioritization of projects. It should also be noted that while the study area for this Report is primarily north of Sunset Blvd, aligning with the VHFHSZ maps, wildfires under these conditions could be expected to continue traveling south past Sunset into other neighborhoods. This is also consistent with numerous wildfires in recent years. Keep in mind the current FHSZ maps date from 2008, and many communities and neighborhoods outside of the High and Very High designations on these maps have been significantly impacted by wildfires in recent years. This emphasizes the fact that while the maps can provide a guideline for planning purposes, they must not be misinterpreted to mean that wildfires will only impact the zones that are at highest threat. It is critical that all residents of Beverly Hills understand they are not immune from the threat of a wildfire simply because they live to the south of Sunset Blvd.



Map #2: Potential Fire Progression Map

Progression maps have primarily been used as a tool after a wildfire event to show where the fire traveled over a period of time. This progression map assumes the ignition along Mulholland Drive, one of several potential ignitions modeled, but the one with the greatest potential for to the city of Beverly Hills. The map shows the distance a wildfire might spread in 15-minute intervals, up to the first hour. Fire departments utilize common language to

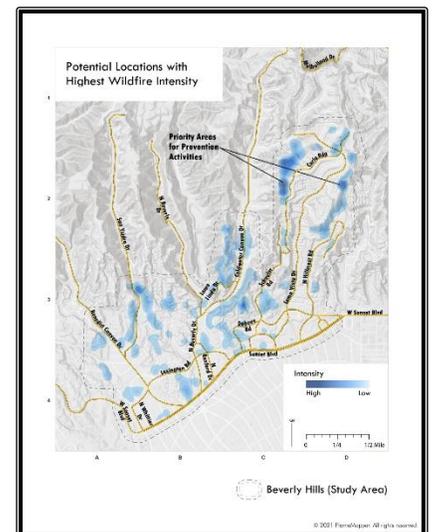


describe how fast a wildfire travels across the landscape, which is referred to as the Rate of Spread (ROS). The ROS is commonly broken down into four categories from low to high speeds – Low, Moderate, Dangerous, and Critical. Consistent with the information provided in this Report, this fire scenario spreads very quickly from its' ignition point towards the south at a critical rate of spread. As would be expected, the central portion of the fire travels at a critical speed, translating to greater than 3 mph in a relatively straight line to the south. Over time, the fire begins to spread outwards from the flanks, or sides of the fire, but the greatest risk indicates the primary flame front approaching the Trousdale Estates neighborhood in a short period of time – less than 15 minutes.

This map immediately informs us of a number of important aspects. Due to the speed at which this fire would travel, there will be very little time to inform residents of its' existence, and subsequent need to evacuate those critical areas where the fire will first impact. The reflex time for the BHFD to be notified and respond to this area could place them at the point where the fire will begin to impact the City with very little time to take defensive actions. As we will see in subsequent maps, the intensity of the fire may be high enough that defensive fire department actions may have little to no effect on the fire itself. This also reinforces the need for structures and properties to be hardened and ready for this sort of impact. The more prepared residents are for this scenario, the more likely structures and properties will survive.

Map #3: Potential Wildfire Intensity

A fire intensity map indicates the amount of energy, or heat output, that will be generated by the fire. This calculation is generally measured in kilowatts (kw) and is portrayed on this map with higher intensity levels shown in dark blue, and decreasing to lower intensity levels shown in lighter blue. This map does not represent the entire area where fire would burn, and therefore you should not look at this map and assume that only the areas identified in blue would burn. The blue areas simply inform us as to where the highest levels of fire intensity would burn based on fuel loads, topography, and weather conditions that would cause it to burn at intensities rendering it difficult if not impossible to extinguish at its maximum output. The importance of knowing where the highest fire intensity will occur often relates to the areas where the highest fuel loads may exist for the fire to burn. Knowing this helps inform us where we can focus efforts to reduce those fuel loads, and potentially reduce the intensity of a fire when it does burn in that area. Reducing the intensity of a fire means there is less energy output, which means the radiant heat from the fire will cause fewer problems of igniting additional fuel. It also helps emergency responders in that their suppression efforts may be enough to overcome the reduced energy release, and be more effective in minimizing fire spread, or perhaps even stopping it.

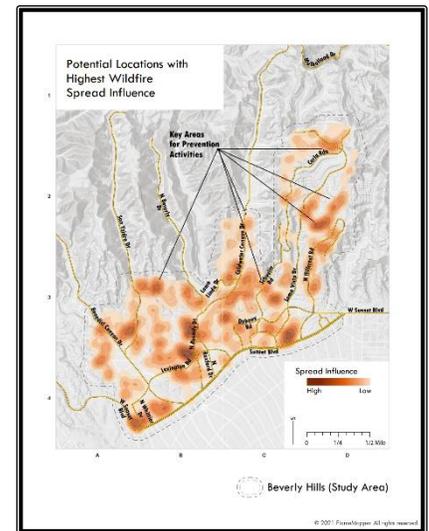


On this particular map, the analysis identifies two areas on both the east and west borders of the Trousdale Estates neighborhood that potentially may cause the highest intensity when a

fire burns in the conditions specified. These are areas that will require more focused analysis by the City to address actions that may help reduce wildfire intensity.

Map #4: Potential Wildfire Spread Influence

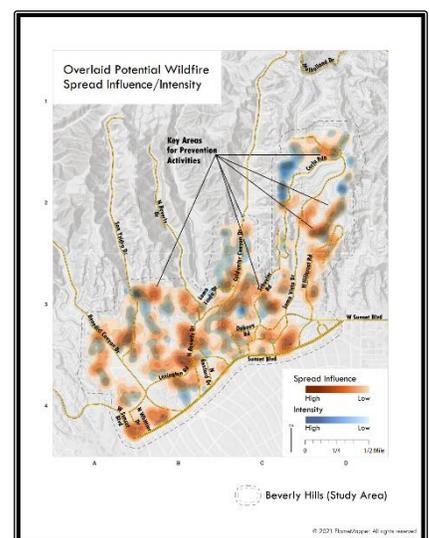
This map shows the locations within the study area that contains the highest probability for fire to spread, if an ignition were to start. The factors that are analyzed to determine this probability include vegetation density, vegetation composition, topography, and fuel continuity. In this map, the orange colors range from light orange where spread influence is lowest, to dark orange where spread influence is highest. Topography has been discussed before – steeper slopes and southern or western aspects provide a higher probability for fire to spread once an ignition occurs in these areas. Vegetation composition references the type of fuel that may exist. This ties directly to the fire resilience of both vegetation and any human created sources, such as structures, fences, vehicles, etc. Should any of these sources ignite, the fire has a higher likelihood of spreading than in other areas. Vegetation density and continuity have some similarities, but influence fire spread in different ways. Vegetation density is not about how close one plant is to another, but how densely formed is the composition of a particular plant species. This can be determined by simply looking at the plant – if it forms a dense wall that has very tight spacing between leaves and limbs, it will contribute significantly to the spread of a fire. Conversely, plants that have less dense composition has less fuel to contribute for the fire to spread. Vegetation continuity, on the other hand, refers to how closely spaced vegetation is located to each other. If the continuity of vegetation is continuous, with no space or breaks in between plants, the fire has an increased ability to spread without interruption. However, if spacing is created in between plants, a fire has to expend more energy to simply travel from one plant to another, thereby forcing it to expend some of its energy to continue spreading. The more space provided between vegetation and other fuels, the less likely the fire has to continue spreading – space helps reduce both intensity and rate of spread.



The map shown identifies a number of areas where the likelihood of wildfire spread influence is at the highest levels. It is in these areas, similar to the areas identified as high intensity, that should be analyzed for priority prevention actions to reduce the likelihood of a wildfire spreading.

Map #5: Overlaid Potential Wildfire Spread Influence and Intensity

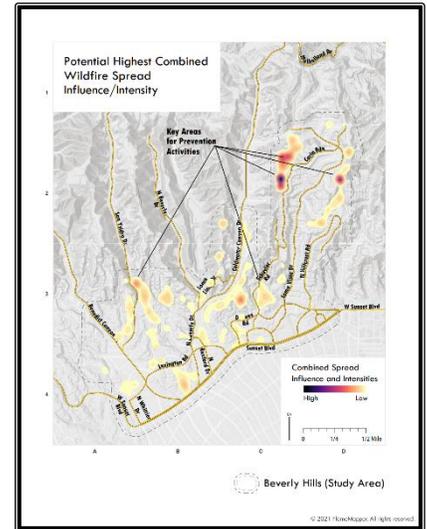
With the information available for both wildfire intensity and spread influence, we are now able to overlay both of these maps and see where common high-risk areas exist. It is important to



note that there are some areas identified as high intensity, but not high spread influence, while other areas may exhibit traits of high spread influence, but may not necessarily contribute to high fire intensity. Therefore, while Maps #3 and #4 have been created by the simulation to identify the areas of fire intensity and fire spread influence on their own, these areas don't necessarily share both of these factors together. Map #5 was therefore created to provide the basis for Map #6, which will focus on those areas where both of these factors overlap.

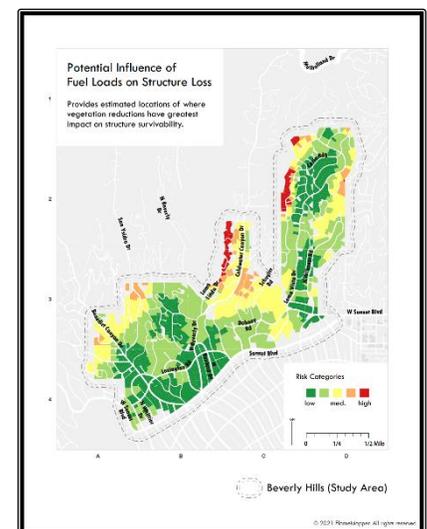
Map #6: Potential Highest Combined Wildfire Spread Influence and Intensity

With Maps #3 and #4 shown overlapping as seen in Map #5, the analysis can then identify the areas where the combined highest risks exist. Map #6 shows the areas where both the highest intensities and the highest fire spread influences overlap, identifying specific areas that may be of highest concern for wildfire impacts. On this map, the dark purple color indicates the highest combined risk, transitioning to a lighter shade of yellow to indicate the lowest combined risk. The map identifies two areas on both the eastern and western edges of the Trousdale Estates neighborhood that appear to show the highest risk from these factors. From a fire behavior standpoint, this makes logical sense due to the fact that the Trousdale Estates neighborhood happens to be at the most northern portion of the City, and would be one of the first areas impacted by a fire from this direction. Because the canyons help drive the simulated fire to the south, and the fact that this neighborhood exists with canyons flanking both the eastern and western sides, it is logical to see a high risk of both fire intensity and spread influence exist on both sides of the neighborhood. The other areas identified on this map as the highest risk also align with the canyon topography. As identified in the Wildfire Behavior section of this Report, these canyons will tend to influence both fire intensity and spread in these areas, as we see in this map. Depending on where an ignition point may occur, it is important to recognize the potential risk along the top of canyon slopes, as well as locations that exist in alignment with the canyon floor. Fire will behave with a higher risk in these areas and therefore should be given higher priorities to focus on fire prevention measures.



Map #7: Potential Fuel Load Influence on Structure Loss

The modeling results shown in Map #7 identify the influence that vegetation may have on potential structure loss. This map utilized vegetation layers that included both trees and other vegetation on public rights-of-way, as well as vegetation on private property. The resulting data allows us to predict where the most beneficial fuel mitigation actions could influence structure survivability. Note that this map is focused solely on the influence of structure loss from



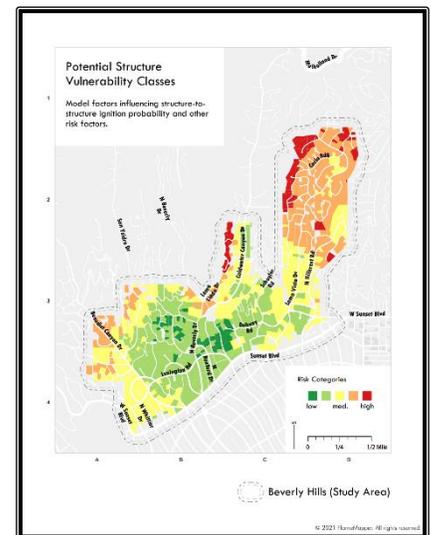
vegetation surrounding and nearby the structures. An additional risk to structure loss is from structure-to-structure ignition, which will be the focus of Map #8.

As expected, the structures located at the top of ridgelines and uphill of west facing slopes appear to be at the greatest risk from high fuel loading. These areas would benefit the most from fuel mitigation projects. This is again based upon the fact that the modeled wildfire scenario would be pushed from the north to the south through the canyon topography that is prevalent to the north of Beverly Hills. It is also important to highlight the fact that this is still not an exact science. There is no guarantee that simply modifying vegetation around structures shown at high risk will completely remove that risk entirely. And it also does not mean that structures identified at low risk do not need to worry about fuel mitigation. You will note from Map #6 above that some of the higher risk areas identified by combining fire intensity and fire spread influence are located in areas shown as relatively low risk when looking only at fuel load influence on Map #7. This emphasizes the importance of looking at all of these maps as a package in order to analyze the complete story the data is showing us, and not just one map by itself.

Map #8: Potential Structure Vulnerability

One of the rising threats from wildfires today is the increasing severity of these fires, which then have a much more catastrophic effect on neighborhoods where structures are closer together. Previous comments in this Report while discussing vegetation have indicated that space between flammable plants plays a significant influence on both fire spread and intensity. The same “space” factor also influences the potential ignition of structures depending on how close together they are positioned. This is known as structure-to-structure ignition, and is represented in Map #8.

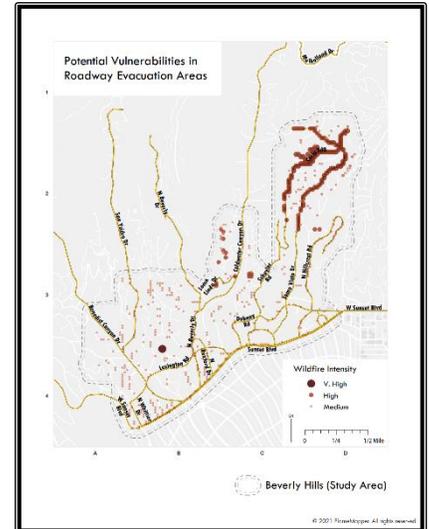
As discussed throughout this Report, the primary cause of structure ignitions during a wildfire is embers. However, as we have seen in numerous fire events over the past several years, structures can also be ignited from the radiant heat and even direct flame impingement from adjacent structures when the right conditions exist – such as a Santa Ana wind event. The most prominent examples of this are the Coffey Park neighborhood in Santa Rosa during the Tubbs Fire in 2017, a number of neighborhoods in Paradise during the Camp Fire in 2018, and still more communities in 2020. Beverly Hills has neighborhoods with similar characteristics where structure-to-structure ignition could occur. Map #8 indicates the vulnerability of structure loss, ranging from a low probability, shown in green, to a high probability, shown in red. As with the fuel load influence map above, it is important to emphasize again the fact that this is not an exact science. Structures identified as low risk from ignition due to an adjacent burning structure does not guarantee that it might not happen. Taking this information into account, it may be possible for residents to review their structures with a critical eye toward both ember ignition potential as well as potential ignition from a neighboring structure. Do opportunities exist to “harden” the



structure to help reduce these impacts? The answer in most cases will be yes. Steps to harden a structure, and make it more resilient to wildfire impacts will be discussed in the upcoming section on Structure Ignitions.

Map #9: Potential Vulnerabilities in Roadway Evacuation Areas

While this Report is focused on many goals to help inform the City of Beverly Hills about wildfire impacts, one of the highest priorities is to maintain the highest level of public safety possible. This includes the ability for residents to safely evacuate in the event of an emergency, while also allowing for the safe access by emergency responders at the same time. Map #9 provides an analysis of the highest levels of vulnerability to evacuation routes during this wildfire simulation. Utilizing data from previous maps, this particular map identifies potential areas where the highest fire intensity could impact evacuation routes during the fire event. The lowest vulnerabilities are indicated by smaller, light red dots, expanding to darker, larger red dots that indicate the highest vulnerabilities. In this particular model, the dark red spots indicate potential crown fire activity, while the smaller red dots correspond with a potential ground fire. While this analysis is specific to this simulation, it once again spotlights the highest vulnerabilities in the northern areas of the Trousdale Estates neighborhood. This coincides with the previous maps showing these same areas with the highest level of fire intensity and potential spread influence. For this particular simulation, the resulting data suggests that reducing or thinning vegetation along the roads could help reduce the vulnerability in these highest risk areas, which in turn may reduce the risk of these evacuation routes being compromised during an emergency. It is important to note that these particular roads are lined with some of the densest trees with continuous fuel in their canopy. As identified in Maps #3 and #4, these factors can play a significant role in the impact of evacuations. From this analysis, the City may choose to implement priority prevention projects to help reduce the fuel loads along these particular roadways to reduce the risk to evacuations. It is also important to note that these same conditions with dense tree canopies and continuous fuel loading occur in neighborhoods other than Trousdale Estates. While this particular simulation identifies the northern area of Trousdale, the same risk occurs along other streets and evacuation routes where similar tree densities and continuous fuel loading exist. All of these areas deserve to be examined as potential priorities for prevention activities to reduce the risk to all of these evacuation routes.



All Maps – Tying Them Together

The nine maps created by this simulation each share specific information related to outputs from wildfire scenarios. As stated earlier, they are best utilized as a package to provide a more comprehensive view of wildfire impacts in the study area. The overall analysis that these maps provide is intended to help the City of Beverly Hills create additional tools to help prioritize their plans for wildfire prevention projects and activities.

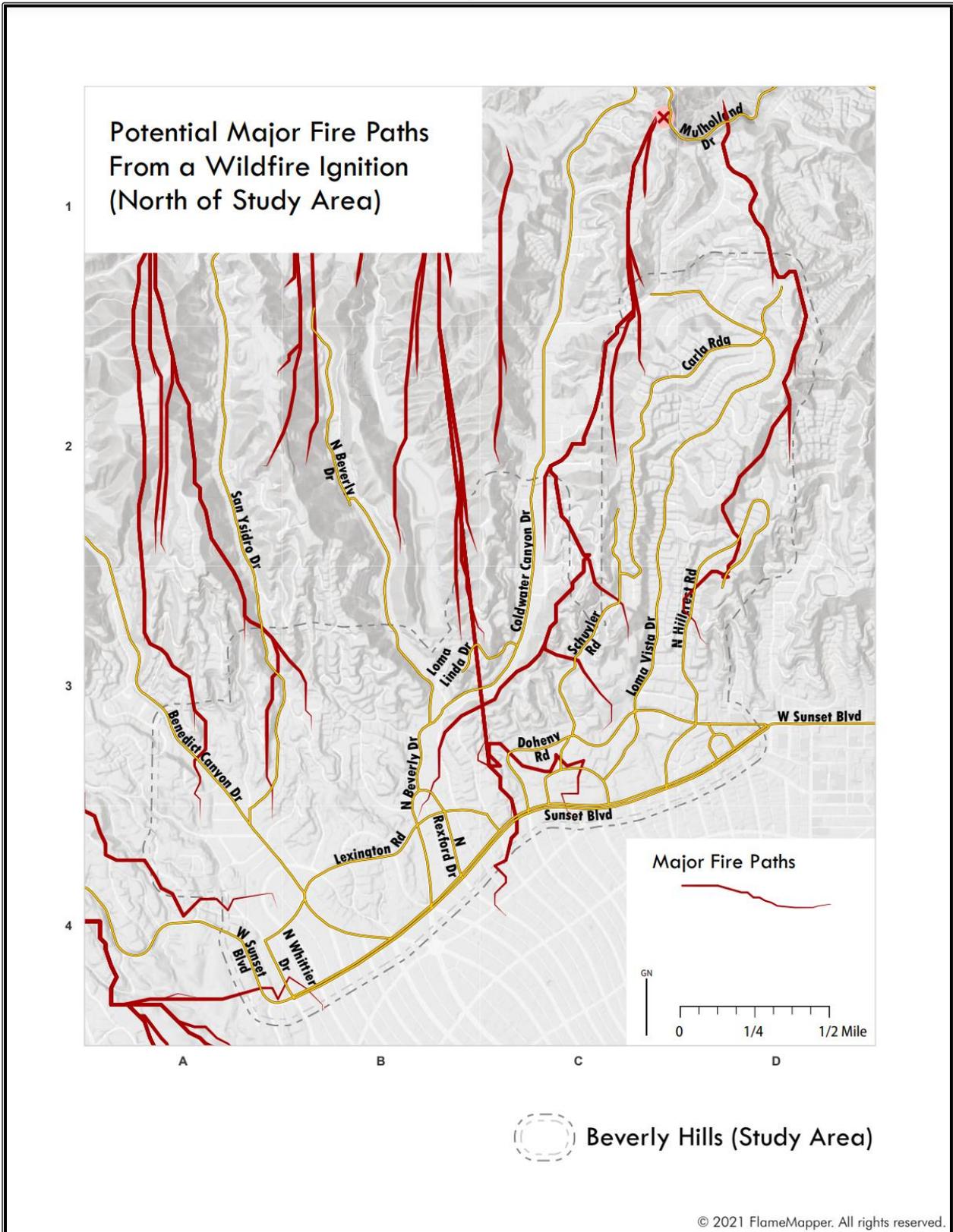
This is also a good time to point out how critical it is to pay attention to all the variables that exist due to risk from wildfires. Structure survival will never be dependent only on vegetation treatment, nor only on hardening a single structure itself. Surviving a wildfire requires all of these things to be considered, and acted upon. A single resident paying attention to these details alone will also not guarantee survival. Actions a resident takes – or does not take – to protect their home from wildfires will have a direct impact on the risk associated with their neighbor, and the next neighbor, and so on. Vegetation management and structure hardening has a very real impact on reducing the risk of destruction from a wildfire. This has been well documented. But to be most effective, it must be practiced at a community-wide level, and not at a single property level. This is why it is so important for neighborhoods to work collaboratively with one another to maximize their risk reduction. It also points out the importance of reducing the risk across public-private boundaries to be most effective in reducing wildfire impacts overall. Wildfires do not respect these boundaries, which therefore make it imperative for all parties to work together to reduce these risks.

The maps provided contain a great deal of information, but must be seen as models that are derived from programmed inputs. As with all computer models, different results could be created utilizing different inputs, and as such, these maps should not be studied as absolute and final data. However, the data layers chosen to create these models were based upon the goals of this Report – to help Beverly Hills utilize current practices, past analysis, and state-of-the-art wildfire modeling to best understand the City’s current wildfire vulnerabilities. Once these are known, efforts can then be prioritized both now and long-term to maximize the effectiveness of reducing those vulnerabilities. The resulting maps provide valuable insight for both the City of Beverly Hills and its residents to identify where the highest risks exist, and offer a platform to help coordinate their planning efforts to reduce the impacts of a wildfire event when it happens. It is important to reiterate that these maps are primarily based on selected inputs from multiple ignition scenarios, along with specified weather, topographic, and fuel information. Changing any of these variables would also likely alter the maps and resulting information. For example, a location on the map may indicate there is a low risk based on these inputs, but by altering the inputs the results could be reversed to a high risk, and vice versa. Therefore, it is important to clearly understand that these results are not an absolute. A plausible scenario was chosen for these particular maps, which in turn will help provide data for the City to prioritize high-risk areas first, as well as a long-term roadmap for fire prevention activities.

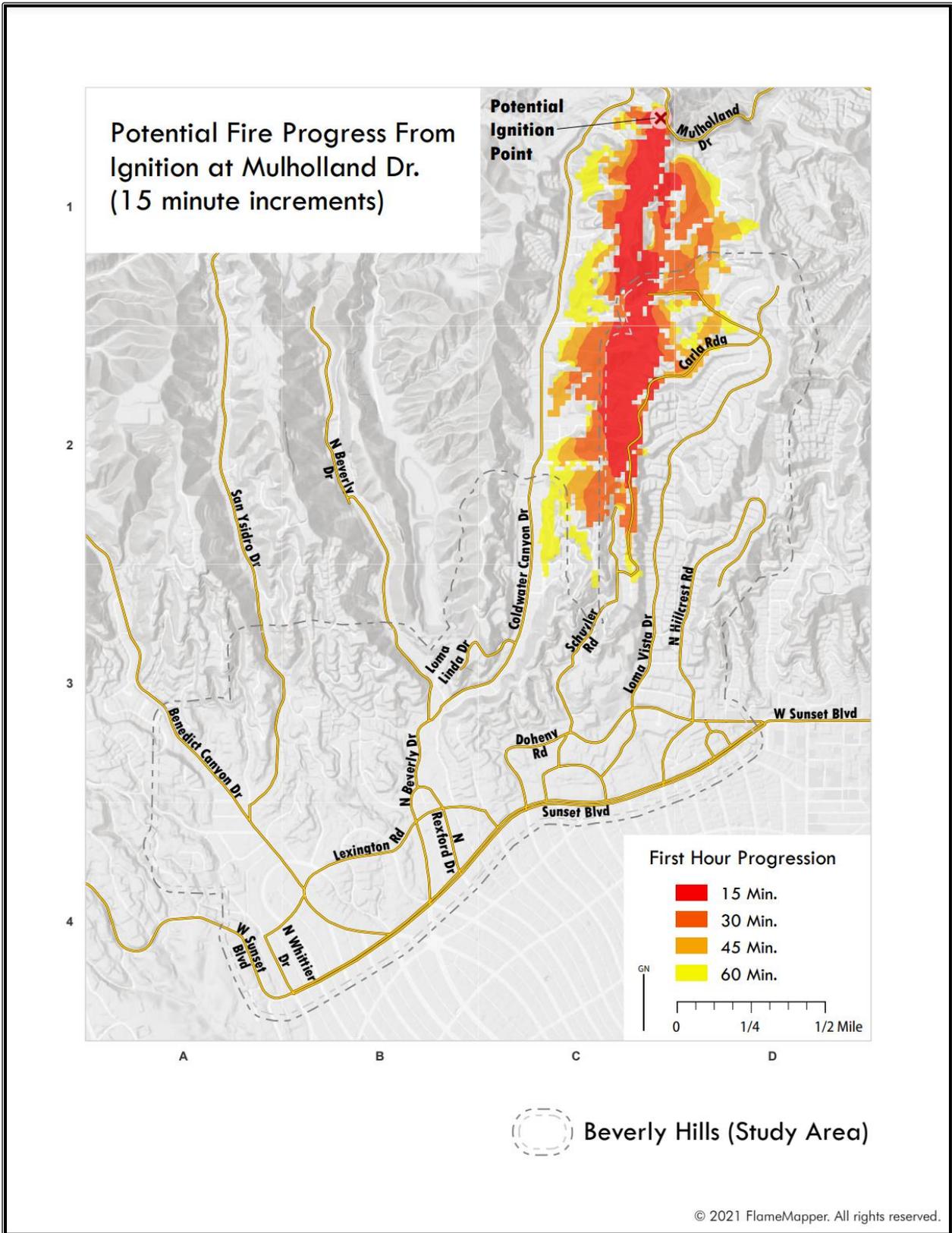
These maps are not intended to “scare” anyone who discovers they may have a higher vulnerability to a wildfire event than they had previously imagined. But knowing and understanding the reality of these vulnerabilities can help spur corrective actions that can help reduce those vulnerabilities. Therefore, the true purpose of these maps is to provide an honest and realistic view of current wildfire threats, and identify opportunities to help mitigate them.

The nine maps described above are now presented on the next nine pages in a larger format:

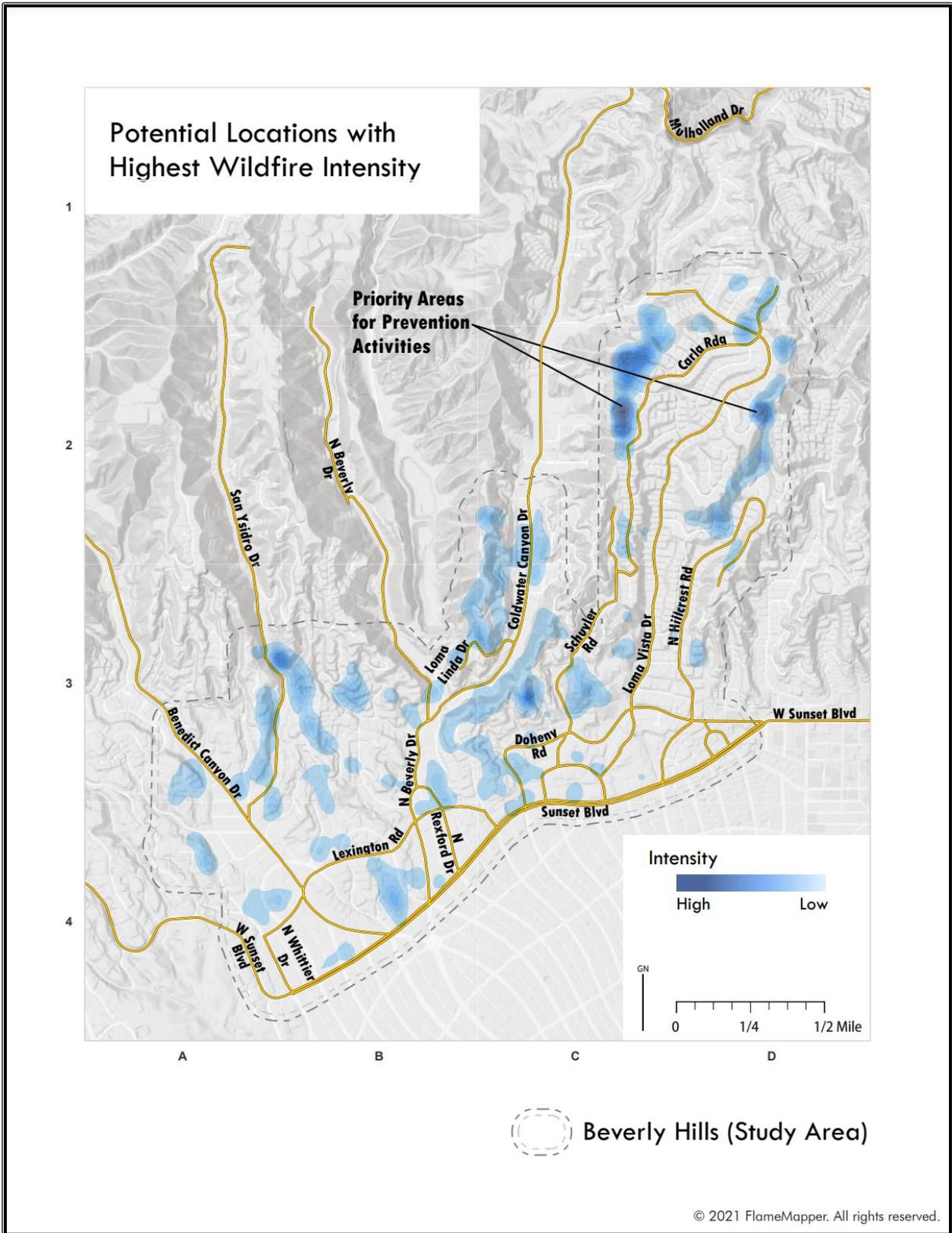
Map #1



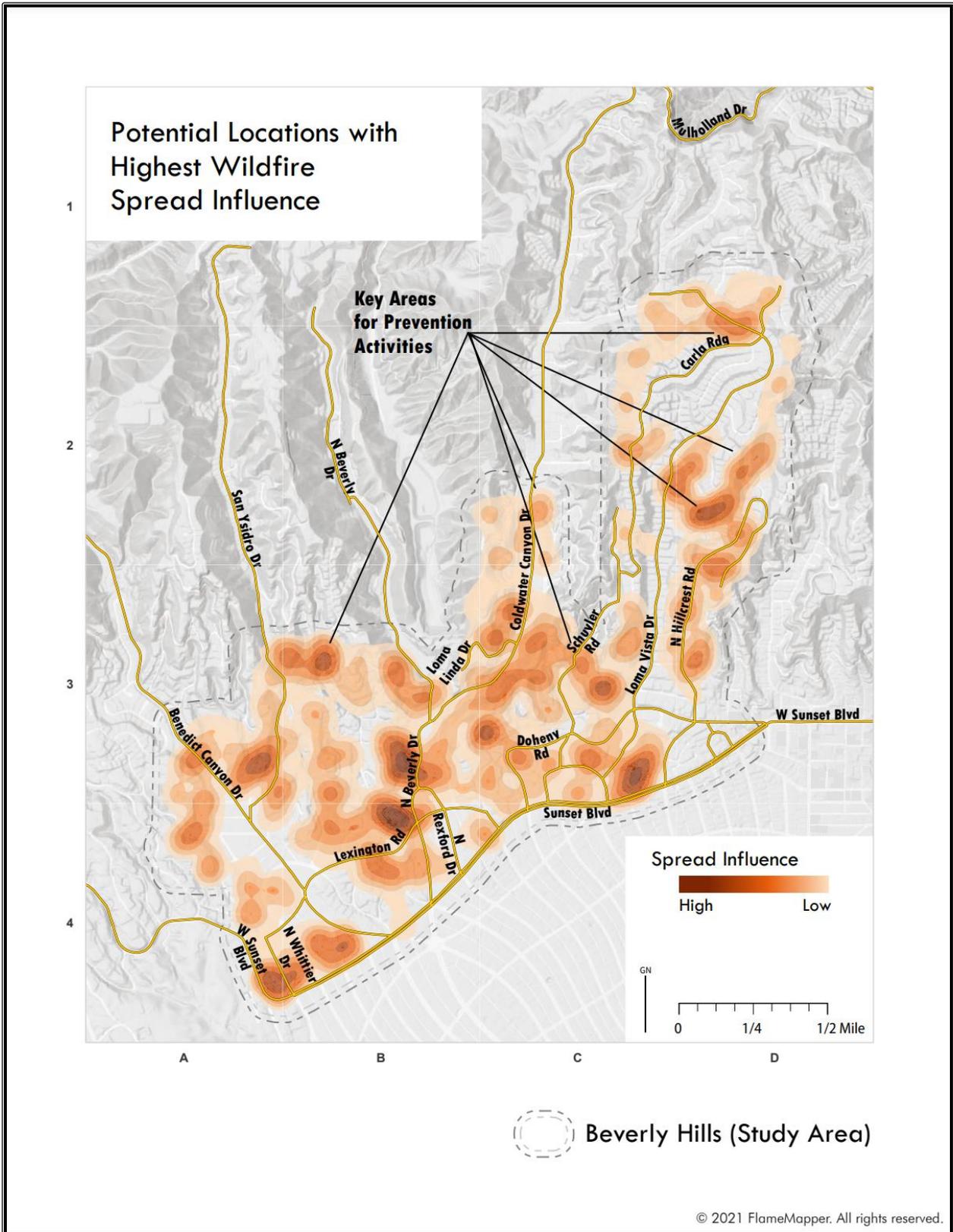
Map #2



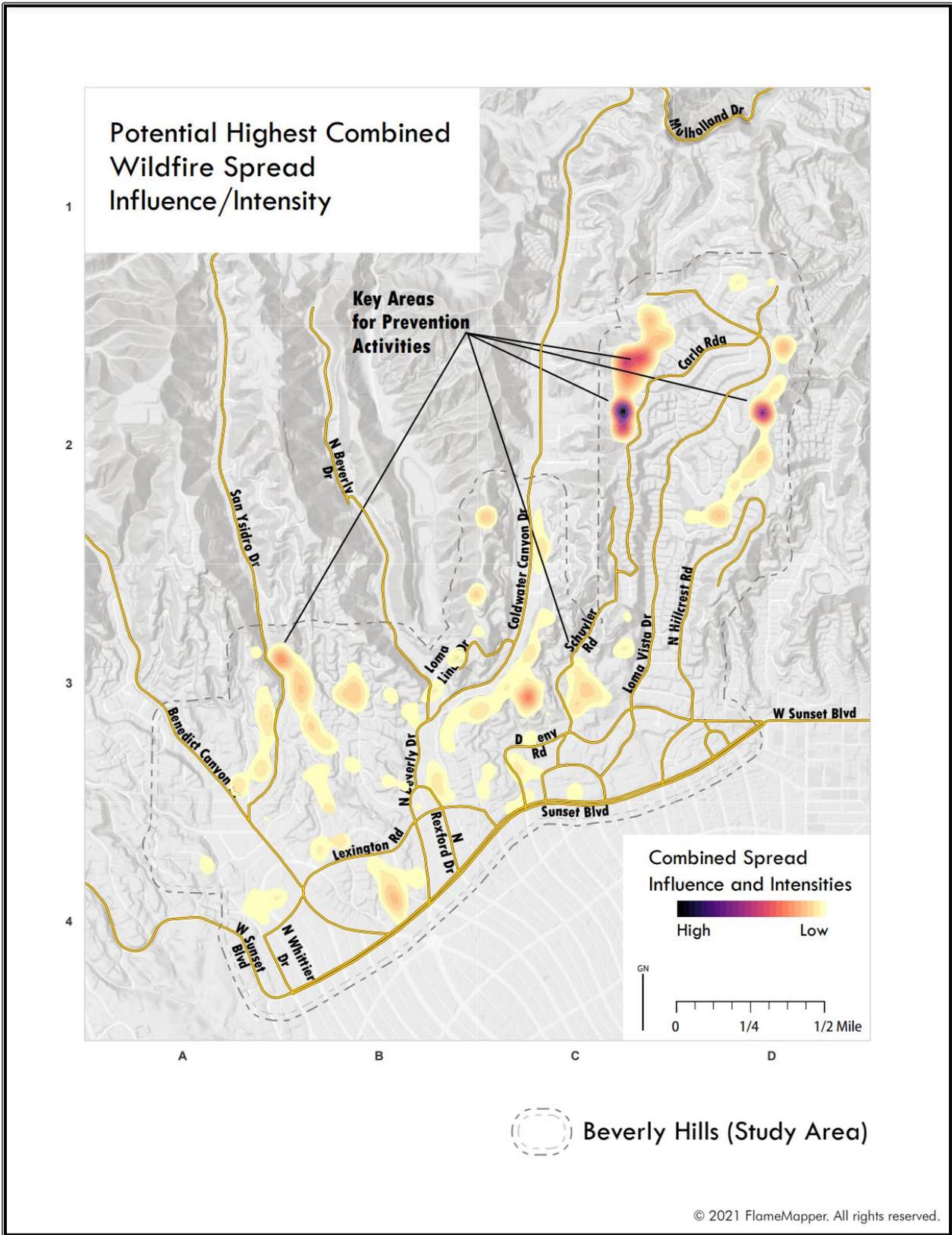
Map #3



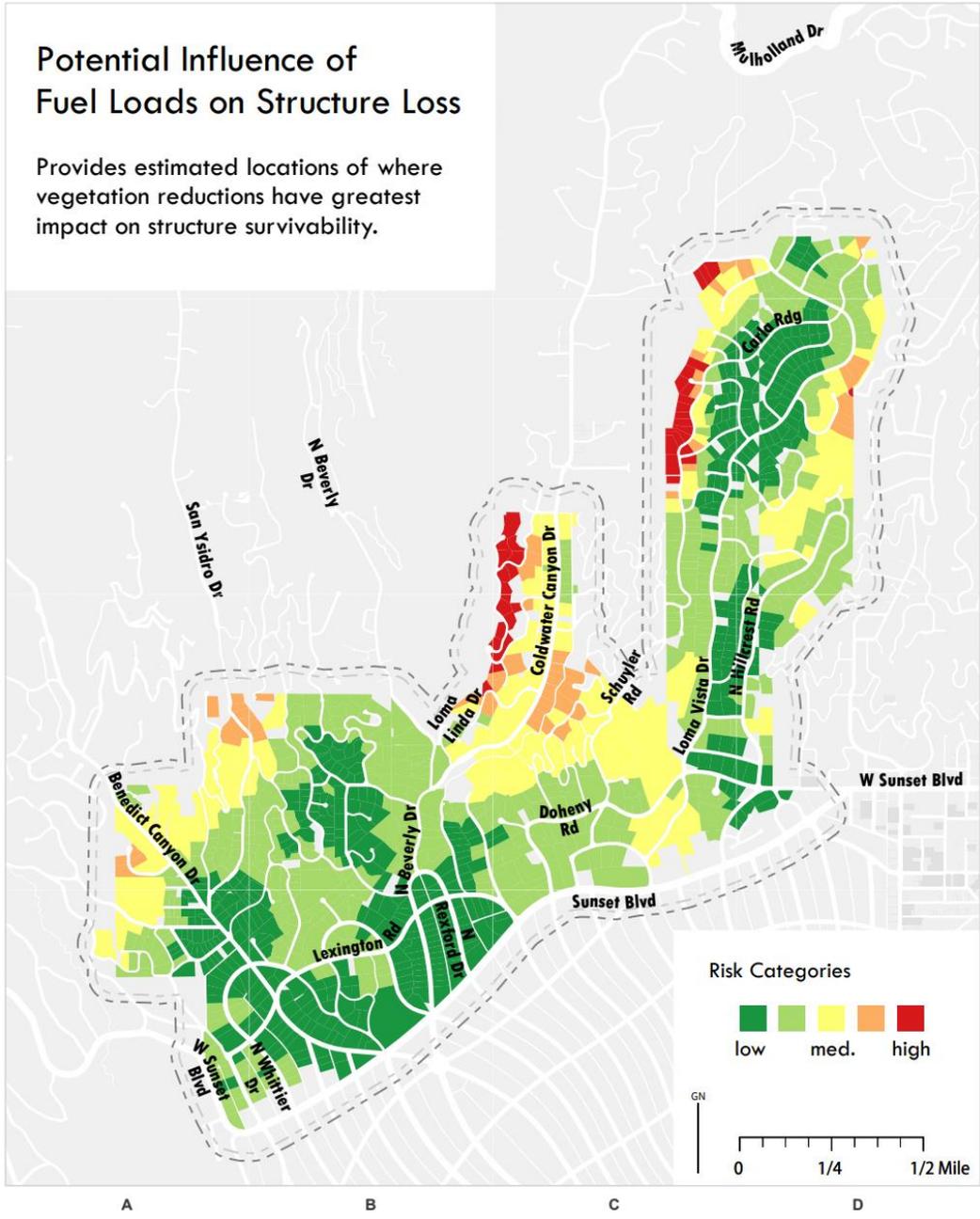
Map #4



Map #6



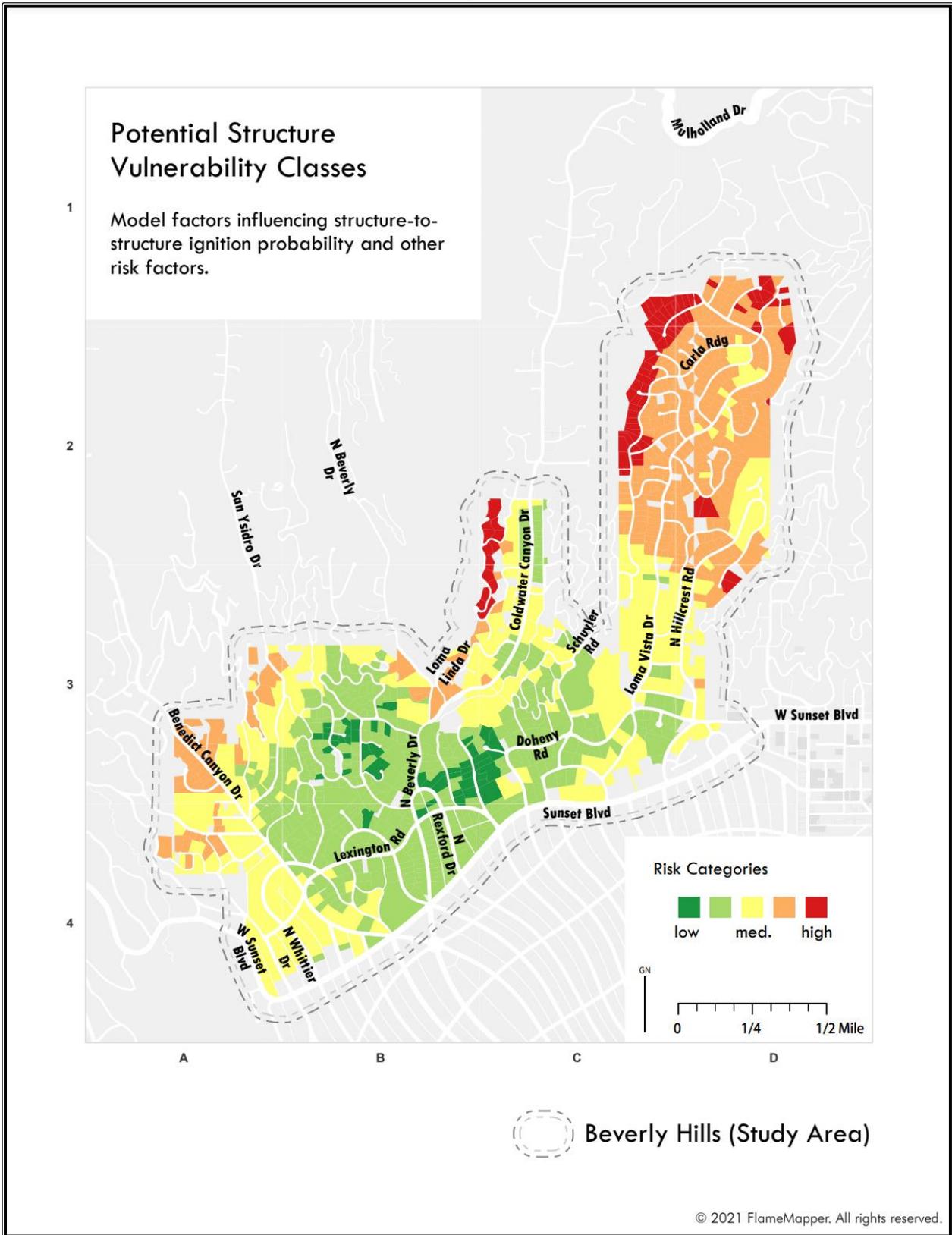
Map #7



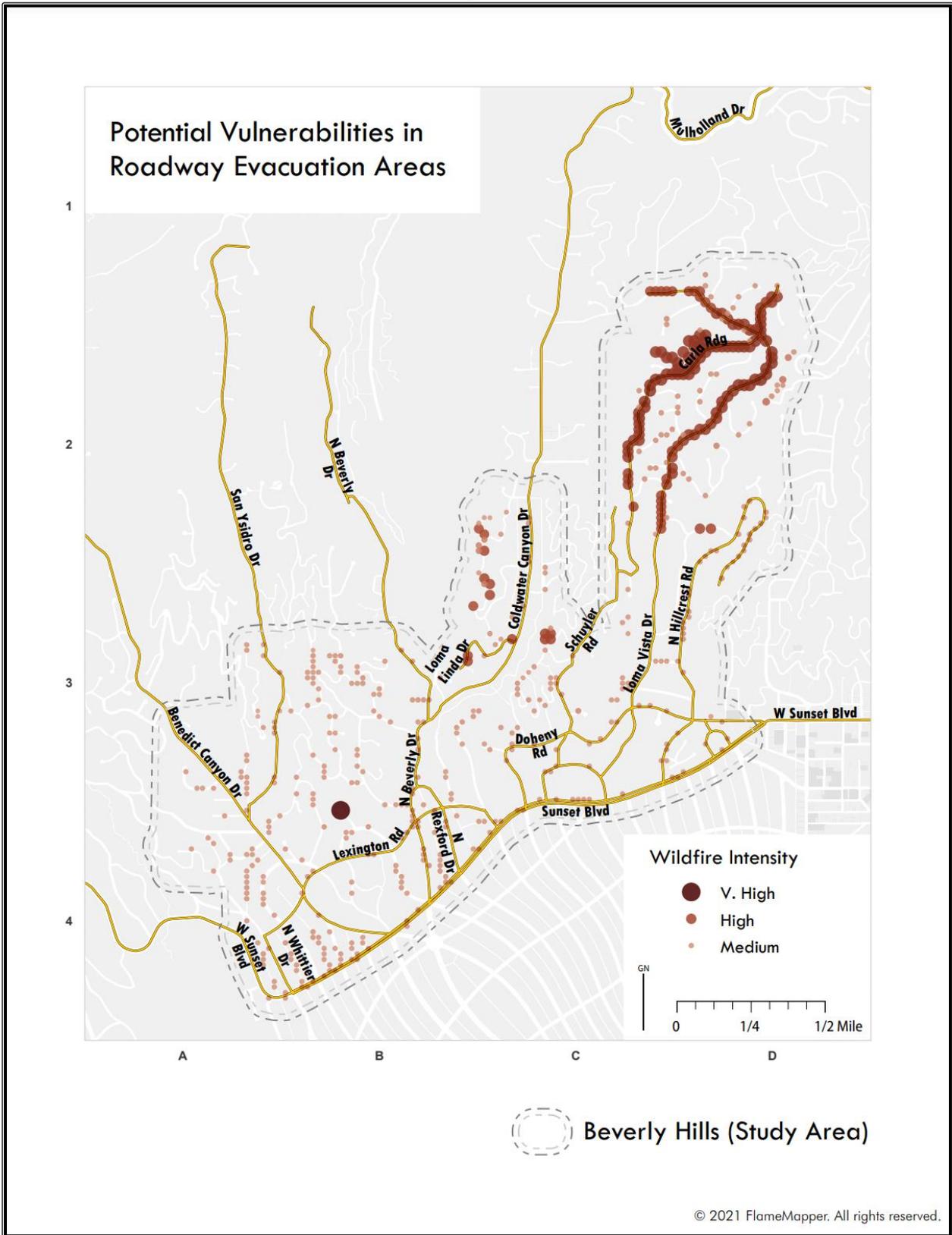
Beverly Hills (Study Area)

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Map #8



Map #9



CONNECTING THE DOTS

As stated throughout this Report, the City of Beverly Hills has taken proactive steps for many years to address their wildfire risks and threats. They received recognition by the Firewise USA® Program in 2005, and have continued to provide information to the public to help educate residents on ways to reduce the risks of wildfires to their homes and communities. The City has done an excellent job at maintaining the trees lining their city streets, which provide so much of the character within their neighborhoods. A Wildfire Hazard Assessment by David Kerr was written in 2018 that provides an in-depth analysis of wildfire impacts in the VHFHSZ areas north of Sunset Blvd., complete with three wildfire scenarios. In addition, the City has completed Phase I of their new UFMP, which recognizes the age and high fire hazard of some trees, while offering recommendations to continue a high state of maintenance and creation of a long-term replacement plan as these trees reach the end of their lifespan.

These steps have all been achieved over time, and have ironically coincided with the recent increase in wildfire impacts and structure loss that has occurred throughout the State of California. Rightly so, residents within Beverly Hills have recognized their risk to wildfires, despite the lack of direct fire history in modern times. Yet the evidence of large, devastating wildfires nearby clearly indicate that Beverly Hills is not immune from the possibility of a wildfire impacting their City directly, and the actions they have taken to help reduce these impacts will help when that time comes. Yet still more can be done.

Some of these wildfire prevention activities, such as tree thinning and replacement, have been seen by some residents as negatively impacting the tree-lined streets north of Sunset Blvd., and there has been a strong reaction against these activities. This Report has reviewed the historical data, the maintenance plans and vision of the City, the Dudek Report focused on Tree Related Fire Hazards, the Wildfire Hazard Assessment, the wildfire predictive analysis produced by FlameMapper, and the BHFD efforts towards education, information, and Firewise USA® recognition. Based on these reviews, this Report has identified some areas of improvements that can be made. The following discussions will provide some conclusions and recommendations to help provide better clarity on how the proactive actions by the City can be tied together.

1. Focus on Structure Ignitions

Throughout the abundance of reports, activities and actions taken by Beverly Hills, there is only a cursory acknowledgement of what has now been identified as one of the highest risks from wildfires – structure ignitions due to wind-blown embers. This is not a new phenomenon. The primary reason why so many homes were destroyed in the 1961 Bel Air Fire was directly attributed to embers igniting wood shake roofs. It was also one of the primary reasons for such a high structure loss in the 1991 Tunnel Fire in the Oakland hills. Firefighters have actually witnessed this happen on numerous occasions as fire severity and structure loss has increased since the early 2000's. CAL FIRE (California Department of Forestry and Fire Protection) created

an electronic data collection program to gather information from damaged and destroyed structures in 2014, labeled as the Damage Inspection Program, or DINS. This program has been used successfully to collect data from large fires beginning in 2015, such as the Valley Fire in Lake County (approximately 2,000 structures lost) and the Butte Fire in Calaveras County (approximately 1,000 structures lost). Since 2015, this unique database now has well over 50,000 entries of structures lost across the entire State of California, and is the only database of its kind in the world. Wildfire research and scientific communities around the globe are hard at work analyzing this database to better understand the causes of structure ignitions. As a result of these studies, important information has come forward.

The data tells us that up to 90% of every structure ignited in a wildfire today is either directly or indirectly caused by embers. Again, this has been understood from an anecdotal standpoint by firefighters

Wildfire Defense Works



Figure 14: Bark mulch burned up to gravel landscaping adjacent to house during Glass Fire. Note: Homeowner had bark mulch removed and replaced with rock landscaping only two weeks prior to start of Glass Fire.



Figure 15: Home that survived the recent Glass Fire, showing impact of burning wood fence – firefighters successfully removed burning fence just before home fully caught fire.

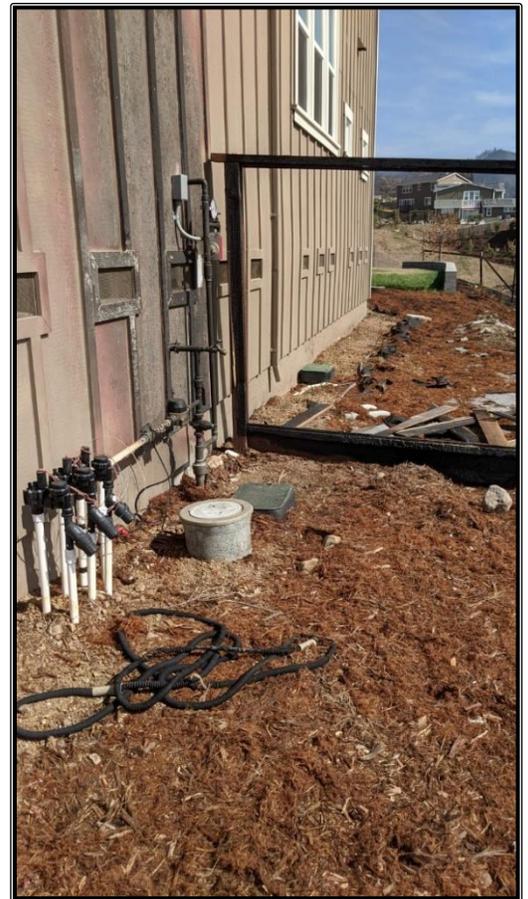


Figure 16: Same house from photo at left showing burned fence removed, and efforts by firefighters to rake away bark mulch from perimeter of home.

witnessing this phenomenon for many years. But the data collected now allows a more formal scientific focus to be made. This encapsulates the entire basis behind the concept of “home hardening” that has been mentioned previously in this Report. Embers will seek out any path possible to directly ignite a structure – whether it be vegetative debris accumulated in gutters or elsewhere on roofs, cracks in siding or openings along the edges of garage doors. There is a very long list of possible entry points that embers will seek out to ignite a structure. But if the structure has been carefully maintained with ember-resistant materials and details, the potential for these wind-blown embers to ignite a structure is dramatically reduced. This is most evident in tests conducted by the Insurance Institute for Business and Home Safety (IBHS) in their testing labs in South Carolina. Short video clips of these tests can be viewed on the BHFD website.

In addition to direct ignition factors discussed above, embers can also ignite surrounding landscaping, patio furniture, wooden decks, as well as wooden fences and gates that are connected directly to structures. One of the most vulnerable materials to ember ignition is highly flammable wood bark mulch that is so popular as landscaping immediately surrounding homes and other buildings. This bark mulch often ignites from embers, which in turn may ignite the adjacent structure – this is referred to as indirect ignition. As fires move into more densely developed neighborhoods, such as in Beverly Hills, we have also seen an increase in structure-to-structure ignition, which was previously identified during the discussion of Map #8. During high wind events, a burning structure can easily ignite other nearby structures due to radiant heat and direct flame impingement. In these instances, a higher percentage of structures are ignited by neighboring structures. But even in these extreme cases, the primary cause of structure loss due to direct or indirect ignition from embers remains at or above 85%.

Either way – via direct or indirect ignitions – it is now recognized that this is the primary cause of structure loss in wildfires today. The data also tells us that once a structure ignites, there is a very low survivability rate – less than 10% in most fires. Therefore, if we know that embers are the primary cause of structure ignitions, and if the structure ignites, there is a very low probability of it surviving, it seems obvious that a majority of our focus should be on reducing the likelihood of ember ignitions. To be fair, this level of statistical data is relatively new, and therefore previous reports would not have been able to utilize this knowledge. However, as this information continues to improve, it strengthens our knowledge of successful mitigation steps that can reduce structure ignitions. Beverly Hills can more proactively incorporate these findings into actions.

In reference to the elements immediately adjacent to the structure, such as landscaping and bark mulch, the research community has shown that a 5 foot wide zone of non-combustible material surrounding the entire structure has proven to be a highly effective means of reducing structure ignitions. The scientific evidence of this change in landscaping has proven to be so conclusive that Assembly Bill (AB) 3074 was signed into law in September 2020, requiring all residential structures in VHFHSZ areas to establish and maintain an ember-resistant zone within 5 feet of the structure. While this new law will apply to all residential structures north of Sunset Blvd., it will not take effect for existing structures until one year after the regulations

have been approved and adopted by the Board of Forestry and Fire Protection (BOF). It is anticipated this could occur sometime during the 2023 calendar year. In order to prepare for this new state law to take effect, the City of Beverly Hills should begin educating residents of this new requirement, along with suggested options to meet this new design mandate.

Any discussion today of structure ignitions from wildfires should include comments on prevention actions beyond structure hardening and defensible space. Today, there are alternatives that include exterior sprinkler systems of many different designs, gels and retardants that can be applied, private firefighting resources from insurance companies, and even wrapping the entire building to “shield” it from heat and embers. There are also alternative building components that contain no combustible materials, while improving energy efficiencies and reducing long-term maintenance. This Report will not dive into any of these alternatives in detail, but simply acknowledge that alternatives do exist to address our current wildfire challenges. There are plusses and minuses associated with all these options, but they must all be carefully considered, understanding that a solution for one home or location may not be appropriate or effective elsewhere. Ongoing research and innovation will continue to improve these alternatives, allowing us options to alter “the way we’ve always done things before.”

2. Improve the Firewise USA® Recognition Program

As mentioned earlier in this Report, the City of Beverly Hills became recognized as a Firewise USA® site in 2005. The Firewise program for Beverly Hills is identified under the Community Outreach tab on the BHFD website. It is unknown how many residents within the City have visited this section, nor what actions may have been taken as a result of these visits. There are some programmatic details that require updating on this link due to recent changes in the program from NFPA, but these can be easily accomplished.

However, there are more substantial changes for this program that can potentially provide additional benefits to the City and its’ residents. The boundaries for the Firewise USA® site in Beverly Hills are identified as the entire incorporated jurisdiction to the north of Sunset Blvd., which corresponds to the VHFHSZ area. However, the evolution of the Firewise program within NFPA has since recognized that smaller boundaries for more focused neighborhoods tend to be much more successful and actively engaged in fire prevention efforts. Therefore, one recommendation of this Report is for the BHFD to revise the Firewise program for the City, and consider creating smaller Firewise neighborhoods where residents can more actively engage in fire prevention efforts that focus on their own residential area. These revised neighborhoods can be broken down utilizing geographic boundaries or existing neighborhood groups that homeowners have already created. The current assessment for the Beverly Hills Firewise program can be utilized as a basis to focus specific goals and objectives for individual neighborhoods, which can then be used for educational efforts with those residents. NFPA has discovered that residents tend to become more engaged and focused on efforts within their specific neighborhood rather than a more anonymous and larger program that encompasses

the entire City. There are numerous examples of neighborhoods actually competing with each other to achieve the highest level of fire prevention actions.

One of the key elements to invigorating the Firewise program is to provide the education and knowledge of appropriate fire prevention efforts for the residents to use at their own properties. BHFD has implemented a successful program with prevention officers working on a year-round basis to help with this effort. These positions will be instrumental in formulating new Firewise boundaries, and providing the educational component for residents to become active partners in creating a more fire resilient community. In order for them to be more successful at this, BHFD should consider providing a more prominent link to the Firewise Program so it is more visible and readily available on their website.

This updated link could also function as a coordinated collection point for other elements of wildfire resiliency, such as the video clips of ember ignition from IBHS, and wildfire prevention actions from CAL FIRE and other sources. This “one-stop-shop” location for all aspects of wildfire resiliency issues would not only provide an easier path for residents to access this information, but also send a more prominent message regarding the City’s commitment toward wildfire resiliency.

Expanding beyond the Firewise USA® program, this link could also provide information related to the most current aspects of wildfire prevention. In addition to AB 3074 referenced above, recent legislation in California has directed the BOF to amend existing fire safety regulations to improve home hardening and immediate ignition zones around structures, as well as upgrading building codes to improve the “hardening” of structures against ember ignitions. These new regulations will also be based upon wildfire research and technology that is known to help reduce the impacts of embers and other aspects of wildfires on the built environment. Yet the standard process for adopting new regulatory language can take several years before jurisdictions are mandated to enforce them. Beverly Hills could proactively convey some of these aspects now to help reduce the risk of wildfires to residents. There are a number of ways to apply these concepts, which can be individually tailored to each home and property.

In addition to the 5-foot ember resistant zone, also referred to as the “home ignition zone,” research and data has also identified wood fences and gates as another element that contributes to structure ignitions. By simply replacing existing wooden fences and gates directly adjacent to structures with a non-combustible material, this ignition source can also be eliminated. The recommendation is to maintain a 5-foot separation from the structure to any wood or combustible fences or gates. Again, while this has not yet been incorporated into state fire safety regulations, flammable wood fencing has become recognized as one of the leading contributors to structure ignitions.

Beverly Hills could create a more visible focus and provide a stronger information and education campaign on these details to help residents better understand how they can incorporate these changes on their own properties to reduce the risk of ember ignitions. It is clear that the Firewise USA® program overlaps with the “Focus on Structure Ignition” section.

This is because the Firewise program is solely focused on helping residents and communities identify their wildfire risks and vulnerabilities, and encourage actions by homeowners to help mitigate these risks. Between these two overlapping recommendations, this Report highlights the significant role to be played by homeowners in reducing the vulnerabilities of a community to wildfires. The City will do what they can to help, but the challenges will never be fully overcome without the acknowledgement and participation of residents doing their part.

3. Reach Consensus on the Trees

One of the purposes for this Report was to address the reaction generated by proposed actions outlined in the Dudek Report. The City did its due diligence in providing public outreach and meetings, conducted online surveys, and should be commended on their vision to create a very strong UFMP that addresses both public and private trees. Unfortunately, these well-intended actions resulted in a few unintended consequences. From the information we have been able to gather, there appears to be a misunderstanding about the overall, long-term tree replacement program.

As recommendations from the draft Dudek report became finalized, some residents reacted negatively to the initial plan that outlined the removal of approximately 1200 trees. This initial plan also included steps to begin the long-term replacement plan of trees as outlined in the draft Dudek report, as early phases of the UFMP. Simultaneously, other residents focused on the fact that some trees were identified as “high fire hazard trees” and expressed a desire for even more trees to be removed to help reduce the fire hazard. These conflicting agendas from the public resulted in a suspension of the plan to remove 1200 trees until further analysis could be performed. The new plan now identifies less than 100 trees to be removed in the immediate future, with others being thinned and maintained for a longer period of time. However, the long-term necessity of replacing aging and unhealthy trees will remain in place, and be implemented on an as-needed basis over time. The wildfire predictive analysis and mapping included as part of this report will aid the City to merge this long-term replacement plan as part of the UFMP, with prioritizing reduction of wildfire risks to evacuation routes and the public in general.

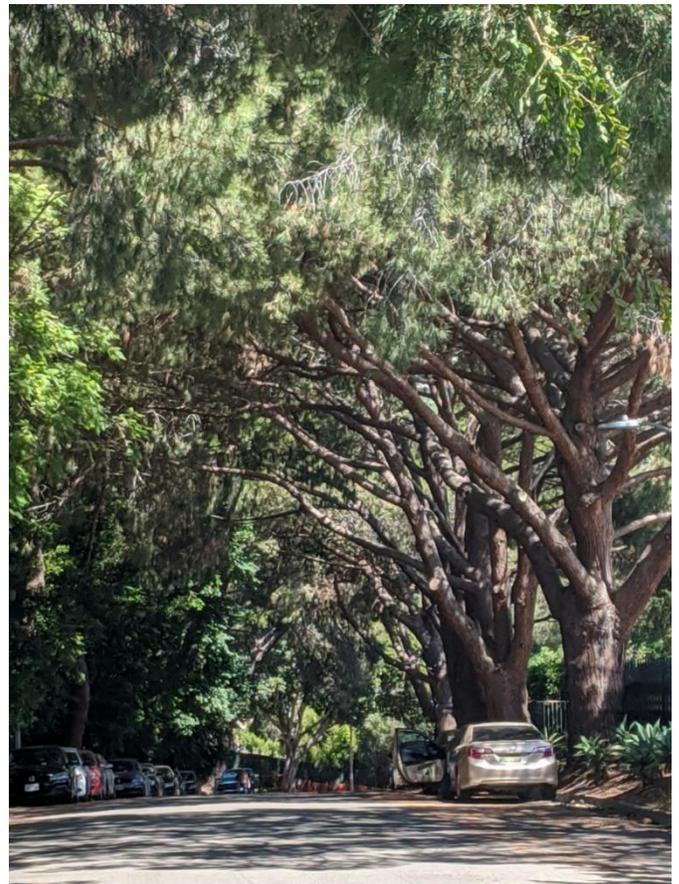
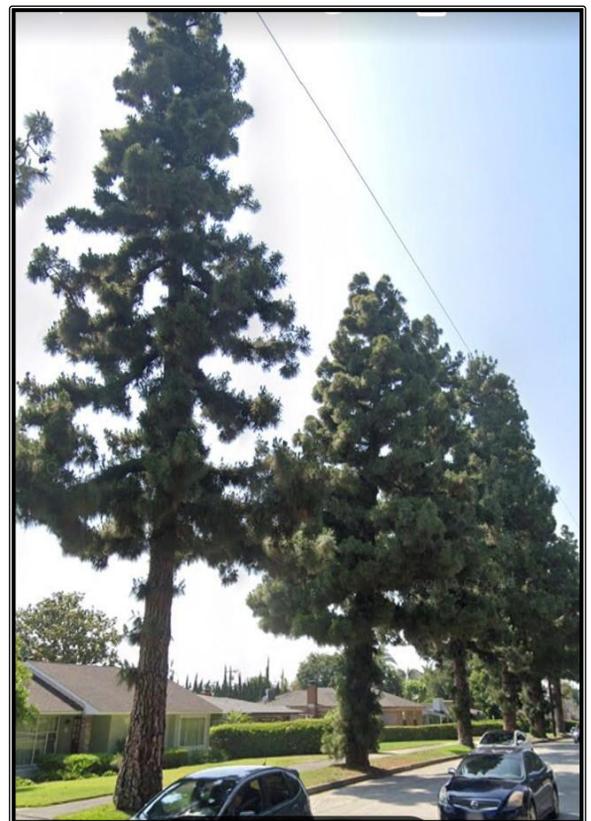


Figure 17: Existing pine tree canopy above streets

The history of using trees for landscaping along streets has a long history in Beverly Hills dating back well over a century to the early 1900's. These decisions have contributed to the beautiful character and legacy of neighborhoods that Beverly Hills has become known for. But as with all living plants, they do have a lifespan, and we are far more knowledgeable today about their role in the wildfire environment. Both the Kerr and the Dudek Reports correctly identifies the primary fire hazard trees as Pines, Eucalyptus, Acacia, and Cypress. There is a combination of recognizing these trees for their heightened impact on wildfire behavior, as well as their current status and lifespan. To begin with, the City has deemed these species as hazardous, and therefore have appropriately banned future planting of these types of trees in the City. This is a good first step in order to curb the problem into the future. However, the question remains on what to do with the existing trees?

It was correctly pointed out that the City has a robust maintenance program that has aided the longevity and health of these trees for many years. But no amount of maintenance can keep a tree alive forever. Therefore, an aggressive plan to frequently check on these aging trees to ensure their health for the remainder of their lives is essential. At some point, regardless of which side of the discussion you sit on, these trees will eventually need to be removed, even though that time may not occur in some cases for many years. But an active replacement plan to look at the long-term status of trees throughout Beverly Hills is the only appropriate path forward. One of the top priorities within the replacement plan is to maintain the character of tree-lined streets throughout Beverly Hills, but with new species that are more drought tolerant and fire resistive. This automatically means that the existing Pines, Eucalyptus, Acacias and Cypress will eventually be replaced with other species



Figures 18 & 19: Canary Island Pines along Beverly Blvd. in Whittier, CA

of trees such as oaks and similar fire resistive species. The replacement plan will also acknowledge the View Corridor Maintenance Plan that is currently in place, and should augment that program.

In discussing the ongoing maintenance plans, it is worth noting that the City of Beverly Hills is not alone in dealing with these issues. During the early decades of growth in the Los Angeles region, other cities chose similar paths of planting trees for landscaping – some even using the same Canary Island Pine that is currently under scrutiny in Beverly Hills. Time has allowed us the luxury of observing and understanding variable degrees of maintenance strategies and tactics. One such example is located along, ironically, Beverly Blvd. in the nearby town of Whittier. The photos above show these trees lining the street, but with some visible differences from the Canary Island Pines in Beverly Hills. Whittier chose to space these street trees further apart, as well as implement a different vision in long-term trimming and thinning. As these photos point out, the trees provide a strong visual presence along the street, while still allowing space between their canopies, adequate vertical clearance of “ladder fuels,” and a more aggressive thinning plan that, in fact, continues to allow these trees to maintain a healthy and robust presence along this street. The fact that these trees are spaced further apart allow them to not “compete” with nearby trees and other vegetation for water and nutrients, and the thinning program has allowed the limbs to grow in a stronger and healthier manner. Additional positive impacts from this is the lack of brown pine needles that are quite evident on many Canary Island Pines throughout Southern California. Because the tree is healthier overall, the amount of pine needle drop is dramatically reduced, which also helps reduce the buildup of combustible litter on the ground.

Similar efforts have also been achieved in Beverly Hills in some locations. The photos at right show a Canary Island Pine both before and after a thinning project. The before photo clearly shows a significant amount of brown pine needles, pointing out the stressed nature of this tree. By reducing the density of the tree, it becomes healthier, with far fewer brown needles, which will reduce wildfire ignition threats on this property. It is important to note that since this Report was first begun, the City’s tree maintenance program has made great progress in both thinning and maintaining a large number of trees in the areas north of Sunset Blvd. As this program continues, significant strides will be made to help reduce the wildfire threat in this area.



Figures 20 & 21: Canary Island Pine thinning - before and after

There have been some discussions as to whether trees provide an advantage or disadvantage related to wildfire events. Some arguments have been made that trees and other types of vegetation may actually impede the blowing embers that are identified as the number one cause for structural ignitions. This argument implies that trees should not only be saved, but perhaps more trees should be planted to help reduce this ember impact. The response to this suggestion is “perhaps” but only in some limited cases. At this time, there is no clear scientific data to support this theory, and in fact there are currently contradicting theories about this topic. That being said, there are some researchers who are studying this idea, and have posed some interesting questions and analysis. One idea that has come forward is that some hardwood species, such as oak trees, may offer some limited protection from ember impacts on structures downwind. But this idea has a number of caveats, which include the size and location of the trees in relation to the structure itself. Because the highest threat of wildfires traditionally are pushed by north or east winds, the trees would have to be strategically placed on the north, east, or northeast aspect of a structure. In addition, a sloped terrain would also impact the location of the trees either uphill or downhill. The theory behind this idea is that the strong wood in trees such as Oaks may have more resistance to the heavy blowing winds during a Santa Ana wildfire event. This theory suggests that because the tree sways less than softer wood species, it may also provide a resistance to embers blowing through its canopy. Other tree species, such as Pines or other softwood tree species may have much more movement during these wind events, thereby reducing the likelihood of reducing ember cast. There are ongoing studies to examine these theories, but the scientific evidence is not conclusive at this point in time.

These theories may have much more relevance in rural areas where the landscape provides more open space for these advantages to take place. In a more densely developed neighborhood such as Beverly Hills, there may not be enough room to enjoy the benefits of this theory. What is more likely is the increased number of embers resulting from a fire burning through the hillsides as they currently exist, igniting the pine needles that are a constant litter factor on the ground below these trees, or on roofs of homes surrounding them.



Figure 22: Street trees with significant "ladder" fuels

This also touches on another aspect of trees in a wildfire environment as it burns through a neighborhood. As was pointed out earlier, current observations point toward a higher incident rate of trees being ignited from exposures to burning structures rather than the other way around. With the density of Beverly Hills taken into consideration, it is likely that many trees

may be at a higher risk of ignition from burning structures than vice versa. It is also important to point out the fact that the City's maintenance program has established a 17-foot vertical clearance under street tree canopies to reduce "ladder" fuels that can propel a ground fire up into a tree canopy. It is critical that this maintenance standard be met at all times, and not rely solely on a routine maintenance schedule that could be on a cycle of several years apart. There is one critical juncture where the public trees continue to be under threat. That is from private landscaping that largely exists immediately across property lines that separate public rights-of-way and private property. As discussed earlier in this report, the levels of defensible space and landscaping in the immediate "home ignition zone" around structures has proven to be a major contributor to structure ignitions. Likewise, the location and density of private landscaping can often relegate the efforts from the City to thin vegetation and remove ladder fuels on public trees irrelevant. The vegetation shown in Figure 22 above highlights this problem. While the City can remove vegetation on the public right-of-way, as well as provide the 17-foot vertical clearance to remove ladder fuels, the adjacent vegetation on private property is not under the direct authority of the City. In the event of a wildfire, the vegetation on the private property could ignite, and pose a direct ignition source to the vegetation across the property line, rendering the clearance efforts from the City as useless. The landscaping on private property becomes the ladder fuels that ignite public trees, and potentially causes a chain reaction to spread from tree to tree. These issues can be exacerbated on sloped terrain, increasing the ignition potential across property lines. And this same risk also exists across property lines of neighbors, potentially allowing fire ignitions to travel unabated from one property to the next due to dense vegetation. Wooden fences, gates, decks, and other combustible materials will only exacerbate this problem.

The "solution" to this problem is both simple and extremely complex at the same time. The simple portion is to understand wildfire behavior and fire spread, and accept the fact that changes in landscaping choices such as a noncombustible zone around structures, and vegetation reduction can reduce this risk. Yet those same choices significantly impact privacy issues and traditional paradigms of "attractive landscaping" for many people, causing a negative reaction or outright refusal to change. But these are the choices and compromises that must be discussed in order to truly reduce the risks of wildfire to neighborhoods and entire communities. The evidence of these choices from recent wildfire events is becoming more obvious. Changes in landscaping techniques, vegetation choices, defensible space initiatives, home hardening and long-term maintenance have proven overwhelmingly to help reduce losses during wildfire events. However, it must also be pointed out that there is no guarantee that by taking these steps you will escape harm or loss. We have simply not reached the level of understanding about wildfires to be able to quantify the exact steps everyone can take to guarantee survival. We will hopefully get there someday – but the science and research are not there yet.

These issues deserve deep conversations with residents about their roles in relation to the public trees and wildfires in general. But the connection between the public trees and private landscaping cannot be ignored as a contributing impact during a wildfire event.

Trees are an extremely important component of the ecosystem and the cityscape within Beverly Hills. Acknowledging their role, as well as other types of vegetation as part of the wildfire environment demands we consider alternatives to past practice to help reduce their impacts during a wildfire event. These reconsiderations must take into account the valuable role they play in carbon sequestration, as well as their critical place on hardscape areas to help reduce urban heatsinks. These considerations are being proactively addressed as part of the long-term UFMP. Collectively, over time, changes will occur to improve all of these factors in a cohesive manner. But it will demand that changes take place in order to meet of these goals.

4. Evacuation Issues

As stated earlier in this Report, the City of Beverly Hills is focused on providing the highest level of public safety possible, which translates into providing effective evacuation measures during emergencies. In the event of a wildfire as identified in this scenario, the resulting evacuations of thousands of residents will place a heavy burden on the entire street system to the south of Sunset Blvd. as evacuees escape the approaching fire. This will clearly have a major effect on all neighborhoods in the remaining portions of Beverly Hills, as well as surrounding communities. We have all witnessed far too frequently the chaos that ensues during these evacuations, as sometimes the fire is moving with such speed that people are literally fleeing through smoke and flames to escape. There are far too many videos on social media sites from evacuees posting this experience as they escape a wildfire conflagration. The goal is to never provide anyone from Beverly Hills the opportunity to post another one of these chaotic videos.



Figure 23: No Parking Sign for Red Flag Days

Beverly Hills must review and constantly update their plans to address the mass exodus that will occur in the event a fire threatens the hillside neighborhoods north of Sunset Blvd. Steps have been taken to post signs in prominent locations along major evacuation routes. The intent of taking this step is to ensure that these streets remain as free from any restrictions as possible to accommodate as much movement of traffic as possible with the fewest obstacles for drivers to encounter. To ensure this goal is effective, aggressive parking enforcement during high fire danger must be embraced. It must be kept in mind that thick smoke will obscure a driver's vision, so traveling a street with no cars parked offer fewer opportunities for accidents. In addition, emergency personnel will be able to access these areas quicker with no cars parked on the streets. The recommendations to implement a wildfire mitigation plan to reduce the risks to these evacuation routes as identified in Map #9 will also help improve the ability for residents to safely escape an oncoming wildfire. Not only should a strong and well-known evacuation plan be implemented by the City, but it should be practiced. There are of course many hurdles to accomplishing an operation such as this, but other cities – including the town of Paradise – had strong evacuations plans that were practiced in advance of a fire event. It is widely acknowledged that the efforts by emergency personnel to engage large portions of the

population to practice their evacuation plan around Paradise prior to the Camp Fire most likely had a positive effect to prevent the death toll from being even higher than it was.

As an alternative to evacuations, it may be worth having a discussion regarding options that would allow individuals to safely remain in place during the passage of a fast-moving wildfire. The positive aspects of this sort of idea would reduce the number of people and vehicles trying to escape while emergency personnel are attempting to gain access. However, any discussion of a safe “shelter” must include how this location can be guaranteed to provide a tenable atmosphere during a specified period of time while a wildfire rages around it, as well as adequate communications with the outside world. Because this is a very new concept only now being discussed with emergency officials, it has not gained full support nor identified all the requirements that would be necessary to adequately accomplish this goal. This requires much more dialogue to be considered as a useful tool.

5. Additional Impacts

While this report has largely addressed wildfire impacts to neighborhoods in Beverly Hills, with a focus north of Sunset Blvd. in the VHFHSZ, the City cannot ignore the additional far-reaching impacts that a wildfire would pose on the remainder of the City. The highest likelihood of a wildfire event would come from an ignition located to the north of the City, pushed by heavy Santa Ana winds, which primarily blow from north to south, or east to west. In addition to the impacts that have already been discussed in this Report, further considerations must be given to smoke issues impacting the City as a whole, impacts on businesses and the tourism industry, post-fire recovery issues, and how the current wildfire threats create challenges with insurance coverage.

The effects of dangerous and unhealthy smoke are yet another significant impact that a fire of this type would pose on the remainder of Beverly Hills and surrounding communities. Not only will it pose a significant health risk, especially to those with compromised breathing capacities, but the smoke can also cause significant impacts to homes and businesses. A clothing store, for example, could lose their entire inventory should smoke enter the premises and contaminate their products. Homes may need to be professionally cleaned before being deemed safe to reoccupy. Air systems in assisted living occupancies and medical facilities may need scrubbed before further use. Because of the worldwide spotlight that a fire in Beverly Hills would produce, there will be impacts to the hospitality industry due to cancellations amid fears of exposure to a wildfire. The list of impacts is long and non-discriminatory. It will affect everyone and everything throughout the entire City, as well as surrounding communities, before it is all over. Many communities, unfortunately, have suffered from these types of impacts in the recent past, and can provide advice and assistance on creating a solid plan for this impact.

The aftermath of a catastrophic wildfire must also be considered. Recovery efforts start almost as soon as the fire begins, and plans should be in place well ahead of the ignition. Decisions must be made as to when residents will be allowed back to their homes to search for recoverable items, and where they will shelter until then. Debris removal has become an all

too common occurrence throughout many parts of California, and there are many vendors who are connected with FEMA (Federal Emergency Management Agency) and other state agencies who have created well-refined plans on this portion of the process. But the debris removal process will have long-term impacts on roadways due to heavy truck traffic. And the psychological impacts will linger for an unspecified length of time as the visual reminders will be ever-present, and will effect people in different ways.

One final impact that bears discussion, and which is present even now before a wildfire ever occurs, is related to insurance. The insurance industry as a whole has suffered tremendous losses from recent wildfires, and naturally have been forced to react. It is understood that some residents have seen insurance costs soar to new levels, while others have been notified that their carriers will not be renewing their policies. Maintaining insurance for some has been a challenge at best. As a last resort, the State of California has available the FAIR Plan (Fair Access to Insurance Requirements), but in Beverly Hills, this may not be a viable option because the maximum amount of a policy from the FAIR Plan may not provide the necessary coverage required by the homeowner. The fact is that the insurance industry was not fully prepared for the increase in wildfire severity and frequency that suddenly hit California over the past 5 years. They have collectively worked hard at better understanding the wildfire environment, and how their risk analysis models need to change in order to more accurately reflect the current and anticipated impacts. This is a continuing work in progress, but the industry is making significant strides forward.

One of the most positive aspects of this evolution is that Beverly Hills is well situated to take full advantage of these changes. Overall, the insurance industry is seeking ways for their policyholders to reduce the risk of wildfire impacts to their properties. They are creating new models that recognize and value fire prevention activities to help reduce these risks. This includes the advantage of BHFD being listed as a Class I rated fire department, which is the highest rating available, and which only an elite group of cities around the country possess. In addition, USAA Insurance Company began offering a discount to clients who live within the boundaries of a Firewise USA® site a number of years ago, and continues this practice today. This is in recognition of the fire safety aspects that are practiced by residents within those neighborhoods. Mercury Insurance just announced a new program that also recognizes the value of Firewise Communities, plus additional criteria for their clients who can demonstrate positive action towards home hardening and fire safe landscaping practices.

These are just two examples of how the insurance industry is moving toward a stronger recognition of clients who take positive action towards helping reduce their wildfire exposure and vulnerability. This aspect of the insurance industry is a work in progress. But it is safe to say that within the coming years, the efforts one takes to improve the fire resiliency of their home and property will become more positively recognized by the insurance industry. There may still be an unspecified cost involved in the final results – it is most likely unrealistic to expect premiums to go down in the future – but it may become far easier to obtain insurance, especially if one has taken steps to improve the overall wildfire resiliency to their home, their property, and their neighborhood. Please know that these statements are in no way a

guarantee this scenario will come to fruition, but it is the current trajectory as understood at this point in time.

CONCLUSION

Beverly Hills has been extremely proactive in addressing their wildfire vulnerabilities. The purpose of this Report has been to recognize the positive steps that have been taken, and collectively show how they all tie together to offer a positive path forward. Yet still more can be done. Continuing the efforts already begun will help reduce the City's risk from a potentially damaging wildfire. To summarize, we will provide a list of ten bullet points for reference:

1. It is not a question of whether a wildfire will occur, but only a question of when.
2. Strengthen the Firewise USA® program by reorganizing it more closely with the neighborhoods it will affect, and encourage more active participation from residents.
3. Recommend creation of one or more Neighborhood Fire Safe Councils to augment and support the Firewise USA® program.
4. Provide a more robust education and information program for home hardening and retrofitting, enhancing defensible space enforcement efforts including the immediate "non-combustible zone" concept, and update local ordinances to enforce decisions.
5. Continue developing the Urban Forest Management Plan, with a robust maintenance and replacement program for trees throughout the City.
6. Provide better understanding of wildfire impacts beyond just trees and the VHFHSZ areas north of Sunset Blvd. The entire City will be impacted and must be prepared.
7. Effectively utilize information from the Wildfire Predictive Analysis maps to help with prevention actions and priorities.
8. Create a robust evacuation plan – and practice it – to maximize the likelihood of a safe and effective evacuation when it is needed.
9. Engage in conversations with neighboring land managers to explore common prevention goals and activities to help reduce wildfire impacts adjacent to the City.
10. Plan for holistic impacts from a wildfire, including smoke issues, effects on businesses and tourism, housing impacts, recovery processes, and psychological effects.

It is all too easy to allow the magnitude of this problem to become overwhelming. The scenes that unfold across our media screens during these catastrophic events lead us to believe that there is nothing we can do to combat this problem. But that could not be further from the truth. We currently find ourselves in a situation that is a result of over a century of planning and land management decisions that largely ignored wildfire impacts. We now know that some of these decisions have proven to be detrimental and have contributed to today's problems. But the silver lining to recent wildfire disasters has provided us insight to the destruction, and taught us about solutions that can help reduce the impacts of future fires.

It is no longer acceptable to continue doing the same things we have always done for decades, and hope for a different result. Recent wildfires have proven to us that changes can and must be made to alter the outcomes. It is imperative that all communities and residents who find themselves vulnerable to wildfires create new, long-term plans to make changes. Research and technology have allowed us to better understand the wildfire environment, and shown us steps we can take to alter the outcomes. These changes will take time – this problem wasn't created overnight, and it won't be solved overnight. But doing nothing ensures that the catastrophic scenarios that have become all too common will simply continue, and likely become worse. It will also require strong will on the part of elected leaders, numerous departments working cohesively toward a common goal, and both acceptance and participation from the public toward changes that are nothing short of significant paradigm shifts. This is not impossible to accomplish.

By tying all these positive efforts together, Beverly Hills will be even more successful in reducing its' vulnerability to wildfires in the future.



Figure 24: Image copied from Flickr