

# THE 2018 WOOLSEY FIRE: A CATALYST FOR CHANGE

*A roadmap to create a safe and thriving community living at the wildland urban interface amid a changing climate.*

LOS ANGELES EMERGENCY PREPAREDNESS FOUNDATION  
December 2019



*Cover Photo: William Buckley, 2018*

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A roadmap to create a safe and thriving community  
living at the wildland urban interface amid  
a changing climate.

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# FOREWORD

Following community wide disasters there is a period of intense interest in what happened and what changes should be made to prevent similar devastation in the future. Over time, public interest in taking action tends to decline with an accompanying increase of apathy, denial and feelings of helplessness: 'I can't control this', 'Let them figure it out'.

Over time, there also emerges select members of the community that are highly motivated towards taking on the challenge of making a positive change. These individuals act as a catalyst providing government officials and community members with an opportunity to develop collaborative, innovative and sustainable solutions. Addressing existing gaps, gaining community support and implementing proactive mitigation measures drive these actions resulting in positive change while reducing the impact and loss from future events.

Following the Woolsey Fire, it was apparent a new era of regular large scale Wildland Urban Interface (WUI) fires was upon us (the new normal). The Los Angeles Emergency Preparedness Foundation with the support of the National Science Foundation and the Natural Hazards Center at the University of Colorado, Boulder, made a decision to conduct an independent study of the Woolsey Fire with a focus on local residents, businesses, community and government. The team brought together the skills, knowledge and extensive first-hand experience of national and global crisis management professionals combined with distinguished academics and local community involvement.

Over 60 semi-structured interviews of individuals directly impacted by the Woolsey Fire were conducted using approved Institutional Review Board guidelines. Many of the forums and community meetings that followed the Woolsey Fire also contributed to the wider contextual information gathering process. In addition, meetings and interviews were conducted with multiple government agencies, home owner associations, volunteer organizations and businesses. Our discoveries were encouraging; yet several issues were also apparent which have led to the publication of this expanded report.

Malibu can be characterized as a paradox; a community of resilient residents supported by somewhat inconsistent and disconnected institutions. The identification of this divergence prompted a broader assessment of the community's ability to both recover and move beyond the seemingly endless cycle of destructive fires.

The tension Malibu faces is not unique. Communities are encouraged to take responsibility for the risks existing within their locations. At the same time and to varying degrees, institutions are challenged by multifaceted problems and their shifting role amid change. Finding a way through fundamental issues to meaningful action is the focus of this report.

The robust and capable neighborhoods of Malibu are assets, as they are committed to taking on the challenges of fire. Such profound community goals require consequential long-term engagement within, across, and between the citizens and the institutions serving the greater Malibu area.

This report is written in support of the motivators, individuals, neighborhoods, and communities across the public and private sector that are willing to face the challenge and implement positive change. Actions speak volumes, save lives and build resilient communities.

*Brent Woodworth  
Chairman and CEO*

*Los Angeles Emergency Preparedness Foundation*







## **PART 1: THE ISSUE AND THE EVIDENCE**

*Photo: William Buckley 2018*

The Malibu area and surrounding communities have a lot going for them; yet, evidence shows reasons for concern about future sustainability if existing challenges within and between government and community stakeholder groups continue. The goal of this document is to provide a pathway to meaningful and lasting collaborative action.

The Roadmap for a Resilient Pilot Community at the Wildland Urban Interface (WUI) provides a map to address the evolving risks and effects of wildland fires toward creating an adaptable and thriving community.

What the wider Malibu area has is a historical track record of people living through periodic wildfires and a robust relationship with the local environment. Malibu is also a community of communicators where relationships hold high value. The concern is that each recurring firestorm takes a toll on the economic, social, human, physical, natural, and cultural assets of the community. Inexplicably, the cyclical erosion of these costs in WUI communities is not being fully addressed with meaningful implementation of recommendations and policies for change.

Solutions that promote unified action are needed to manage the fire hazard that exists living at the WUI. A better way can be found to live in relationship to the WUI as a community. The broader idea is to inspire The City of Malibu to serve as a pilot community, which can inform resilience building among other California WUI communities.

## **MALIBU HAS A HISTORICAL TRACK RECORD**

The historical context of community-based response to fire is relevant, as it is deeply reflective of attitudes and behaviors rooted to the settlement of the American West. Remnants of the self-sufficient attitudes and behaviors are still evident in communities across the western USA, even in places not usually perceived as being self-reliant. Butler (1974) recounts an 1848 pioneer experience of fire to show that fire risk management was much the same as today. The pioneer fire tactics included backburning and establishing defensible space to create a survivable situation for people, animals and property.

Generations of those who have dwelled in Malibu area, acknowledge that the area has been and is likely to continue to be largely on its own during a fire, particularly in the critical early hours of the fire. During the mid-1980s, the fire service built upon this local training and supporting Malibu residents to defend their properties. Community resilience was reinforced by these practices at that time.

The study our team conducted on key community resilience characteristics evidenced in the 2018 Woolsey Fire reveals the strength of Malibu's pioneer past, but also the challenge of engaging today's community stakeholders in proactive preparedness, mitigation, response, and recovery efforts. (Jensen, S. et al., 2019). Many characteristics seen in Malibu can also be applicable to California's urban wildland interface communities.



Malibu has seen its risk profile shift significantly over the past few decades. Current community vulnerabilities arise from climate change affecting the dynamic interactions between the physical, built, and social environments. The measures that were put in place earlier required continual adjustment to keep pace with changes in climate, development and other factors. Malibu is the newest and smallest city in California, which may indicate it is still coming to terms with the processes needed to implement and continually improve its policies.

Mapping an actionable way forward will benefit Malibu, and many other communities struggling with similar fire hazards. Many WUI communities will be looking to Malibu for an actionable example going forward in the new normal.

### THE CONCERN: FIRE AND THE WILDLAND URBAN INTERFACE

Wildland areas offer a great lifestyle, and with that lifestyle comes accepting the fire risk, learning what can be done, and staying diligent with prevention measures. The WUI is the area where homes are built near or among lands prone to wildland fire; it is defined by having at least one structure per 40 acres but is often far denser. California has seen a 34% increase in homes at the WUI between 1990 and 2010. Significantly, 1 out of 3 California homes are at the WUI. Across America the ratio is similar, with more than 43 million homes expanding across 190 million+ interface acres (USDA).

The WUI is better understood as a set of conditions, which the National Fire Protection Association (NFPA) defines as:

*The amount, type, and distribution of vegetation; the flammability of the structures (homes, businesses, outbuildings, decks, fences) in the area, and their proximity to fire-prone vegetation and to other combustible structures; weather patterns and general climate conditions; topography; hydrology; average lot size; and road construction.*

In many parts of the country, warmer temperatures and changing precipitation patterns, combined with ineffective forest management and land use policies have greatly increased fire risk.

### KEY MALIBU COMMUNITY CHARACTERISTICS

- Pioneer spirit and values
  - Economic diversity: *Smallest cosmopolitan city on the planet*
  - Resource rich: *environment, talent, capital*
  - Robust relationship with the environment
  - Valued community relationships
  - A community of communicators
  - Participative but not fully interconnected stakeholders
  - Engaged local government but is not fully interconnected with the vital mix of stakeholders
- Jensen, S. et al. , 2019*

Communities in wildland areas can be composed of both interface and intermix groups; the distinction between them is based on the distribution of houses and vegetation across the landscape. Wildland intermix is where housing and vegetation intermingle, whereas the wildland interface housing is more clustered and in the vicinity of large areas of wildland vegetation. Fire risk conditions are particularly complex and dynamic in the interface group.

Evolving WUI fire risk is multifaceted, influenced by interrelated factors. Despite the interdependence of these mechanisms, they are often addressed in a siloed way for both policy and action.

The key interacting factors of fire risk include:

1. *Community*
2. *Land use*
3. *Environment and vegetation management*
4. *Fire suppression*
5. *Infrastructure*
6. *Home hardening and defensible space*

More broadly, climate change amplifies the factors of fire risk. Guiding shared action (governance) connects these factors to a process for organizing the mitigation work. Deeper descriptions of the multifaceted problem are beyond the scope of this path forward, but a short discussion on how fire tends to spread to structures is worthwhile.

Fire behavior in forests and chaparral areas is still not adequately understood (Finney, 2015), particularly as fire interacts with structures. Fire can spread by direct flame contact, convection or through radiant heating. Importantly, this type of fire spread requires short distances to propagate. In the WUI, fire often spreads through the transport of embers; such sparks can number in the hundreds of thousands and move significant distances. Embers can lodge in flammable items surrounding a structure or find their way into unprotected openings, all leading to a fire. The resulting structure fire is often far more intense and can propagate to nearby structures.

The elimination of all fire risk is not practical; therefore, the importance of ember transport is key for two main reasons:

1. Risk can be minimized through defensible space and fire safe building practices, and
2. Ember ignited fires will start small; the focus of effective practice is catching fires while they are small and manageable (Cohen, 2000) and taking action.

Still, many fire risks can be managed and kept at acceptable levels. Importantly, this management requires community engagement and diligence.

The challenge is that broader community governance has not been up to the task of managing the complex issues of fire in the changing climate of the 21st Century. A series of excellent

reports have been published since the 1993 Firestorms regarding fire risk in Malibu, and more generally on the WUI across the West. Yet, few of the recommendations and policies have been implemented, and the fire risk intensifies with each passing year of inadequate action.

## STATEMENT OF THE PROBLEM FOR CONSIDERATION

The complex problem has three interdependent components. First, an implementation deficit of fire risk reduction policy measures has occurred. Secondly, the WUI fire risk is a multifactorial problem that needs a holistic approach for implementation of existing and future policies. Finally, the challenge of limited community stakeholder civic engagement. A holistic realignment of the tasks for managing fire risk factors is needed, along with the inclusion of the whole community in the tasks. The November 2018 Woolsey Fire provides further impetus to establish a holistic and sustainable approach to action.

- *1993 Firestorms After Action Report*
- *1995, 2010, 2017 City of Malibu General Plan*
- *2004 Governor’s Blue-Ribbon Fire Commission Report*
- *2009 Quadrennial Fire Review Final Report*
- *2013 Santa Monica Mountains Community Wildfire Protection Plan*

## THE 2018 WOOLSEY FIRE AS A VIVID EXAMPLE TO DEFINE THE PROBLEM

Living in Malibu’s incredible natural setting requires its community members to take on the responsibility to proactively and constructively address how to live sustainably with the locality’s existing natural hazards. Fire cyclically visits the area with dramatic results. For those who lost their homes, the problem takes on a new meaning. A few measures are adopted,

### RECENT LARGE ACREAGE FIRES

<b>2017 THOMAS FIRE</b>	<b>281,893 ACRES</b>
<b>2018 CAMP FIRE</b>	<b>153,336 ACRES</b>
<b>2018 CARR FIRE</b>	<b>229,651 ACRES</b>

but not enough really changes to make significant measurable improvements prior to the next occurrence. Life returns mostly to normal for everyone else, and so the fire problem gets shelved for later. The community is at an inflection point, where “kicking the can down the road” no longer works, and the ongoing cycle is rapidly and ferociously changing, leaving costly damages to the community in its wake.

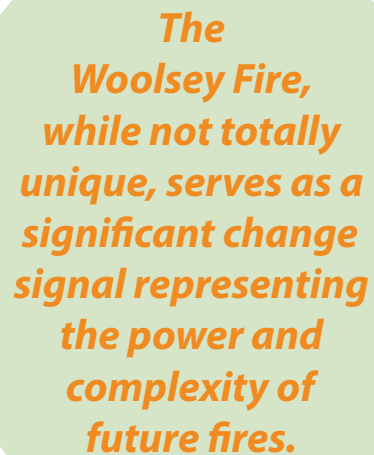
Events occurring near the time the Woolsey Fire provide important context. The Borderline Shooting took place in Thousand Oaks, near the area where the Woolsey Fire started. Two other WUI fires were burning; the nearby Hill Fire, and the more distant Camp Fire, which became the deadliest and most destructive wildfire in California history. The compressed timeframe of these events, increased WUI fire risk factors and a pattern of simultaneous fires shows a need for additional peak load resources (equipment and personnel) to support the California firefighting effort.

On Thursday, November 8, 2018 at 1424 hours, a vegetation fire broke out in the Woolsey Canyon north of Los Angeles. Consequently, the Woolsey Fire heralded the

- Consumption of 96,949 acres chaparral land,
- Destruction of over 1,643 structures,
- 341 damaged houses,
- Prompted evacuation orders for several thousand residents, and
- The death of 3 people.

Collaborative efforts of Strike Teams, Ground Crews and Air Resources were required in the Woolsey Fire. Fierce Santa Ana winds, often a factor in Southern California fires, pushed the fire to the south. The wind driven fire raced through high fuel loads and western Malibu on its drive to the ocean.

The Woolsey Fire, while not totally unique, serves as a significant change signal representing the power and complexity of future fire events. Atypical patterns were exhibited in the fire response point to shifting norms and the need for newer approaches and education for a more agile response. Evidence from the Woolsey Fire has been documented in a variety of town hall and community gathering minutes, reports, and local news sources. The challenges faced during the Woolsey Fire are not part of any deliberate plot or purposeful negative action. Change indicators having implications for future adaptation are highlighted in Figure 1 below. The changing patterns may be symbolic of a new normal.



***The Woolsey Fire, while not totally unique, serves as a significant change signal representing the power and complexity of future fires.***



**FIGURE 1: ATYPICAL PATTERNS OBSERVED AND THEIR IMPLICATIONS FOR COMMUNITY ADAPTATION ACROSS THE WOOLSEY FIRE IMPACT AREA**

CHANGE INDICATOR OBSERVED	IMPLICATION FOR FUTURE ADAPTATION
<p>1. Standard emergency management functions across the Woolsey Fire impact area were irregular and slow to engage.</p>	<p>Plan revisions are needed along with updated training and exercise programs adapted to keep pace with the changing WUI environment, strategic, tactical and community engagement needs.</p>
<p>2. Tardy communication of hastily organized evacuation processes combined with power outages in some areas resulted in confusing and inadequate notification coverage. Thousands of cars were stuck in traffic for up to six hours while evacuating through fire prone areas.</p>	<p>Traffic modeling and evacuation planning based on population density, routing and timing must be well documented. Public Safety Power Shutoff (PSPS) and emergency evacuation plans should include provisions for traffic management personnel, contra-flow, fuel resupply, sanitation and media updates. Consideration should be given to the identification and use of public safe refuge areas with evacuations organized using pre-specified community geographies.</p>
<p>3. Decision processes were unclear and not transparent. Early Friday morning a mission change order was given to fire Strike Team ground resources directing them to prioritize life safety and victim rescue 911 calls because there were not enough resources for structure defense. This change was not effectively conveyed to the public. In multiple interviews citizens reported an unwillingness of some fire Strike Teams to engage in areas where efforts may have been possible. Some engine crews responded to on-scene citizen inquiries by telling them they were “waiting for orders”.</p>	<p>Transparency is essential.</p> <p>Failure to communicate directly and honestly with the public was a major factor in the loss of public trust and a contributor to emotional distress. Clear, truthful, timely, and frequent communications are essential during a crisis event.</p> <p>Poor clarity of processes has led to an erosion of public trust in their institutions. As a result, other ways to cope with an escalating fire problem are being sought by the public.</p>

**FIGURE 1: ATYPICAL PATTERNS OBSERVED AND THEIR IMPLICATIONS FOR COMMUNITY ADAPTATION ACROSS THE WOOLSEY FIRE IMPACT AREA**

CHANGE INDICATOR OBSERVED	IMPLICATION FOR FUTURE ADAPTATION
<p>4. Limited communications and information reduced awareness of the larger situational picture for a protracted period amongst all stakeholders.</p>	<p>Messaging of situation awareness information between and across all stakeholder (government and community) is vital for improved outcomes. Critical information needs to be pushed out to the public as soon as possible. The public can handle bad news. All messaging must be clear, honest and repeated.</p> <p>Technology failures can be anticipated as a new normal and back-up capabilities need to be identified. All communication methods both traditional media and social media should be used when delivering messages to the public.</p>
<p>5. Mutual aid resources were also over-taxed and slow to arrive. Those that did arrive were unfamiliar with the area and some units were unprepared for the unique requirements of fire in the WUI.</p> <p>Few CERT members and similar volunteer resources were activated to their full capacity.</p>	<p>Exploring and implementing a range of ways to enable mutual aid and private sector resources to be more effective is vital.</p> <p>Limited mutual aid resources may be a new state of being. Utilization of peak load resources including certified volunteer trained resources for “fire front following” support and suppression measures should be considered.</p> <p>The mix and quantity of equipment resources for operating in the WUI environment is also important (Ground and Air).</p>

**FIGURE 1: ATYPICAL PATTERNS OBSERVED AND THEIR IMPLICATIONS FOR COMMUNITY ADAPTATION ACROSS THE WOOLSEY FIRE IMPACT AREA**

CHANGE INDICATOR OBSERVED	IMPLICATION FOR FUTURE ADAPTATION
<p>6. Citizen protective action measures were carried out following the fire but were complicated at times by official obstruction and lack of sensitivity and understanding.</p> <p>Citizens remaining in the impact zone reported feeling abandoned with unmet needs. Out of necessity individuals pulled together to organize and innovate to meet the needs of their families and community members. (Example: boats bringing food, water, fuel and supplies into Paradise Cove.)</p>	<p>Inclusion of trained and recognized citizen protective actions is vital as a force multiplier and community ownership of risk.</p> <p>CERT has a strong resource base with the ability to provide logistical support and community assistance services.</p> <p>Engaging certified local community volunteers trained, properly equipped, and operating with communication and direction from fire command could provide “fire front following” support and suppression capabilities needed to address peak load resource requirements while building community trust and confidence.</p> <p>Without support, fragmentation can follow with people seeking other ways to handle escalating fire issues during and immediately following the event.</p> <p>Meaningful future action is reliant upon repair of eroded community trust.</p> <p>Emergency powers provisions should be pre-defined and implemented to support local community needs.</p>

**FIGURE 1: ATYPICAL PATTERNS OBSERVED AND THEIR IMPLICATIONS FOR COMMUNITY ADAPTATION ACROSS THE WOOLSEY FIRE IMPACT AREA**

CHANGE INDICATOR OBSERVED	IMPLICATION FOR FUTURE ADAPTATION
<p>7. Thousands of residents were not allowed to return to their homes for an extended time compared to previous return times after a fire. The exclusion resulted in extra stress and challenges.</p>	<p>Streamlining a safe return of residents with clear communication throughout the process is central in improved human and property outcomes.</p> <p>Escorting homeowners, utilizing law enforcement and certified volunteers, for short term in-person property checks when it is safe, can help reduce the levels of stress until repopulation is fully approved.</p> <p>CERT role should be re-examined to support this process.</p>





The change signals in response are important to understand. Further, the emergent systems are worth considering. In a study of the resilience indicators of those who stayed to take protective actions, semi-structured interviews were conducted with more than 60 people. Our study showed that a gap existed between services of the public sector and the needs of the private sector, and the emergent volunteers filled the gap on an ad hoc basis. These volunteers filled gaps such as: meeting the needs of people with food, water, feeding operations, communications, sanitation, medical supplies, information sharing, comfort and ember suppression following fires.

Los Angeles Emergency Preparedness Foundation and our study team prioritizes life safety considerations and does not advocate staying and defending homes and businesses without proper authorization, training, certification, equipment, communications and established safe refuge areas. The interviews conducted showed those who chose to remain were mostly successful and have done so over multiple fires. Local knowledge was an asset for those who chose to engage in assertive actions to protect their homes and community instead of evacuating. While an imprecise estimate, several hundred structures were saved by their endeavors. The community response to the Woolsey Fire demonstrated how local knowledge and a public sector support gap fueled creative solutions to manage fire risk in a situation where professionally prepared organizations left them on their own.

Human and social capital costs are important considerations for the path forward. The lack of transparency in official decision processes during the Woolsey Fire compounded the trauma of the fire. A similar disadvantage occurred with mutual aid resources (primarily law enforcement) during the fire, where assigned individuals were unfamiliar with the mission, terrain, and community. Local residents reported they were often treated with disrespect, threatened or made to feel like captives. The local Community Emergency Response Teams (CERT) were not activated to their capacity and ignored when queries were officially submitted.

Poor communications were demonstrated by government agencies. The poor information flow reduced the public's ability to adapt and contributed to a defensiveness from all involved. Evacuation processes were poorly communicated, not well thought through, and placed people leaving at significant risk. Finally, messaging used in some of the post fire community meetings was not sensitive to the already traumatized people (Example: the meeting at Santa Monica High School on November 13, 2018 where approximately 30 minutes were spent with government officials congratulating themselves and sharing personal experiences instead of immediately addressing the needs of the fire victims). The bidirectional loss of confidence appears profound, and the evidence points to a migration of trust away from civic processes.



Trust is an essential element needed for any collective action. The 2018 Woolsey Fire has resulted in a concerning erosion of public trust in civic institutions. Establishing processes for community healing and restoration of public trust is necessary before any other movement forward is possible. The learnings from the Woolsey Fire contribute to a resolve that meaningful action is needed..

## JUSTIFICATION OF THE ARGUMENT

Many disaster losses are the predictable result of interactions among the physical environment, the social and demographic characteristics of the community, and the built environment (buildings, roads, etc.) (Mileti, 1999). Important dynamics contribute to Malibu's revolving experience with destructive fires. The environmental and geographical characteristics that define a WUI chaparral community are represented within the western region, the 90265 zip code (Malibu, incorporated and unincorporated area). Secondly, the collective action of greater Malibu has not been in harmony with all essential parts. These two interconnected influences affect the

***"In this age, in this country, public sentiment is everything. With it, nothing can fail; against it, nothing can succeed. Whoever molds public sentiment goes deeper than he who enacts statutes or pronounces judicial decisions."***

*Abraham Lincoln*

community at all levels, from city government to the contracted public safety departments, to neighborhoods and to individual action.

Management of fire risk is reasonably understood. Fire is a natural feature of the environment, but a wide range of factors from land use to climate change have come together, creating a perfect storm of fire across much of the WUI. The good news is that each relevant factor can be managed, reducing fire risk to sustainable levels. Utilizing a systems approach and identifying how each factor is interconnected reveals a meaningful and actionable path forward.

Engagement as a community is required to live with today's complex fire dynamics. President Lincoln stated the requirement clearly in a message that is relevant today: "In this age, in this country, public sentiment is everything. With it, nothing can fail...". We, the people, have relied heavily on government structures to resolve a wildland fire problem. Yet as stewards of this beautiful land, the complex hazards interacting with the social and built environments require both individual and collective responsibility. A unity of effort is essential.

An actionable path forward to contain the cycle of extreme fires in Malibu can be achievable working together with a unity of effort. Great possibilities exist when the whole of community works toward a shared goal. The important point is that all parts of the whole are integral to the process. The community of greater Malibu is robust and talented, with a range of resources to call upon; at the same time, the city contracts fire and sheriff services from outside the community. Building a deeper and trusted relationship is critical for future fire risk management. Discovering how to live more fully with the environment and all related participants is part of the Malibu area beauty.

## THE OVERARCHING GOAL

The goal is to provide a roadmap toward shared action for the City and Community of Malibu to pilot. The guide can assist Malibu in becoming a thriving community living at the wildland urban interface amid a changing climate.

## WHAT IS A ROADMAP TO ACTION?

People have different ideas about the key actions and reasons to prioritize steps to take. Further, the factors that influence fire are interrelated and interdependent, and so, the actions must be taken in tandem with other actions to make a meaningful difference in the full picture. The stakes are too great to be addressed in a piecemeal fashion.

***"Unless and until public policymakers at all levels of government muster the political will to put the protection of life and property ahead of competing political agendas, these tragedies are certain to repeat."***

*Senator William Campbell Ret.,  
Chairman  
California Blue Ribbon Fire  
Commission, 2003*

The way forward is one that every community member needs to engage in at some level to make it work. The roadmap provides a way for all community members to act in concert to reduce the fire risks.

## WHY IS A ROADMAP TO ACTION NEEDED?

Reports, policies, and general plans have officially included and updated well thought through processes and policies for action since 1995. Nevertheless, little progress is evidenced over the decades, an implementation deficit. The core of the inaction can be associated with an incomplete understanding of the issue complexity and tractability.

The implementation difficulty arises from the interdependencies between the wildfire risk factors, the way society collectively organizes itself, and the policies established. The interplay between the numerous fire risk factors, stakeholders, and practices is uncertain, as they each evolve and interact in new ways; meaning, the problem is complex. A lack of consensus on implementation approach exists, and the social management of the implementation involves a wide array of stakeholders. Therefore, an appreciation of the multiple elements at play is important to build before steps to meaningful action can occur.

## FIRE RISK FACTORS

Fire risk at the WUI is influenced by the dynamic interplay between seven key factors. The ever changing conditions must be viewed as a system, where the factors must be addressed in concert for effective risk reduction.

- Guiding shared action (governance – whole of community)
- Community
- Land use
- Environment and vegetation management
- Fire suppression
- Infrastructure
- Home hardening and defensible space

Further complicating the situation are larger external forces, which also interact with fire risk factors. Examples of such external forces include climate change, population growth and housing shortages potentially forcing additional development in WUI, and escalating fire costs. Figure 2 depicts the multi-factorial wildfire problem, grouped into seven interrelated factors, each with related policy and governance implications.



**FIGURE 2 INTER-RELATED FIRE RISK FACTORS**



### **FIRE RISK STAKEHOLDERS**

Each of the fire risk factors discussed above have associated stakeholders. Some examples of stakeholders that might be associated with the factors are depicted in Figure 3 below. Further, one risk factor can also have overlapping stakeholders in two or more of the other factors. Stakeholders are also likely to have interests in the factor(s) that may or may not be consistent with the issues germane to fire risk, depending on the perceived importance of the factor being considered.

Critically, stakeholder efforts tend to be siloed by the associated fire risk factor. Meaning, the work of one stakeholder group is separate and independent from groups engaged with other fire risk factors. These efforts in isolation are occurring at an essential time for energies to be in concert with other related actions. Collaborative stakeholder efforts are beneficial.

**FIGURE 3: FIRE RISK FACTOR STAKEHOLDERS**



The siloed stakeholder efforts and complexity of relationship to the risk factor are often interpreted as a lack of transparency and poorly communicated purpose. Such widely held perceptions tend to derail fire risk reduction policy efforts and sideline implementation as interest wanes following fires.

The importance and understanding of fire risk can be lost over time as stakeholders juggle competing demands for their focus. Further, citizen stakeholders can become active in one area of risk reduction, only to find the specific action being taken is not aligned with other fire risk reduction strategies. As an example, conservation groups might have interests in land use and vegetation management; yet, may also hold views that are at odds with WUI fire risk strategies. Most citizen stakeholders have neither the time, background, nor inclination to grapple with nuanced public policy processes let alone work toward a more unified approach

across stakeholder groups. Nevertheless, when a cohesive effort is applied across the fire risk factor groups, progress can be made in fire risk reduction policy implementation, even amid uncertainty.

### **INTERDEPENDENCIES AND UNCERTAINTIES**

Rapid and significant shifts have occurred across fire risks, but the shared action guidance for reducing the risk has not kept pace. The broader system has become fragmented amid an escalating threat environment, further exacerbating declining levels of participation and political awareness. In place of citizen participation, decisions have been made by smaller groups of organized interests, yielding solutions that are not equal to the problem and may not necessarily provide public value.

The serious issues posed by WUI fire is often hoped to be enough to overcome policy apathy and special interest hijacking. “Disasters are creations of particular times and political cultures with meanings that change gradually over time” (Roberts, P., 2013). Existing policies and plans are already in the Malibu general plan, the Santa Monica Mountain Wildfire Protection Plan, and other documents. Augmenting and harmonizing actions already underway requires an alignment of agendas.

The serious issues posed by WUI fire is often hoped to be enough to overcome policy apathy and special interest hijacking. “Disasters are creations of particular times and political cultures with meanings that change gradually over time” (Roberts, P., 2013). Existing policies and plans are already in the Malibu general plan, the Santa Monica Mountain Wildfire Protection Plan, and other documents. Augmenting and harmonizing actions already underway requires an alignment of agendas.

***“Planning for the future might not be so much a matter of foreseeing what could go wrong as of making our systems and institutions robust enough to withstand a variety of shocks”***

*Ball, 2011*

***The 21st Century requires all-hands-on-deck at the local level in working through the complex issues as we learn to live more in harmony with the environment and each other. This profound community goal requires the long-term commitment for relationship building within, across and between relevant institutions serving the local area and the citizens, as each acts together.***

## **WHAT INFLUENCES MEANINGFUL CHANGE IN THE 21ST CENTURY?**

A hallmark of the 21st Century is the interconnected nature of systems, processes, and relationships. The power of communities lies in the whole adapting together, rather than parts doing independent and unconnected actions. Given a shared vision and trust, the harmonized efforts can work to achieve much more than the sum of the individual work. We must take responsibility. We must take action.

The engagement and empowerment of all parts of the community is one of FEMA's (2011) central principles toward resilience building. The key difference is between "going through the ritual of participation or giving real power to affect the outcome of the process" (Arnstein, 1969, p.216). Whole community seems to be wanted until people affect the outcome; and yet, affecting the outcome is what is needed.

Traditional approaches to managing risk were heavily focused on various levels of government. As the changing environment of disasters became clearer, a Whole of Community approach was called for in the Presidential

Directive 8 (PPD 8). The whole community was defined by FEMA (2011) as "a means by which residents, emergency management practitioners, organizational and community leaders, and government officials can collectively assess and understand the needs of their respective communities and determine the best ways to organize and strengthen their assets, capacities and interests. By doing so, a more effective path to societal security and resilience is built" (p.3). Building on the concept further, FEMA promotes building cultures of preparedness. Participatory processes are by no means a new concept, but the relationship to community resilience is important.

Fundamental to building community resilience is understanding how the systems of the physical and built environments interact to create risk, and then recognizing that risk is interdependent with the social systems. Disaster risk management is “the application of strategies and policies to prevent new disaster risk, reduce existing disaster risk, and manage the residual disaster risk, ultimately contributing to loss reduction, resilience building, and thriving communities” (Feldmann-Jensen, et al., 2017). The coordinated focus of interactions needed is solving for adaptation and system stability in disaster response and recovery. Comfort (2009) states that coordinated action is possible when a hazard event is “perceived as the product of the interaction between groups of people and their environment” (p.3). Therefore, a coordinated adaptation of interactions between people and their environment can be evidence of community resilience.

Communities that can overcome damage, diminished productivity, and a reduced quality of life from an extreme event without significant outside assistance are considered sustainable (Mileti, 1999). Hazard risk mitigation has an amazing six to one return of investment. To mitigate hazards in a sustainable way, Mileti (1999) outlined 6 interdependent objectives:

1. Maintain and enhance environmental quality.
2. Maintain and enhance people’s quality of life.
3. Foster local resiliency and responsibility.
4. Recognize that vibrant local economies are essential.
5. Ensure inter and intragenerational equity.
6. Adopt local consensus building.

In practice, these steps point to a community choice of future losses. This choice is demonstrated through aligning and following policies for development and other interrelated community actions.

Communities can successfully manage common pool resources. This community ability was identified through the work of Elinor Ostrom, who was awarded the 2009 Nobel Prize for

## **MATCHING THE NARRATIVE IN FIRE RISK REDUCTION**

- Fire risk requires nurturing qualities and a willingness to work with natural systems.
- Defensible space preparations require the sensitivities of a gardener.
- Extinguishing spot fires after the fire front requires a thoughtful understanding.
- In the Woolsey Fire, the composition of the people who stayed to defend property reflect the gender, age, and diversity of Malibu and most California communities.

**THE EXISTING MASCULINE  
NARRATIVE HAS  
UNDERMINED THE ACTUAL  
WORK.**



### **PRINCIPLES FOR COMMUNITY OF INTEREST RESOURCE MANAGEMENT SUCCESS**

1. Group boundaries are clearly defined.
2. Rules are matched to local needs and conditions.
3. Those affected by these rules can participate in modifying the rules.
4. The right to devise rules is respected by external authorities
5. The community has a system for monitoring member's behavior.
6. A graduated system of sanctions is used.
7. Governance activities are organized in multiple layers of nested enterprises.

*Ostrom, 2009*

Economic Science for her work comprising 4,000 case studies around the world.

Wider inclusion for capacity can benefit from a brief discussion on the broader nature of governance to provide clarification. The term governance comes from the Greek kuberna, which means to steer or direct. Governance is a society-centered view that incorporates a wide range of institutional arrangements by which we organize our collective lives. The state is central to the transformation of the collective organization and is vested with a range of enabling powers and assets (McCarney et al. 1995; Carmichael 2002). This broader view enables capacity building and moves away from a government-centric approach. Significantly, capacity does not need to reside in government itself and can exist in the larger community. Future wildfire adaptation requires focusing on the community functioning as a whole.

The 21st Century requires all-hands-on-deck at the local level in working through the complex issues as we learn to live more in harmony with the environment and each other.

This profound community goal requires the long term commitment for relationship building within, across and between relevant institutions serving the local area and the citizens, as each takes action together.

**MANY WUI  
COMMUNITIES ACROSS  
CALIFORNIA WILL BE LOOKING TO  
MALIBU FOR AN ACTIONABLE EXAMPLE  
GOING FORWARD IN THE NEW  
NORMAL.**

## **RECOMMENDATION**

In the next pages, the fire risk factors are mapped with basic goals, relatedness between other factors, challenges to implementation, and strategies for collective action. Notably, few strategies are novel, as most have been recommended in previous reports and plans yet remain cogent and essential. A more holistic system for implementation of existing policies corresponds the actionable tasks of managing the fire risks in a whole of community effort. The roadmap presented in Part 2 uses a systems lens and breaks down each of the fire risk factors into actionable and interrelated steps toward reducing fire hazards.

The roadmap is framed by the seven interdependent factors that influence fire risk at the WUI. Each factor has associated goals, challenges, and actionable strategies. The WUI fire risk can be meaningfully reduced through an understanding of both the constituent parts and the whole of the problem, and then harmonizing the collective actions.





## **PART 2: A ROADMAP FOR A RESILIENT WILDLAND URBAN INTERFACE COMMUNITY**

The roadmap offers concrete ways to build a safe and thriving WUI community through a holistic view, integrating changes in community system approaches and policies. First and foremost, the tool addresses ways to share, act, and learn together in a way that makes these elusive concepts of policy and governance actionable and compelling.

Reading the Roadmap for a Resilient WUI Community is intended to be as easy as 1-2-3:

1. Each section defines a key goal for greater community resilience and fire safety.
2. Challenges that can affect the identified goals are identified for awareness.
3. Strategies that people can implement together are linked with the section goals.

The goals, challenges, and strategies were identified through a variety of resources including existing city policies and reports, academic publications, town hall meeting transcripts, local news outlets, and interviews with local civic leaders, businesses and residents. The strategies offer a pathway for embracing actionable implementation change that the whole of community can and should participate in.

The target areas for goals and strategies are framed by the 7 key WUI fire risk factors. The areas prioritized for actionable goals were depicted earlier in Figure 2 and include:

1. Guiding Shared Action (Governance)
2. Community
3. Land Use
4. Environment & Vegetation Management
5. Fire Suppression
6. Infrastructure
7. Home Hardening and Defensible Space

The relationships between the factors can manifest as varied effects in different fires. For example, environment & vegetation management along with infrastructure played a role in the Woolsey Fire, but other factors were also present. In contrast, the devastating fire in Paradise showed evidence of interactions between building practices and infrastructure. The ever-changing conditions must be viewed as a system, where the factors must be addressed in concert for effective risk reduction.

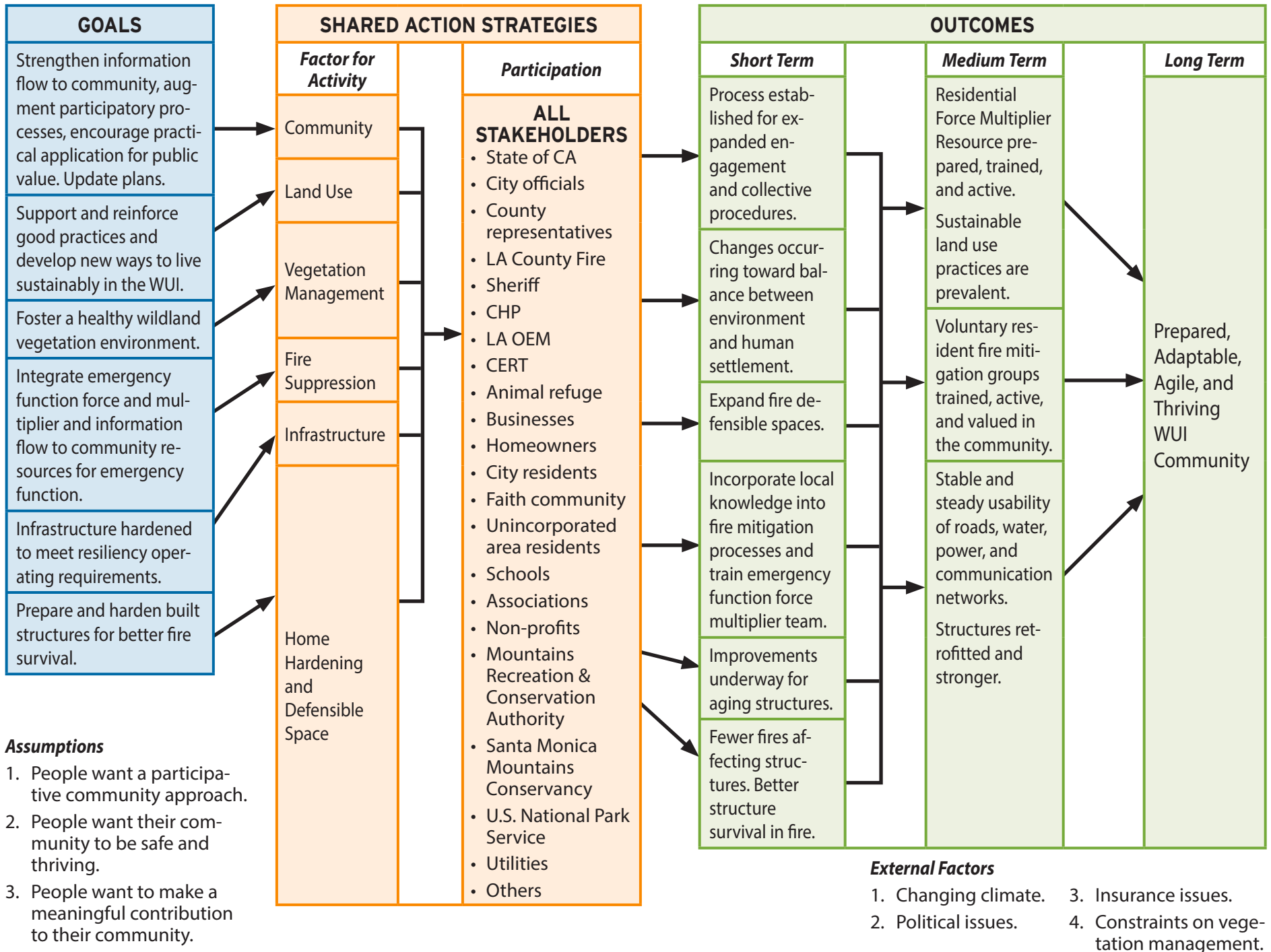
The point in the roadmap is to take coordinated action on each of the factors in order to diminish the possibility or severity of a wildland fire. Aligning local context actions for each factor to work together as a whole can significantly reduce WUI fire risk. Meaningful WUI fire risk reduction is achievable through understanding the constituent parts, the whole of the problem, and then harmonizing the collective actions.

***The real world demands that we learn to cope with chaos, that we understand what motivates humans, that we adopt strategies and behaviors that lead to order, not more chaos.***

*Margaret J. Wheatley,  
Leadership and the New Science*



## A ROADMAP FOR A RESILIENT WILDLAND URBAN INTERFACE COMMUNITY



## USING THIS ROADMAP

The roadmap presents concrete ways to build a safe and thriving WUI community at the wild-land interface. The individual factor forward mapping models speak to the specific strategies for action. The overarching logic map provides the big picture of the stakeholders working together across the factor areas to a larger goal and desired outcome. Aligning local context actions for each factor to work together as a whole can significantly reduce the WUI fire risk.

Through a holistic approach, policy implementation can be realized, unifying the stakeholder actions across each risk factor to amplify the results.

The whole is indeed much more than the sum of its parts. Malibu can actively reduce its fire risk and learn to live constructively with this very present hazard. Moreover, Malibu can share the journey toward becoming a resilient, adaptable and fire hardy community and pave the way for other interface communities.

## GUIDING SHARED ACTION (GOVERNANCE)

Collective action to reduce future WUI fire risk first requires an acknowledgment of the trauma the community has recently experienced. The human element of the fire response cannot be overlooked or considered an inevitable collateral consequence of dealing with natural hazards. A successful renewal of trust in this city of communicators and influencers can be a story worth telling to inspire others.

***“Motivation and inspiration energize people, not by pushing them in the right direction but by satisfying basic human needs.”***

*Kotter, J.P., 1996*

GUIDING SHARED ACTION (GOVERNANCE)		
① GOALS	② CHALLENGES	③ STRATEGIES
<ol style="list-style-type: none"> <li>1. Healthy and productive relationships between the community and its institutions.</li> <li>2. Effective, reliable clear, frequent and honest communications.</li> <li>3. Community agility to cope with change.</li> <li>4. Stakeholders are actively engaged.</li> <li>5. Intelligent and purposeful action.</li> </ol>	<ul style="list-style-type: none"> <li>• Migration of trust away from civic processes.</li> <li>• Unclear official processes cause further distrust and perceived lack of support.</li> <li>• Without effective communications lives are at risk, coordination and control are compromised.</li> <li>• Traditional communication services via Cell Phone or Internet and Cable may not be working due to (PSPS) events or fire related loss of power.</li> <li>• Overlooked human considerations following an event.</li> <li>• Poor past performance of institutions.</li> <li>• Healing processes.</li> <li>• City of Malibu trust and confidence.</li> </ul>	<p><b><i>Involve the wide range of stakeholders affected by the fire hazard risk.</i></b></p> <ul style="list-style-type: none"> <li>• Cultivate partnerships and mutual respect.</li> <li>• Nurture inclusive excellence.</li> <li>• Design opportunities for building harmony, commitment, and accountability across and between all stakeholders.</li> <li>• Cultivate community’s relationship with official processes.</li> <li>• Incorporate the human element into fire hazard planning.</li> <li>• Establish a process for expanded engagement, collective procedures, and continual learning.               <ul style="list-style-type: none"> <li>o Focus stakeholder interaction on specific preparedness and mitigation essentials for collective action on fire risk issues.</li> <li>o Guide exploration of options and negotiate differing views.</li> </ul> </li> </ul>

GUIDING SHARED ACTION (GOVERNANCE)		
① GOALS	② CHALLENGES	③ STRATEGIES
		<p><b>Develop a shared vision for fire risk management</b></p> <ul style="list-style-type: none"> <li>• Clearly communicate and explain hazard risks to a wide range of stakeholders.</li> <li>• Facilitate dialogue on the shared fire risk reduction goal.</li> <li>• Facilitate team building with shared vision.</li> <li>• Cultivate shared action to achieve goal.</li> </ul> <p><b>Communications</b></p> <ul style="list-style-type: none"> <li>• The use of traditional media (radio and broadcast television) should be expanded to supplement social media and telephone/text notification systems (KBUU 99.1 &amp; KNX 1070).</li> <li>• The public should be updated on situational awareness and mission changes impacting them. (Example: at 1:25 AM on Friday, 11/9/18 life safety and victim rescue 911 calls were prioritized because there were not enough resources for structure defense) (Citygate, page 61). The public can handle bad news. The point is simple: “tell the truth and tell it often”.</li> </ul>

GUIDING SHARED ACTION (GOVERNANCE)		
① GOALS	② CHALLENGES	③ STRATEGIES
		<ul style="list-style-type: none"> <li>• Establish channels for information to flow freely through a complex system, allowing parts to make continual adjustments consistent with the whole system.</li> <li>• Recognize the damage to community relations from challenges and problems and rebuild using lessons learned.</li> <li>• Update communication training for both civic and public safety leaders.</li> <li>• The completed COOP should be used as a training tool with associated table top exercises on an annual basis.</li> </ul> <p><b><i>Foster collaborative and unifying opportunities</i></b></p> <ul style="list-style-type: none"> <li>• Seek practical application for public value.</li> <li>• Establish a Community Advisory Council for Fire Risk. <ul style="list-style-type: none"> <li>o An advisory council can gather data and conduct reviews of research covering a wide range of issues while offering authoritative guidance for complex issue decisions.</li> </ul> </li> </ul>



GUIDING SHARED ACTION (GOVERNANCE)		
① GOALS	② CHALLENGES	③ STRATEGIES
		<p><b>City of Malibu Coordination and Support</b></p> <ul style="list-style-type: none"> <li>• The City of Malibu Emergency Operations Center (EOC) and overall management functions faced significant challenges during the Woolsey Fire event.               <ul style="list-style-type: none"> <li>o The City of Malibu Continuity of Operations Plan (COOP) and Emergency Operations Plan (EOP) should be reviewed and updated based on lessons learned in response to the Woolsey Fire.</li> <li>o The use of automated tools with mobile device support for task tracking, incident status, mapping, resource management and operational support data capture should be considered.</li> <li>o The interface between the City of Malibu and contracted service providers (fire fighting and law enforcement) should be reviewed and updated to ensure appropriate City of Malibu presence in command center(s).</li> <li>o The role and responsibilities of elected officials and contracted staff during a crisis event should also be clarified.</li> <li>o Building public trust through collaborative and visible actions is a necessity for positive change.</li> </ul> </li> </ul>

## COMMUNITY

Cooperation is a necessary condition to attain the outcomes sought. To achieve cooperation, navigation is needed. One steering strategy is aimed at ensuring stakeholder inclusion and focusing their interactions for shared wisdom. This process management is a vital component to engage and inspire the multiplicity of actors to accomplish the end goal: a safe and thriving WUI community.

Community can be described as a web of mutuality. A committed community can initiate government action and then complement the legitimate government needs. Fire risk reduction can be accomplished in strengthening what already exists and increasing the connectivity between the community parts, so that it is better able to function as a unit.

Bringing people together around a topic that matters is a model that can be both simple and effective, functioning on the foundation that all people have the capacity to work together (Wheatly, 2006). The practical model provides conversation opportunity to access collective intelligence on situations people care about. The strategy can be one means for widening community-based ideas for action.

Participatory research brings greater equity to the production of knowledge. As the environment of the chaparral clad mountains changes rapidly amid a shifting climate, all hands and eyes are needed to record the nuances of change, so that timely informed decisions and plans can be made.

Empowering the capable and ensuring support for the vulnerable are both important considerations for keeping all in the relational web. Knowledge, attitudes, and action appropriate for living with the evolving challenges of the WUI requires deep community engagement. Relationships require ongoing relevant information, shared purpose, and value production.

COMMUNITY		
① GOALS	② CHALLENGES	③ STRATEGIES
<ol style="list-style-type: none"> <li>Steer the participatory processes for fire mitigation.</li> <li>Strengthen fire mitigation capabilities among local residents.</li> </ol>	<ul style="list-style-type: none"> <li>Weakened trust of public institutions.</li> <li>Engaging appropriate diversity of ideas and concerns.</li> </ul>	<p><b>Community Communications</b></p> <ul style="list-style-type: none"> <li>Expand authentic communication opportunities within, across and between all community stakeholders and public institutions.</li> <li>Amend communication plan to respect the need all people have for information and realistic timelines.</li> </ul>

COMMUNITY		
① GOALS	② CHALLENGES	③ STRATEGIES
<p>3. Develop evacuation plans based on logical segmentation of the geography.</p> <p>4. Cultivate wider community support for vulnerable residents.</p>	<ul style="list-style-type: none"> <li>• Comprehensive evacuation and traffic management plans need to be developed with associated law enforcement training.</li> <li>• Limited quantity of public sector firefighting resources available to support “fire front following” ember suppression in neighborhoods after the main fire front passed through.</li> <li>• CERT and other qualified volunteer groups were not fully utilized.</li> <li>• Support services are needed for individuals remaining in a safe refuge locations or impacted areas.</li> <li>• Consistent protocols for the respectful treatment of individuals in the impact zone need to be established.</li> <li>• Sufficient and sustained community-based actions are affected by: <ul style="list-style-type: none"> <li>o Competing time demands for residents.</li> <li>o Action needed is perceived as insignificant.</li> <li>o Action needed is misunderstood.</li> </ul> </li> </ul>	<p><b>Evacuation</b></p> <ul style="list-style-type: none"> <li>• Evacuation efficiency can be enhanced by breaking the community into logical geographical zones similar to the approach utilized in Topanga Canyon.</li> <li>• Each zone should include identified safe refuge areas, support and information center locations, and documented evacuation and communication protocols.</li> <li>• Law enforcement agencies (Sheriff, California Highway Patrol (CHP), and Police) along with local city government should utilize traffic pattern analysis in the development of evacuation plans. Considerations should include the impact of PSPS events, use of contra-flow, and provisions for refueling, sanitation, notification and medical support.</li> </ul>

COMMUNITY		
① GOALS	② CHALLENGES	③ STRATEGIES
	<ul style="list-style-type: none"> <li>o Action needed is perceived to be dangerous.</li> <li>o Action needed is perceived to be the domain of professionals.</li> </ul>	<p><b><i>Volunteer Fire Front Following: Support and Suppress</i></b></p> <ul style="list-style-type: none"> <li>• Establish provisions in plans and practice for local volunteers with up-to-date qualifications, certification and local knowledge to be timely peak force multipliers to address resource gaps.</li> <li>• Creating a supplemental volunteer “fire front following” team to be deployed after the main fire front moves through to support the extinguishing of burning embers.</li> <li>• Local knowledge can be valuable in understanding local topography and the make-up of the community. This knowledge can also be used to support welfare checks along with providing outside the area resources with information on local roads and access points.</li> </ul> <p><b><i>CERT and Qualified Volunteer Groups</i></b></p> <ul style="list-style-type: none"> <li>• The Community Emergency Response Team (CERT) and qualified volunteer groups should be more fully utilized and tasked with providing a variety of support services including but not limited to:               <ul style="list-style-type: none"> <li>o Communication support services (Amateur Radio Groups: DCS, ACS, ARES, and others).</li> <li>o Animal Safety and Evacuation.</li> <li>o Traffic intersection management (must have qualified training).</li> <li>o Supply acquisition and delivery.</li> </ul> </li> </ul>

COMMUNITY		
① GOALS	② CHALLENGES	③ STRATEGIES
		<ul style="list-style-type: none"> <li>o Shelter volunteer (must have qualified training).</li> <li>o Evacuation volunteer.</li> <li>o Administrative support.</li> <li>o Messenger.</li> </ul> <p><b>Logistical Support Systems</b></p> <ul style="list-style-type: none"> <li>• Support service locations need to be identified, planned for, and implemented for individuals requiring communications, food, water, shelter, fuel and medical care while remaining in a safe zone or the impacted area.</li> <li>• Delivery and re-supply strategies and resources should be identified in advance with considerations for use of roadways, water routes and air-drop as needed.</li> <li>• A simple tracking system should be utilized to ensure the fair distribution of supplies.</li> <li>• Respectful treatment and reasonable protocols for interfacing with individuals by law enforcement personnel during the crisis event should be documented with proper training provided to law enforcement personnel stationed in the impacted area.</li> </ul>



COMMUNITY		
① GOALS	② CHALLENGES	③ STRATEGIES
		<p><b>Vulnerable Populations</b></p> <ul style="list-style-type: none"> <li>• Awareness of and planning for residents with access and functional needs will reduce vulnerabilities.</li> <li>• Awareness of and planning for day laborer and domestic workers.</li> <li>• Include residents with specific needs in the practice and improvement processes.</li> </ul> <p><b>Health Consequences</b></p> <ul style="list-style-type: none"> <li>• Both residents and first responders are exposed to serious health risks from fires.</li> <li>• Psychological trauma related issues were apparent among community members.</li> <li>• Trauma related mental health effects include post-traumatic stress disorder, depression, anxiety and alcohol/substance abuse.</li> <li>• Loss, disappointment, anger, distrust, feeling captive and disbelief were emotions expressed by many of the residents interviewed for this report.</li> <li>• Professional psychological support services, outreach and monitoring to assess the rate of behavioral health consequences among community members and to develop improved strategies will be helpful in preparing for future events.</li> </ul>

COMMUNITY		
① GOALS	② CHALLENGES	③ STRATEGIES
		<p><b>Business Continuity</b></p> <ul style="list-style-type: none"> <li>• Proactive preparedness, response and recovery measures will help keep these businesses operational and active.</li> <li>• The community and local businesses are interdependent.</li> </ul> <p><b>Learning</b></p> <ul style="list-style-type: none"> <li>• Distinguish between belief, opinion, and evidenced-based knowledge for ongoing improvement and building adaptive capacity.</li> <li>• Sponsor small business continuity of operations planning courses.</li> <li>• Conduct events that foster bringing the community together for open communications.</li> <li>• Provide regular community-based topic specific training and practice sessions.</li> <li>• Fire mitigation training.</li> <li>• Define community communication process with each other and civic entities.</li> </ul>

## LAND USE

Where and how people choose to live on the WUI land is among the most important decisions to be made in reducing disaster risk. The choice of a home location is particularly true for wildfire risk. As discussed earlier, fire risk is influenced by the interactions of dynamic factors. No matter the location choice, a great lifestyle is possible when coupled with an understanding of the unique natural environment of the particular location and a commitment to living prudently in the environment selected.

Misunderstandings remain around the fire problem in California. Three-quarters of California voters believe the state should restrain home building in areas at high risk of wildfires, according to a June 2019 poll conducted by the UC Berkeley Institute of Governmental Studies. Several major issues complicate the resolve. California is short of millions of housing units and must build somewhere. The fire problem has been exacerbated by the mismanagement of fuels, prolonged drought and a failure to constructively manage this complex issue. The reality is that somebody is always going to live on the interface, no matter where that line is. The real question is how the land is used safely and sustainably given competing demands.

LAND USE		
① GOALS	② CHALLENGES	③ STRATEGIES
<ol style="list-style-type: none"> <li>1. Understand the requirements for the land.</li> <li>2. Understand how well the natural environment can absorb human settlement nearby.</li> <li>3. Reinforce good practices and develop new ways to live sustainably in the WUI.</li> <li>4. Balance demands on the land with a healthy environment.</li> </ol>	<ul style="list-style-type: none"> <li>• Agreement among stakeholders in extending or maintaining development in the WUI.</li> <li>• California’s housing shortage will force development somewhere and part of this growth is likely to be at the interface.</li> <li>• An interface always exists between the wildland &amp; urban areas.</li> </ul>	<ul style="list-style-type: none"> <li>• Reconcile competing demands and legislation (eg. CA PRC 4483, SB 1260).</li> <li>• Implement and maintain ongoing fuel reduction measures in selected areas.</li> <li>• Establish and maintain buffer zones described by the UN Environment Program as areas peripheral to a specific protected area, where restrictions on resource use and special development measures are undertaken in order to enhance the conservation value of the protected area.               <ul style="list-style-type: none"> <li>o This strategy has been committed to in Malibu’s General Plan, yet not implemented. Buffer Zones allow for protection of the chaparral from encroachment, while protecting development from fire.</li> <li>o The size and composition of buffer zones needs can be worked through expert advice and lessons learned from previous fire events.</li> </ul> </li> </ul>

## ENVIRONMENT AND VEGETATION MANAGEMENT

A practical fire risk reduction application for public value is environment & vegetation management. Even so, a sustainable balance between well thought through vegetation management and natural adaptation is involved when considering WUI fire risk factors.

The interactions of a changing climate, increasing human settlement at the WUI, and changes in fire regimes with the local chaparral are continually evolving. As a result, the dynamic chaparral environment is not clearly understood. In secluded areas, chaparral has evolved and can continue to do so in its natural state. Consistently, chaparral at the WUI has been subjected to centuries of human settlement and less natural adaptations. As a result, a different management strategy is needed at the WUI. The crucial fire risk reduction factors of home hardening, defensible space, and vegetation management are basic to management of fire risk.

ENVIRONMENT AND VEGETATION MANAGEMENT		
① GOALS	② CHALLENGES	③ STRATEGIES
<ul style="list-style-type: none"> <li>1. A healthy environment.</li> <li>2. Expand fire defensible spaces.</li> <li>3. Reduce fire fuel near homes and city structures.</li> </ul>	<ul style="list-style-type: none"> <li>• Climate crisis amplifies the impact of low humidity, high winds, and high heat on WUI.</li> <li>• WUI fires can grow at a pace well beyond that of such events a few years ago. The number of fire prone days (fire season) has expanded by 105 since the 1970's.</li> <li>• Species succession.</li> <li>• Changes in land cover and topographic fire risk.</li> <li>• Stress of large populations.</li> <li>• Different agendas among stakeholders.</li> <li>• Poorly understood chaparral environment.</li> </ul>	<p><b>Education</b></p> <ul style="list-style-type: none"> <li>• Identify how residents, visitors, businesses and community stakeholders are educated on fire risks, impact, and mitigation needed to reduce wildland fire threat.</li> <li>• Provide education in the relevant ways all stakeholders learn about the fire risks and mitigation.</li> <li>• Utilize research from Scientific Advisory Council.</li> <li>• Clearly communicate and explain hazard risks to the wide range of stakeholders.</li> <li>• Provide targeted force multiplier training on fire fuel reduction.</li> </ul>

**ENVIRONMENT AND VEGETATION MANAGEMENT**

① GOALS	② CHALLENGES	③ STRATEGIES
		<ul style="list-style-type: none"> <li>• Clearance around neighborhoods, roads, power lines and homes to reduce fuel load and ignition spreading:                             <ul style="list-style-type: none"> <li>o Expanded brush clearance surrounding neighborhoods and by historical fire travel points (i.e. clearance on both sides of the 101 Freeway where fire has traditionally crossed moving towards the ocean.</li> <li>o Increased neighborhood, residential, road and power line overgrowth visual reviews by L.A. County Fire Department officials and follow-up enforcement on citations (ensure the cited violations are addressed).</li> </ul> </li> </ul> <p><b>Create Buffer Zones</b></p> <ul style="list-style-type: none"> <li>• Areas peripheral to a specific protected area, where restrictions on resource use and special development measures are undertaken in order to enhance the conservation value of the protected area.</li> <li>• Reduce fuel load in areas adjacent to build spaces, as per the Safety Element of the General Plan.</li> <li>• Reduce fuel load and ignition spreading through clearance around homes and neighborhoods.</li> <li>• Expand and enforce brush clearance in historical fire corridors and surrounding neighborhoods.</li> </ul>



**ENVIRONMENT AND VEGETATION MANAGEMENT**

① GOALS	② CHALLENGES	③ STRATEGIES
		<p><b>Fuel Reduction</b></p> <ul style="list-style-type: none"> <li>• Assess and implement fuel reduction measures similar to those being implemented by CalFire in high risk WUI areas.</li> </ul> <p><b>Environmental Stewardship</b></p> <ul style="list-style-type: none"> <li>• The Santa Monica Mountains include Environmentally Sensitive Habitat Areas (ESHAs) that are part of the WUI and subject to significant fire risk. Mitigating this risk requires proactive measures to reduce exposure from both natural and man-made causes. Climate change is real and fire risk is real. The proven pattern of increased damaging WUI fires highlights the need to reduce, not expand the fire risk exposure in these sensitive areas.</li> <li>• Assess and implement fuel reduction measures similar to those being implemented by CalFire.</li> </ul> <p><b>Malibu General Plan</b></p> <ul style="list-style-type: none"> <li>• 2022 review and update – California requirement to address climate adaptation and resiliency strategies.</li> <li>• Updating the plan in relationship to the Woolsey Fire lessons learned is beneficial and ahead of schedule.</li> <li>• Consider a hybrid fire model where vegetation is carefully managed to reduce fire intensity, while fire is suppressed aggressively to limit damage to the natural and built environment.</li> </ul>

## FIRE SUPPRESSION

Fire suppression is rapidly evolving as a complex adaptive system utilizing technologies that require a new level of organization to realize the potential benefits. For example, one year after Woolsey, a strong response to the Getty Fire demonstrated the value of remote sensing, fire modeling, and predictive analytics, together with other technologies to enable better real-time decision-making in the critical early stages of the fire. The emerging system is best characterized as socio-technological, requiring a more capable workforce to realize the full potential of advanced technologies to support firefighting, as well as deeper engagement with the range of stakeholders.

FIRE SUPPRESSION		
① GOALS	② CHALLENGES	③ STRATEGIES
<ol style="list-style-type: none"> <li>1. Fast and effective fire suppression, particularly in Red Flag conditions.</li> <li>2. Integrated community resources as force multipliers.</li> <li>3. Community is a respected partner in fire risk reduction.</li> </ol>	<ul style="list-style-type: none"> <li>• Trust.</li> <li>• Culture.</li> <li>• Professional development.</li> <li>• Disconnected from the real issues faced by communities.</li> <li>• Resources.</li> <li>• Multi-fire impact on mutual aid resources.</li> <li>• Budget constraints.</li> </ul>	<p><b>Education and Training</b></p> <ul style="list-style-type: none"> <li>• LAFD has built higher education requirements and preferences into its structure for advancement. Building on this initiative, the State Fire Marshal and the US Fire Administration, together with local stakeholders, should study future education requirements for the fire service, similar to the Department of Navy's "Education for Seapower" strategy.</li> <li>• Continue development of the "Take Initiative Engage and Report" training.</li> </ul> <p><b>Advanced Technologies</b></p> <ul style="list-style-type: none"> <li>• Utilize remote sensing, modeling and predictive analytics to improve the speed and quality of decision making. The technologies are particularly important as a wider range of stakeholders are engaged. The WiFIRE system developed by UC San Diego and utilized by LAFD is an example of improved near real-time modeling programs. Ember modeling is not yet available but should be considered a high priority.</li> </ul>

FIRE SUPPRESSION		
① GOALS	② CHALLENGES	③ STRATEGIES
		<p><b>Ground Resources</b></p> <ul style="list-style-type: none"> <li>• Consider the acquisition of additional Type 3 engines and other appropriate equipment for use in wildland fire interface areas where narrow roads limit mobility.</li> </ul> <p><b>Air Resources</b></p> <ul style="list-style-type: none"> <li>• Study future regional air resource requirements for fighting wildland fires, particularly as integrated with other developments.</li> <li>• As required, lease or purchase additional high capacity fixed wing aircraft and/or water dropping helicopters (Firehawks and Erickson Sky Crane) to be available throughout the extended high fire risk season.</li> <li>• Resolve problems with the early positioning and deployment of National Guard air resources in helping to fight wildland fires, as per the 2003 Governor’s Blue Ribbon Fire Commission.</li> <li>• Consider advanced night vision system now being piloted by San Diego for more effective night time firefighting.</li> </ul> <p><b>Deployment Model</b></p> <ul style="list-style-type: none"> <li>• Study the use of Point Mugu Naval Air Base for firefighting fixed wing and helicopter aircraft. The Base is less than 3 minutes by air from the Malibu geography and was recommended in the 2003 Governor’s Blue Ribbon Report.</li> </ul>

FIRE SUPPRESSION		
① GOALS	② CHALLENGES	③ STRATEGIES
		<ul style="list-style-type: none"> <li>• Aggressive Wildfire Attack Approach: Consideration should be given to increase the availability of resources to rapidly attack a wildland fire as soon as it is reported during Red Flag conditions.</li> </ul> <p><b><i>Incident Management: Rapid Detection, Rapid Response</i></b></p> <ul style="list-style-type: none"> <li>• The changing environment requires a change in strategy. Rapid detection and rapid response are critical.</li> <li>• To develop more agility in the response structure, consider the Net-Centric Operations incident management principles to modify ICS, using well established theory and practice from military operations.</li> <li>• Local Knowledge is of great benefit and should be incorporated into the region firefighting process for mutual aid.</li> </ul> <p><b><i>Community Resources as Peak Force Multipliers</i></b></p> <ul style="list-style-type: none"> <li>• Consider the development of certified volunteer firefighters that can be effectively deployed as force multipliers in fire front following strategies. This is relatively low risk labor intensive work, putting out spot fires and suppressing burning embers.</li> </ul>

FIRE SUPPRESSION		
① GOALS	② CHALLENGES	③ STRATEGIES
		<ul style="list-style-type: none"> <li>• Require the following:               <ul style="list-style-type: none"> <li>o Individuals must be physically capable to operating in a WUI fire environment.</li> <li>o Individuals must attend training and certification classes approved by L.A. County and/or the State Fire Marshall.</li> <li>o Individuals will be responsible for purchasing the required Personal Protection Equipment.</li> <li>o Neighborhoods participating in the program will be responsible for the purchase and maintenance of fire hoses connectors and other required equipment.</li> <li>o Certified teams will operate under the guidance and control of incident command.</li> <li>o Certified teams will be staged in safe refuge areas.</li> </ul> </li> </ul> <p><b><i>NOTE: Our study team does not support or recommend individuals remain in a mandatory evacuation zone. Mandatory evacuation orders should be carefully followed, utilizing public safe refuge areas if required.</i></b></p>

## INFRASTRUCTURE

The infrastructure (energy, communications, water, and roads) to support interface communities and remote “intermix” areas can be expensive and a challenge to maintain. Moreover, ensuring the infrastructure can meet the unique demands of a wildfire or other disaster is particularly challenging, as it tends to be spread out, in vulnerable positions, and must be robust.

INFRASTRUCTURE		
① GOALS	② CHALLENGES	③ STRATEGIES
<p>1. Vital infrastructure is:</p> <ul style="list-style-type: none"> <li>• Available when needed.</li> <li>• Poses no additional risk.</li> <li>• Meets surge requirements.</li> <li>• Cost-effective.</li> </ul>	<ul style="list-style-type: none"> <li>• The understanding of infrastructure vulnerabilities and complexities is low.</li> <li>• Infrastructure is costly to build, update, and maintain.</li> <li>• Interdependencies exist between infrastructure types.</li> <li>• Infrastructure is in transition to new modes.</li> <li>• Existing infrastructure is aging with high demands for improvement in many areas and significant deferred maintenance.</li> <li>• Public Safety Power Shut Off (PSPS) events have widespread impact.</li> </ul>	<p><b>Electricity</b></p> <ul style="list-style-type: none"> <li>• A strategic approach to managing risk across the grid is still required. <ul style="list-style-type: none"> <li>o Australia’s CSIRO is a potential model for how risk can be managed through different strategies in various parts of the grid. Of interest, is a review of the externalized costs of failing to adequately harden our power infrastructure.</li> </ul> </li> <li>• Specific plans and metrics are required by the California Public Utilities Code and should be well understood by all stakeholders. <ul style="list-style-type: none"> <li>o Section 8386 requires “preventive strategies and programs to be adopted by the electrical corporation to minimize the risk of its electrical lines and equipment causing catastrophic wildfires, including consideration of “dynamic climate change risks”. These plans are available for review.</li> </ul> </li> </ul>



INFRASTRUCTURE		
① GOALS	② CHALLENGES	③ STRATEGIES
		<ul style="list-style-type: none"> <li>• Southern California Edison (SCE) has replaced some of the utility poles destroyed in the Woolsey Fire with new, non-flammable composite poles. This process should be repeated for all poles located along major access and evacuation routes in the WUI area.</li> <li>• All new high voltage wire should be insulated along with the use of new breaker technology to prevent dangerous sparks when tripped.</li> <li>• Efforts should be expanded in developing a fire-resistant coating that can be applied to existing wood utility poles in the WUI area.</li> <li>• Local city officials along with law enforcement (sheriff, highway patrol, police) should develop, train on and test traffic management plans during a PSPS event or fire related power outage.</li> <li>• A strategic approach to managing risk across the grid is still required.</li> </ul> <p><b>Communications</b></p> <ul style="list-style-type: none"> <li>• Prior to and during a WUI fire, traditional communication services via Cell Phone or Internet and Cable may not be working due to PSPS or fire.</li> <li>• Effective and reliable communications are required to support notification, evacuation, situational awareness, incident management, resource coordination, safety, security and recovery efforts.</li> </ul>

INFRASTRUCTURE		
① GOALS	② CHALLENGES	③ STRATEGIES
		<ul style="list-style-type: none"> <li>• Emergency mobile wireless network trucks should be staged for deployment during PSPS events. (COW-Cell on wheels and COLT-Cell on light trucks.</li> <li>• Hard wired plain old telephone systems lines (POTS) remain one of the more reliable and active methods of communication in a PSPS event.</li> <li>• Coordinated communications using the amateur radio (HAM) user network have proven to be reliable and resilient during major disaster events.</li> </ul> <p><b>Roads</b></p> <ul style="list-style-type: none"> <li>• Roadside vegetation by power lines needs to be carefully managed, as it is an area of high risk.</li> <li>• Road access is critical for evacuation and getting fire resources in place.               <ul style="list-style-type: none"> <li>o Roads should be as free as possible of downed powerlines, poles and trees that are likely to fall in a fire.</li> </ul> </li> </ul> <p><b>Water</b></p> <ul style="list-style-type: none"> <li>• Surge capacity during a fire must be accounted for, with reservoirs kept at capacity and back-up power supplies for pumps in place.</li> </ul>

## HOME HARDENING AND DEFENSIBLE SPACE

Home hardening and creating defensible space are a type of mitigation, or the act of addressing identified risk. The U.S. Congressional approved study on Mitigation shows that for every \$1 spent on mitigation there is an equivalent \$6 benefit on the average. The benefits or education and changed behavior have been documented as high as 60:1. The good news is that buildings can survive a wildfire when properly constructed or retrofitted. And this does not need to be expensive. The challenge is to stay committed maintaining the building and its defensible space.

HOME HARDENING AND DEFENSIBLE SPACE		
① GOALS	② CHALLENGES	③ STRATEGIES
<ol style="list-style-type: none"> <li>1. New and existing structures are hardened.</li> <li>2. Defensible space is created and maintained throughout the area.</li> <li>3. Retrofitting recommendations are implemented.</li> </ol>	<ul style="list-style-type: none"> <li>• Local application is not well researched.</li> <li>• Inadequate fire risk knowledge in the community.</li> <li>• Implementation deficits of existing policies, such as the General Plan.</li> <li>• Inadequacy of current codes.</li> <li>• Maintenance difficulties.</li> <li>• Retrofitting existing building stock.</li> <li>• Limited research and understanding of WUI combustion and fire spread.</li> <li>• Insurance considerations.</li> </ul>	<p><b><i>Reimagine Home Hardening and Defensible Spaces</i></b></p> <ul style="list-style-type: none"> <li>• Celebrate innovations in design and cost-effectiveness.</li> <li>• Engage the community on specific measures through collaborative engagement.</li> </ul> <p><b><i>Home Brush Clearance</i></b></p> <ul style="list-style-type: none"> <li>• Review and improve the home inspection and enforcement process for brush clearance to increase compliance.</li> <li>• Engage insurance companies in supporting compliance.</li> <li>• Examine the benefits of a retrofit program to make older homes more fire resistant (Example: ember stopping screens and enclosing exposed eaves).</li> <li>• Identify potential financial incentives (similar to the successful earthquake “bolt and brace” program) to encourage proactive mitigation.</li> <li>• Based on Woolsey Fire lessons learned advocate the removal of creosote treated railroad ties.</li> </ul>

HOME HARDENING AND DEFENSIBLE SPACE		
① GOALS	② CHALLENGES	③ STRATEGIES
		<ul style="list-style-type: none"> <li>• Recommend aggressive trimming or removal of highly flammable and ember producing plants and trees.</li> </ul> <p><b>Clarifying State and Local Requirements</b></p> <ul style="list-style-type: none"> <li>• California Public Resources Code Section 4291 requires “defensible space of 100 feet from each side and from the front and rear of the structure. The amount of fuel modification necessary shall take into account the flammability of the structure as affected by building material, building standards, location, and type of vegetation. Fuels shall be maintained in a condition so that a wildfire burning under average weather conditions would be unlikely to ignite the structure”.</li> </ul> <p><b>California Fair Plan Coverage</b></p> <ul style="list-style-type: none"> <li>• Increase the coverage provided by the California Fair Plan from \$1.4M to \$3M or greater.</li> </ul>

## CONCLUDING SUMMARY

The Malibu community has consistently demonstrated its ability to successfully address difficult challenges. Moving forward requires us to express our feelings, share our experiences and commit to making changes. We reflect on ourselves, our families, and our community. We think about what went right, what went wrong and what we need to change. This report is a reflection of many of those thoughts and experiences combined with a vision of positive results. Innovative, collaborative, sustainable, measurable and repeatable are the characteristics of programs and transformations we can all benefit from. Our team is committed to participating with you in making these changes a reality.

### **EIGHT STAGES FOR SUCCESSFUL CHANGE**

1. Create a sense of urgency.
2. Aligning people with the skills, credibility, connections, and authority to act.
3. Generate a shared vision.
4. Communicate the vision and strategy.
5. Empowering people to move ahead.
6. Produce visible signs of progress.
7. Persevere through the process when it becomes difficult.
8. Motivate and shape a new culture (of preparedness).

*Kotter, J.P., 1996*

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We also recognize and applaud the brave men and women firefighters serving on the front lines working tirelessly when responding to the difficult challenges of Wildland Urban Interface (WUI) fires. Our team was inspired by both government and private sector individuals who are committed to making the changes necessary to achieve resiliency in the WUI environment.

To those who shared their personal photos of the Woolsey Fire, we thank you for allowing us to include them in this report.

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## BIBLIOGRAPHY

- Arnstein, S.R., (1969). A Ladder of Citizen Participation. *Journal of American Planning Association* 35:4.
- Ball, P. (2011). The New History, *Nature*, 2 December, 2011, Vol 480
- Becker, J.S., Johnston, D.M., Daly, M.C., Paton, D.M., Mamula-Seadon, L., Peterson, J., Hughes, M.E., and Williams, S., (2011). *Building Community Resilience to Disasters: A Practical Guide for the Emergency Management Sector*. New Zealand: GNS Science Report.
- Brown, J. and Isaacs, D., (2005). *The World Café: Shaping Our Futures Through Conversations That Matter*. Oakland, CA; Berret-Koehler Publishers.
- Butler, C.P. (1974). The urban/wildland fire interface. In: Proceedings of Western states section/ Combustion Institute papers, vol. 74, no. 15. Pullman, WA: Washington State University.
- Campbell, William, Commission Chair, (2004). Governor's Blue Ribbon Fire Commission Report. Retrieved 11-3-2019 from <https://www.caloes.ca.gov/FireRescueSite/Documents/20040405-BRCFinal%20Report%20-%20Part%201%20of%205.pdf>
- Carmichael, P., (2002). Review of Public Administration Briefing Paper: Multilevel Governance. Retrieved 11-2-19 from <http://www.rpani.gov.uk/multilevel.pdf>
- Castells, M, (2009). Manuel Castells in *Communication Power*. Oxford University Press City of Malibu General Plan (1995, 2010, & 2017). Retrieved 11-2-19 from <http://www.qcode.us/codes/malibu-general-plan/>
- Cohen, J.D., (2008). The Wildland Urban Interface Fire Problem. *Forest History Today* (Fall), 20-26.
- Comfort, L., Sungu, Y., Herber, M., Piatek, J., Dunn, M., and Johnson, D., (1999). Self Organization in Disaster Mitigation and Management: Increasing Community Capacity for Response. Presentation given to International Emergency Management Society Conference.
- County of Los Angeles, November 2019, *After Action Review of the Woolsey Fire Incident*, Citygate Associates, LLC.
- Federal Emergency Management Agency, (2011). A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action. FDOC-104-008-1. Washington D.C.: Federal Emergency Management Agency.
- Federal Emergency Management Agency, (2018). FEMA 2018 – 2022 Strategic Plan. Washington, DC: Department of Homeland Security. Retrieved from: [https://www.fema.gov/media-library-data/1533052524696-b5137201a4614ade5e0129ef01cbf661/strat\\_plan.pdf](https://www.fema.gov/media-library-data/1533052524696-b5137201a4614ade5e0129ef01cbf661/strat_plan.pdf)
- Federal Emergency Management Agency, (2019). "Building Cultures of Preparedness: A report for the emergency management higher education community." Washington, DC: FEMA.
- Feldmann-Jensen, S., Jensen, S.J., and Maxwell Smith, S., (2017). *The Next Generation Core Competencies for Emergency Management: Handbook of Behavioral Anchors and Key Actions for Measurement*. Emmitsburg, MD: FEMA Higher Educations Program.
- Feldmann-Jensen, S., Jensen, S.J., and Maxwell Smith, S., (2019). The Next Generation Core Competencies for Emergency Management. *Journal of Emergency Management* Vol 17. No.1. DOI: 10.5055/jem.2019.0393

## BIBLIOGRAPHY

- Finney, M.A., Cohen, J.D., Forthofer, J.M., McAllister, S.S., Gollner, M.J., Saito, K., Akafuah, N.K., Adam, B.A., English, J.D., (2015). *Flame Dynamics and Wildfire Spread*. Proceedings of the National Academy of Sciences August 2015, 112 (32) 98339838. DOI: 10.1073/pnas.1504498112
- Haase, T.W., Ertan, G. and Comfort, L.K., (2017). "The Roots of Community Resilience: A Comparative Analysis of Structural Change in Four Gulf Coast Hurricane Response Networks." *Homeland Security Affairs*.
- Hannibal, M.E., (2016). *Citizen Scientist: Searching for Heroes and Hope in an Age of Extinction*. New York, NY;The Experiment LLC.
- Hill, M., and Hupe, P., (2009). *Implementing Public Policy* 2nd Edition. Thousand Oaks, CA: Sage Publications Ltd.
- Jensen, S.J., Feldmann-Jensen, S., and Woodworth, B., 2019. *Resilience Under Fire: Protective Action Attitudes and Behaviors Evidenced in the 2018 Woolsey Fire*. NSF Quick Response Research Report, Natural Hazards Center, University of Colorado, Boulder.
- Kotter, J.P., (1996). *Leading Change*. Harvard Business School Publishing.
- Mileti, D.S., (1999). *Disasters by Design: A Reassessment of Natural Hazards in the United States*. Washington D.C.: Joseph Henry Press.
- National Wildfire Coordinating Group Executive Board, (2009). *Quadrennial Fire Review Final Report*. Retrieved 11-3-2019 from [https://www.forestsandrangelands.gov/documents/strategy/foundational/qfr2\\_009final.pdf](https://www.forestsandrangelands.gov/documents/strategy/foundational/qfr2_009final.pdf)
- Ostrom, E. (2009). "Engaging with Impossibilities and Possibilities" in Kanbur, Ravi, Basu, Kaushik (Eds.), *Arguments for a Better World: Essays in Honor of Amartya Sen Volume II: Society, Institutions and Development*. Oxford, New York: Oxford University Press, pp. 522-541.
- Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.), (2018). *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*. Washington D.C.: Volume II: Report-in-Brief U.S. Global Change Research Program.
- Roberts, P. S., 2013. *Disasters and the American State: How Politicians and the Public Prepare for the Unexpected*. New York, NY: Cambridge University Press.
- Royal Commission into Victoria's Bushfires, McLeod, R. N., Pascoe, S. M., & Teague, B. G. (2009). *2009 Victorian Bushfires Royal Commission: Interim Report*. Melbourne: Government Printer for the State of Victoria.
- Santa Monica Mountains Community Wildfire Protection Plan, 2013. Retrieved 11-3-2019 from [https://www.nps.gov/samo/learn/management/upload/SMM\\_CWPP\\_02MAY20\\_12\\_FINAL\\_v3.pdf](https://www.nps.gov/samo/learn/management/upload/SMM_CWPP_02MAY20_12_FINAL_v3.pdf)