

University of Nevada, Reno

**Socially Vulnerable Populations' Experiences with Wildfire Preparation Programs at Lake  
Tahoe**

A thesis submitted in partial fulfillment of the  
requirements of Master of Arts in  
Communication Studies

By

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## Abstract

Wildfires have been increasing in size and severity, with more people being impacted each year. To prepare communities, wildfire agencies and organizations across the United States are receiving significant public and private funding to expand the amount of information and support services they provide to community members, such as free defensible space inspections, public workshops, and print and online resources. Although wildfire itself does not discriminate against specific community members, wildfire agencies and organizations have failed to adapt existing programs to provide individualized support to socially vulnerable populations, including Spanish-speakers, older adults, and persons with disabilities, who are disproportionately impacted by wildfires each year. Lake Tahoe has experienced several large-scale wildfires in recent years, with the 2021 Caldor Fire having impacted communities significantly. This study seeks to identify how Lake Tahoe wildfire agencies and organizations can adapt their programs to prepare socially vulnerable populations for the inevitable impacts of wildfires.

*Keywords:* wildfire preparation, socially vulnerable populations, defensible space, evacuation planning, home hardening, Spanish-speaking, older adult, disability

## **Dedication**

To my husband, family, and friends who continuously bring me into the public lands surrounding Lake Tahoe on foot, bicycle, and skis to keep me grounded and to remind me why I continuously work to protect Lake Tahoe's natural environment and communities from the catastrophic impacts of wildfire.

## Acknowledgements

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Many individuals provided direct assistance to ensure the success of this research who deserve recognition. Thank you to my research advisor, Dr. Shawn Marsh, for allowing me the space to make this project my own while also providing invaluable time and assistance to ensure its success. Thank you to Kenya Sancho, who served as the Spanish interpreter, for dedicating her time to ensure wildfire programs adapt to reach Spanish-speaking populations at Lake Tahoe. And finally, thank you to the nearly fifty participants who committed their time during a record-breaking winter to discuss wildfire impacts with me, which is not typically a subject people are eager to discuss. Their contributions mean more than they will ever realize, and I am grateful for their time and interest in enacting positive change in their communities.

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## **Socially Vulnerable Populations' Experiences with Wildfire Preparation Programs at Lake Tahoe**

An increase in drought conditions exacerbated by climate change and decades of poor forest management has increased the size, frequency, and destruction of wildfires throughout the Western United States (California Forest Management Task Force, 2021). Although wildfires are a global phenomenon, with climate change increasing their severity and scale, the Western United States, including California and Nevada, has experienced unprecedented wildfires in recent years (California Tahoe Conservancy, 2019). Climate change is causing more extreme weather events, which is altering the retention of snowpack across the Sierra Nevada Mountains, with the subsequent vegetation types that prosper in these changing conditions posing an increased risk of wildfire to the natural environment and communities (California Wildfire and Forest Resilience Task Force, n.d.-a).

In California alone, seven of the ten most destructive wildfires occurred between 2015 and 2020, with four of these wildfires occurring in 2017 and 2018 alone, and these numbers do not reflect the devastation felt by the 2021 and 2022 fire seasons (Rosenthal et al., 2021). Similarly, Nevada is experiencing an unprecedented increase in the number of acres burned by wildfires, with 9.5 million acres burning between 2000-2018 in comparison to 4.2 million acres burning from 1980-1999 (Stinnesbeck, 2020). Both California and Nevada are experiencing first-hand the increase in size and severity of wildfires and deeply recognize the necessity of forest management agencies and individuals living in wildfire-prone needing to take action immediately to prepare themselves and their property for imminent wildfire threats.

Not only are wildfires increasing in size and scale in areas that are already wildfire-prone, but recent research by Masri et al. (2021) suggests that wildfires are becoming prevalent

in areas that have not experienced wildfires previously, with double the amount of census tracts across the United States now having experienced wildfires and also double the number of people living in those census tracts having been directly impacted by wildfires. There has also been an increase in the number of people living in wildfire-prone areas in an area typically referred to as the wildland-urban interface (WUI). According to Haldane (2013), over two-thirds of new homes constructed across the United States between 2000 and 2010 reside in the WUI. Similarly, the California Forest Management Task Force (2021) describes this phenomenon of a significant human presence in mid-elevation mixed-conifer forests as putting increasing numbers of people at risk of wildfire threats and an increase in the number of ignitions that could occur. The increase of people residing in these wildfire-prone areas coupled with the increase in the size and scale of wildfires has resulted in more people than ever before experiencing impacts from wildfires.

Impacts from wildfires vary significantly among and across communities based on geography, the prevalence of native and non-native vegetation, weather patterns, and the presence of land management conducted by wildfire agencies and organizations, and individuals on both private and public land. Because wildfire impacts vary based on local contexts, people experience wildfire impacts at varying degrees, both through indirect and direct impacts. Indirectly, over 25 million people in 2020 alone experienced at least one day of wildfire smoke exposure at an unhealthy level (Childs et al., 2022), and directly, over one million people were ordered to evacuate wildfires in California between 2017-2019 (Wong et al., 2020). Directly, people are also experiencing unprecedented home loss due to wildfires. Although home loss is notoriously difficult to track consistently and is more commonly linked to specific wildfire events rather than widespread trends in wildfires, it is worth noting that thousands of homes are lost in

any given year (McCaffrey, 2018). All of this is to say that most, if not all, people residing in California, Nevada, or elsewhere in the Western United States are keenly aware of wildfires and resulting wildfire impacts that have either a direct or indirect impact on them, their families, and their properties.

### **Lake Tahoe Context**

Similar to the rest of the Western United States, people who reside in communities at Lake Tahoe, both in Nevada and California, are experiencing both direct and indirect wildfire impacts. Lake Tahoe is situated in the Sierra Nevada Mountains split almost equally between the States of Nevada and California. Although two states run through Lake Tahoe, five counties, one city, seven fire protection districts, and one regulatory planning agency also govern the area, resulting in layered jurisdictions at any given location at Lake Tahoe. Lake Tahoe also holds a patchwork of land ownerships, with over 75% of the land being owned and managed publicly by the USDA Forest Service, the State of California, the State of Nevada, and local government agencies (California Tahoe Conservancy, 2019). Scattered throughout Lake Tahoe and surrounded by public land are privately owned and managed parcels that are both developed with homes or other buildings or are undeveloped forested land.

### ***Wildfire Risks***

Despite the complex land management and regulatory oversight at Lake Tahoe, nearly all of the public and private land located in California at Lake Tahoe (North, South, and West Shores) is located in a California Department of Forestry and Fire Protection (CAL FIRE) identified “very high fire severity zone” (California Department of Forestry and Fire Protection Office of the State Fire Marshal, n.d.). This “very high fire severity zone” designation identifies that those

who live within the zone are at an increased risk of experiencing wildfires and that local, state, and federal agencies must prioritize forest management in these areas, and that private landowners need to manage their properties to reduce the risk of wildfire. Similarly, the National Risk Index published by FEMA rated the five counties surrounding Lake Tahoe as “relatively high” wildfire risk, the highest level of risk on their scales, except for Douglas County, which is rated as “moderately high” (Federal Emergency Management Agency, n.d.).

Additionally, those in South Lake Tahoe, California are at a 32% greater risk and those in Kings Beach, California are at a 36% greater risk of experiencing a wildfire than other communities in California (USDA Forest Service, n.d.). For those located in Nevada at Lake Tahoe (North, South, and East Shores), wildfire risk has been identified as moderate to extreme, based on the exact location (Nevada Division of Forestry, n.d.). Those in Incline Village, Nevada are at a 36% greater risk and those in Stateline, Nevada are at a 29% greater risk of experiencing a wildfire than other communities in Nevada (USDA Forest Service, n.d.). Needless to say, regardless of the jurisdiction or exact location, a community member residing in either California or Nevada at Lake Tahoe are at an increased risk of experiencing direct wildfire threats.

With an increased risk of wildfires, there is often a subsequent history of wildfires and at Lake Tahoe, there have been many wildfires that have shaped both the physical landscape and the mentality of the community members who experienced them. Every year, Lake Tahoe experiences a plethora of wildfire ignitions, with 350 wildfires being reported between 2010 and 2017, with 80% of these being caused by humans (California Tahoe Conservancy, 2019). Although not every wildfire ignited at Lake Tahoe results in a large-scale fire, some of them have previously and will continue to do so in the future. Out of all the wildfires that have occurred at

Lake Tahoe, a handful (all located on the South Shore) have been significant enough to result in mandatory evacuations and enact change by individuals and agencies.

The most notable wildfires at Lake Tahoe in recent years include the 2002 Gondola Fire, the 2007 Angora Fire, and the 2021 Caldor Fire. The 2002 Gondola Fire burned more than 670 acres, threatened more than 550 structures, and evacuated thousands of people after an individual tossed a burning cigarette out of a gondola cabin at Heavenly Mountain Resort (Halsted, 2002). Although the Gondola Fire did not damage any structures, it left a lasting burn scar on the landscape as a constant reminder to Tahoe residents and visitors that wildfires could occur at any moment. Five years later, the 2007 Angora Fire burned more than 3,100 acres, destroyed more than 250 homes, and evacuated thousands from South Lake Tahoe after a campfire was abandoned in a population recreation area (Revisiting Angora Fire 10 years after devastating blaze ignited Lake Tahoe, 2017). At the time, the Angora Fire was one of the most destructive wildfires in California's history, and it left a lasting impact on Lake Tahoe residents and wildfire agencies and organizations that is still felt today. Fast-forward 14 years, the 2021 Caldor Fire burned 221,835 acres, destroyed 1,005 structures (all outside of Lake Tahoe), evacuated tens of thousands of people from Lake Tahoe and beyond, and the cause remains under investigation (California Department of Forestry and Fire Protection, n.d.-a). The Caldor Fire evacuated all of the South Shore of Lake Tahoe and placed much of the West Shore and East Shore on an evacuation watch. Although the Caldor Fire remains fresh on Lake Tahoe residents' minds, the impacts felt by all three of these notable wildfires serve as a constant reminder that wildfires will continue to threaten Lake Tahoe.

### ***Demographics***

In addition to those residing at Lake Tahoe having an increased risk of experiencing the catastrophic impacts of wildfire due to the overall increased wildfire risk, many residents who reside in the high-density neighborhoods of Lake Tahoe fall within state-recognized low-income communities (California Air Resources Board, n.d.; California Wildfire and Forest Resilience Task Force, n.d.-b). Those living in Kings Beach, California, and South Lake Tahoe, California reside within a recognized low-income community, meaning a majority of households are at or below 80% of the statewide median income or are at or below the threshold designated as low-income by the California Department of Housing and Community Development (California Air Resources Board, n.d.).

Moreover, approximately more than half of the residents in Lake Tahoe communities are classified as being housing burdened, where households are both low-income and severely burdened by housing costs (i.e., paying more than half of their income on housing costs) (California Wildfire & Forest Resilience Task Force, n.d.-b). Because of the high costs associated with owning a home at Lake Tahoe, many residents rent houses or apartments in high-density neighborhoods. According to the Tahoe Prosperity Center's housing data, the "workforce" at Lake Tahoe disproportionately rents homes and has few ownership opportunities, which poses an upward mobility issue for the workforce and their families (Tahoe Prosperity Center, n.d.). Not only do most people who live and work at Lake Tahoe experience challenges finding homes to purchase but there is also a significant socioeconomic divide between those who live at Lake Tahoe and those who buy homes (i.e., vacation homes). This socioeconomic divide is illustrated to break stigmas often associated with tourism-based towns and to highlight the disparities

between those who own homes, and are typically responsible for preparing properties for wildfire, and those who do not.

Besides many community members at Lake Tahoe residing within a low-income community, many individuals are classified as a “vulnerable population” and therefore may be disproportionately impacted by wildfire due to various social and/or economic factors. South Lake Tahoe, California is classified as “very high” in percentages of vulnerable populations with 6.1% of the population experiencing difficulty speaking English (24.7% Hispanic), 14.4% living with disabilities, 16.4% being over 65 years old, and 5.6% living in poverty (USDA Forest Service, n.d.). Kings Beach, California is similarly classified as “very high” for vulnerable populations with 9.7% of the population experiencing difficulty with English (30.9% Hispanic), 8.2% living with disabilities, 10.7% being over 65 years old, and 13.1% living in poverty (USDA Forest Service, n.d.). South Lake Tahoe, California, and Kings Beach, California are offered as examples and have the highest concentrations of socially vulnerable populations at Lake Tahoe; however, other communities across Lake Tahoe also have high rates of socially vulnerable community members who do not speak English, live with disabilities, are over 65 years old, and live in poverty.

### **Wildfire Preparation Actions**

With an increasing number of people experiencing direct or indirect impacts from wildfires each year with no apparent relief from year to year, some residing in wildfire-prone areas hold the belief that there is nothing they can do to reduce their risk of wildfire because of the enormity of the problem. However, research suggests that there are several things public agencies and organizations can do to reduce the threat of wildfire to communities through public land management and wildfire preparation programs, and there are actions community members can take to prepare themselves, their families, and their properties for wildfires.

These actions by agencies and organizations, coupled with actions by community members, have shown significant success in the survivability of a structure and an individual when implemented in tandem (California Department of Forestry and Fire Protection, n.d.-e). At the state, local, and regional levels, there are many recommended actions a community member can take to reduce the threat of wildfire across a community and there are actions agencies can take to protect those communities. To foster work across private and public land ownership, wildfire preparation programs, such as the Tahoe Network of Fire Adapted Communities, are administered to ensure wildfire preparation activities are complementary and cohesive across land ownerships. These efforts by wildfire agencies and organizations and community members have been shown to reduce the risk of wildfire and are outlined extensively in the subsequent sections.

### ***Wildfire Agencies & Organizations***

There are two primary actions wildfire agencies and organizations undertake to prepare communities for wildfire. First, they manage the public land surrounding communities to ensure wildfire threats to community members are mitigated and the land is prepared to withstand wildfire impacts. Additionally, wildfire agencies and organizations administer programs to ensure community members know what they need to do to adequately prepare for wildfires and have support to do so. The types of agencies and organizations that assist in this work include local fire protection districts, state and federal agencies, and nonprofit organizations. In California alone, a significant amount of funding is allocated in each year's budget and administered to the aforementioned entities for both the management of public land and for creating and administering programs to help community members prepare. In California alone, funding for fire protection, resource management, and fire prevention grew from \$800 million



in the 2005-2006 budget to approximately \$3.7 billion in the 2021-2022 budget (Petek, 2022). With a significant amount of this funding directed toward resource management and fire prevention, many agencies and organizations are utilizing this funding to educate and provide support to community members in their wildfire preparation endeavors.

Because a vast majority of the land at Lake Tahoe is publicly owned and managed, a significant amount of land management must be completed to protect communities from wildfires. According to the Tahoe Fire and Fuels Team (n.d.-a), there are several techniques public land management agencies utilize to prepare public land for wildfire, with the two primary techniques being forest thinning and prescribed fire. According to the Tahoe Fire and Fuels Team (n.d.-a), “forest thinning involves reducing the number of small trees in the forest by cutting and removing them from the site with equipment” and “prescribed fires are set by forest managers during less-flammable weather conditions and kept within control lines so that the fire is of low severity, consuming fuels that would otherwise burn at high severity during dangerous weather” (Tahoe Fire and Fuels Team, n.d.-a, Understanding Fire section). These land management practices are continuously tested by wildfires that ignite or progress toward Lake Tahoe and proved to be immensely successful during the 2021 Caldor Fire (Schafer, 2021).

### ***Community Members***

In addition to managing public land, agencies and organizations utilize state, federal, local, and private funding to create and implement wildfire preparation programs to educate and support community members in their wildfire preparation endeavors. Nationally, these programs include Firewise USA and Fire Safe Councils, and at Lake Tahoe, it includes the Tahoe Network of Fire Adapted Communities and Firewise USA. These types of programs typically provide a framework to educate community members on wildfire preparation actions they can

pursue, and provide financial incentives and assistance programs for community members and neighborhoods to take advantage of. At Lake Tahoe, the Tahoe Network of Fire Adapted Communities utilizes state and federal funding to provide education to the community on wildfire broadly and actions individuals can take to prepare themselves, their families, and their properties for wildfire (Tahoe Fire and Fuels Team, n.d.-b). In addition to providing education on topics such as evacuation planning, defensible space, and home hardening, the Tahoe Network of Fire Adapted Communities also provides local fire protection districts funding to offer free educational inspections and financial assistance programs (i.e., rebates) for community members who need assistance preparing their properties for wildfire.

### **Literature Review**

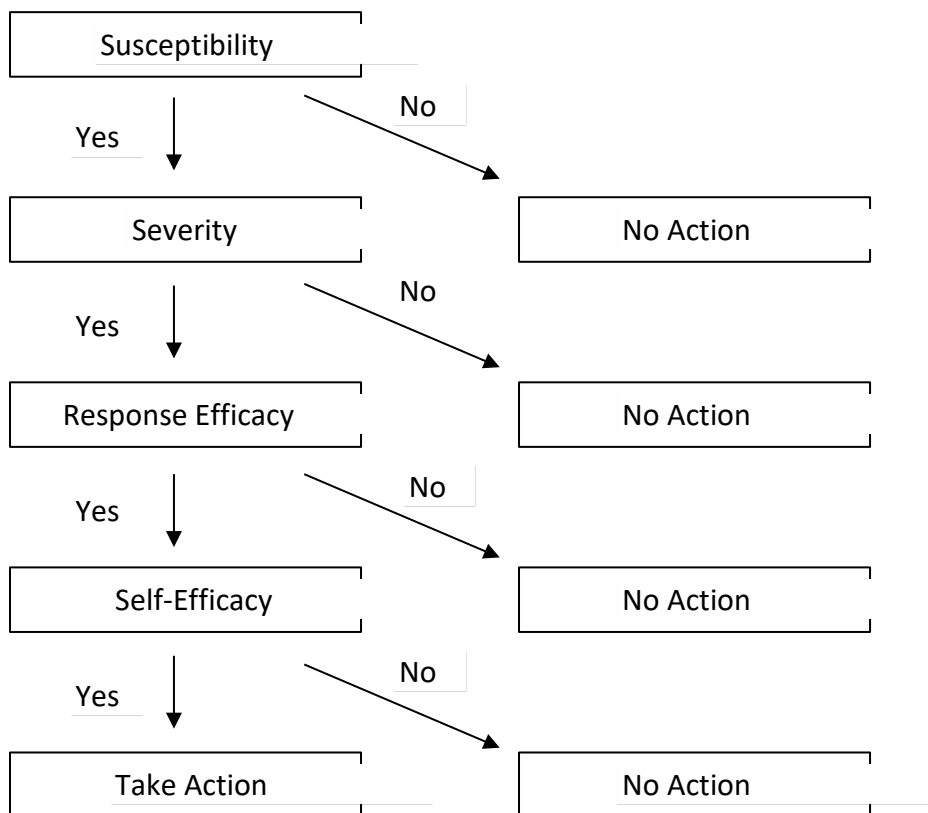
There are many risk-reducing actions community members and wildfire agencies and organizations can take to prepare communities for wildfires. This study focuses on what community members can do to reduce their risk and the publicly administered programs that support community members in their wildfire preparation endeavors. The subsequent sections will provide a framework for this study through an in-depth review of the criteria that must be met before an individual will begin preparing for wildfire. Then, an in-depth look into socially vulnerable populations will provide insight into the decision to focus the study on the three identified populations.

The Sequential Risk Judgement and Decision-Making Model (Figure 1) introduced by Fletcher and Lovejoy (2018) provides a framework to categorize research related to criteria that must be met before an individual will perform a wildfire-related risk-reducing action. The model includes four primary criteria (susceptibility, severity, response efficacy, and self-efficacy), with all four criteria needing to be met before a community member will perform a risk-reducing

action. Each criterion is explained in the subsequent sections, with literature to support the significance of each. Other models, such as those derived from Vested Interest Theory and the Protective Action Decision Model have been used by some scholars (e.g., McCaffrey et al., 2018; Fletcher & Lovejoy, 2018) to explain the nuances of wildfire preparation. However, the Sequential Risk Judgement and Decision-Making Model is the most comprehensive of the popular models, which is why it is applied as the framework for this literature review.

**Figure 1**

*Sequential Risk Judgment and Decision-Making Model*



*Note:* Figure 1 is an iteration from Fletcher and Lovejoy (2018, p. 136). *Natural Disaster and Risk Communication: Implications of the Cascadia Subduction Zone Megaquake*. Lexington Books.

While the mass of wildfire preparation-related research fits within one of the criteria of the Sequential Risk Judgement and Decision-Making Model, there are important considerations that do not fit within a criterion of the model but must be included to fully understand the conditions that must be met before a community member will perform a risk-reducing action. These “other considerations” include social and local contexts, place attachments, trusted sources for information, and the nuances of socially vulnerable populations. Each is described in detail and should be viewed as equally important as the criteria that fit within the Sequential Risk Judgement and Decision-Making Model.

### **Sequential Risk Judgement and Decision-Making Model**

#### ***Susceptibility***

The first criterion introduced in the Sequential Risk Judgement and Decision-Making Model is susceptibility, which is a belief in the likelihood of a threat occurring (Fletcher & Lovejoy, 2018). Susceptibility is often viewed as the most paramount criterion of the model because if a community member does not believe a wildfire is going to occur, they will make either a conscious or an unconscious decision to not perform a risk-reducing action because they will not feel they are susceptible to the wildfire threat (Fletcher & Lovejoy, 2018).

Overwhelmingly, research has found that people living in wildfire-prone areas and people working in wildfire professions differ in their perceptions of wildfire risk in any given area (Gordon et al., 2010; Meldrum et al., 2015), meaning susceptibility is not consistent between what wildfire professionals are educating the public on and what people believe to be true.

Further, wildfire risk perceptions vary across and within communities (e.g., Meldrum et al., 2018; McCaffrey et al., 2011), highlighting differing susceptibility attitudes to wildfire from community member to community member even within the same community. Although

community members largely recognize that they reside within a wildfire-prone area and generally understand the associated risks, some are far more willing to accept wildfire-related risks because they have differing risk tolerances, resulting in conscious or unconscious decisions to perform a risk-reducing action or not (McCaffrey & Olsen, 2012). Because of these nuances, it is not accurate to assume that heightened risk will result in increased action.

**Risk Tolerance.** A significant area of wildfire preparation research is specific to risk tolerance and the belief that people have differing wildfire-related risk tolerances, resulting in them either performing a risk-reducing action or not and the timing of which they may choose to do so (e.g., Martin et al., 2007; Gordon et al., 2010). Through this perspective, people will pursue varying types of wildfire risk-reducing actions. Those with high-risk tolerances are often willing to assume greater risks and typically do not take immediate action while those with low-risk tolerances will be more willing to take immediate action (Martin et al., 2007). Specifically, McCaffrey (2006) found that a community member with a heightened sense of wildfire risk will often increase the number of risk-reducing actions they perform on their property and are less willing to do nothing for fear of negative consequences.

A community member's wildfire-related risk tolerance is typically developed based on their sociodemographic and land use values (Gordon et al., 2010). Winter and Fried (2000) offer an expanded view of this notion by proposing that whether or not a community member perceives risk-reducing actions as being their responsibility or not will greatly influence the amount of risk they are willing to take for themselves and their property. For example, if a person believes that risk-reducing actions (e.g., defensible space) should be the responsibility of a wildfire agency or organization, the conflicting idea that they must perform actions themselves will conflict with their land use values and subsequent thoughts on performing any risk-reducing

actions. Further, the importance of wildfire-related risk tolerances are highlighted in McCaffrey et al. (2018), with a significant amount of a community member's decision to evacuate early falling on their wildfire-related risk tolerance. While risk tolerance is a critical factor in determining if a person will perform a risk-reducing action or not, it does not necessarily lead to action alone (e.g., McCaffrey et al., 2013; McCaffrey, 2008; Daniel et al., 2002; Kent et al., 2003; McCaffrey, 2004; Steelman, 2008). Instead, risk tolerance as an aspect of susceptibility is complemented by other criteria in the Sequential Risk Judgement and Decision-Making Model to determine the likelihood of a community member performing risk-reducing actions ahead of a wildfire.

### ***Severity***

Before an individual will perform a risk-reducing action, they must first recognize that they are susceptible to becoming a victim of a wildfire and then they must understand the severity of consequences they will encounter if the threat becomes a reality. Severity, which is defined as a community member's belief about the magnitude and significance of a threat (Fletcher & Lovejoy, 2018), is an essential criterion of the Sequential Risk Judgement and Decision-Making Model. Severity is imperative because if a community member understands their susceptibility to become a victim, but the threat itself is not deemed severe in its impacts, a person will not perform risk-reducing actions because the actions could be perceived as being more work than the consequences of not taking action (Fletcher & Lovejoy, 2018). Although most people living in wildfire-prone areas recognize the susceptibility of wildfire and their associated risk (McCaffrey et al., 2013), people consistently underestimate the severity of the risk.

**Prior Experiences & Near-Misses With Wildfires.** Underestimating wildfire risks is most commonly understood through the context of prior wildfire experiences, where people are divided on understanding the severity of a wildfire after having encountered one previously, which results in some people being more inclined to prepare after a near-miss and others feeling jaded about risk-reducing actions after having lost a home or damaged property during a wildfire (e.g., Paveglio et al., 2016a; McCaffrey et al., 2018). In terms of evacuation planning, some people assume greater risk after having had a successful evacuation before, while others are more inclined to evacuate early (e.g., McCaffrey et al., 2013; McLennan et al., 2018; Blanchard & Ryan, 2007; Cohn et al., 2008; Collins, 2005).

Concerning wildfire preparation actions, such as creating defensible space or home hardening, people who have previously experienced wildfires are likely to be more susceptible to performing risk-reducing actions because the risk may feel even more severe after having experienced it at least once previously (e.g., Bihari & Ryan, 2012; Eriksen & Gill, 2010; Lopez-Marrero & Tschakert, 2011; McGee et al., 2009). However, there is variation in people's responses to prior experiences and near-misses, including people becoming unconcerned with performing further risk-reducing actions after having been successful once before, resulting in people feeling that they do not need to prepare any more than they already have (Bihari & Ryan, 2012; Paveglio et al., 2010). Whereas others may feel as though the probability of another severe wildfire occurring is unlikely (Larsen et al., 2021).

### ***Response Efficacy***

After an individual recognizes their susceptibility of experiencing a wildfire and the severity of the threat to them, their family, and/or their property, they must then believe that performing risk-reducing actions will reduce their risk of negative outcomes after a wildfire

(Fletcher & Lovejoy, 2018). Response efficacy refers to the likelihood of a risk being reduced after performing an action (Fletcher & Lovejoy, 2018). According to Martin et al. (2007), there is a positive correlation between an individual increasing their confidence in their response efficacy and the number of risk-mitigating actions they will consider. This suggests that if people believe a risk-reducing action will reduce their overall risk they will be more willing to perform such action than if they did not believe that the outcomes of an action would result in a reduction of risk.

Response efficacy of risk-reducing actions related to wildfires has been studied extensively by many scholars (e.g., Smith & Sistare, 2014; Cohen, 2004; Restaino et al., 2020) to better understand which actions result in the best outcomes for people, properties, and entire communities. Although there is significant evidence that suggests risk-reducing actions, such as creating defensible space, retrofitting a home with non-combustible materials, and planning for an evacuation reduce the likelihood of being impacted by a wildfire, there is not a consistent metric to gauge how prepared an individual is due to the variable nature of wildfires and the importance of context (Penman et al., 2013). Additionally, there is growing research suggesting that people must be both physically and mentally prepared for wildfire, with mental preparation being ambiguous and not clearly defined in existing literature (Eriksen & Prior, 2013). Physical preparation, such as defensible space, home hardening, and evacuation planning, as well as mental preparation, are described in detail in the subsequent sections.

**Physical Preparation.** Physically preparing for wildfire includes actions that an individual can take to prepare their property, themselves, and their family. These actions are recommendations that federal (e.g., Firewise USA®), state (e.g., Ready for Wildfire; Living With Fire), and local (e.g., Tahoe Network of Fire Adapted Communities; Fire Safe Council) agencies



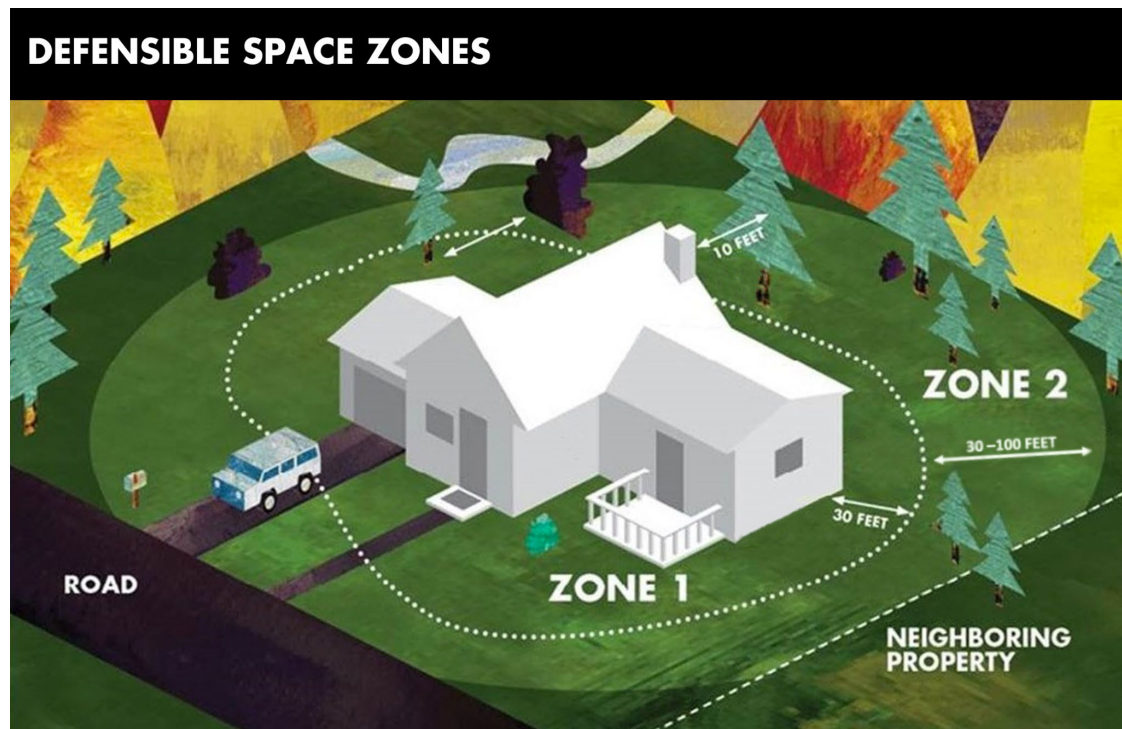
and organizations encourage due to their efficacy and the importance of being ready for wildfire, especially when located in a wildfire-prone area. According to Restaino et al. (2020), “the most effective way for homes to withstand wildfire is a ‘coupled approach’ that considers the exterior construction materials and how they are put together, as well as the surrounding vegetation and other near-home combustible materials” (p. 4). This “coupled approach” refers specifically to defensible space and home hardening as critical actions to reduce risk; however, evacuation planning must also be included as something a community member can do to decrease their overall wildfire risk.

***Defensible Space.*** Defensible space includes the removal of vegetation surrounding a home or other structure to reduce the likelihood of a wildfire reaching the structure (Smith & Sistare, 2014). Some jurisdictions, including counties at Lake Tahoe and the State of California through California Public Resources Code 4291 (1965/2021), require defensible space compliance due to its efficacy. Defensible space recommendations and/or requirements are typically broken into three zones as depicted in Figure 2 and supported by Smith and Sistare (2014) and the California Department of Forestry and Fire Protection (n.d.-b). Zone 0, also called the Ember-Resistant Zone or the Built Environment is the land within 5 feet of a structure and any decks, fences, or sheds attached to a home. In Zone 0, it is recommended that nothing combustible be grown or stored, including shrubs, grasses, trees, firewood, or lawn furniture. Zone 1, also called the Lean, Clean, and Green Zone, includes anything within 30 feet of a structure. It is recommended that all dead plants and dry pine needles or leaves be removed and that trees and shrubs be pruned and maintained to reduce the overall amount of vegetation in Zone 1. Finally, Zone 2, also called the Reduce Fuel Zone or the Wildland Fuel Reduction Zone, extends 30 to 100 feet from a structure and it is recommended that all vegetation, including

shrubs and trees, have adequate spacing and that grasses remain under 4 inches tall (California Department of Forestry and Fire Protection, n.d.-b; Smith & Sistare, 2014).

**Figure 2**

*Defensible Space Zones*



*Note:* From California Department of Forestry and Fire Protection. (n.d.-b). *Defensible Space*.

Retrieved December 10, 2022, from <https://www.readyforwildfire.org/prepare-for-wildfire/get-ready/defensible-space/>

Each defensible space zone presents varying degrees of response efficacy. Syphard et al. (2014) conducted a study on 2,000 structures, half of which were destroyed by wildfires, to learn which defensible space zone is the most effective at reducing wildfire risks posed to a structure. Syphard et al. (2014) found that maintaining defensible space in Zone 0 and Zone 1 reduces the most risk and that any defensible space beyond 100 feet (Zone 2) did not provide significant additional protection to a structure. This is consistent with findings in Penman et al.

(2015), Cohen (2004), Leonard et al. (2009), and others where a considerable amount of research demonstrates that not maintaining defensible space in Zone 0 and Zone 1 poses the greatest risk to a structure and actions taken in Zone 2 are not as consistent in reducing risk; however, maintaining defensible space in Zone 2 still reduces a property's overall risk. Although there are nuances in the specifics around defensible space zones and the most important actions people should perform by zone, there is overwhelming research suggesting that any action, regardless of the scale or location in any of the zones, has a high efficacy in reducing wildfire risk (Penman et al., 2015; Cohen, 2004; and others).

***Home Hardening.*** Looking inward from the three zones of defensible space, home hardening refers to the construction materials and building techniques of a structure, which greatly determines whether or not it will withstand wildfire (e.g., Penman et al., 2015; Restaino et al., 2020). In wildfires, homes and other structures ignite through wind-blown embers, radiant heat, or direct flame contact, with up to 90% of home loss occurring from embers alone (Restaino et al., 2020). Embers can travel many miles ahead of a wildfire and become trapped in parts of a structure, such as through windows and vents. Embers also frequently land on the roof or gutters of a structure. If embers become trapped or land on combustible materials, they will ultimately cause the structure to ignite. To reduce the threat of embers to a structure, there are a few key retrofits that a homeowner should consider, including replacing their roof with a Class A non-combustible roof, covering rain gutters so they are unable to collect vegetation, adding mesh screening behind vents to block ember entry into attics and crawl spaces, replacing combustible siding with non-combustible materials, replacing single-pane windows with multi-pane windows, and removing combustible items that are commonly attached to a structure, such as wooden fences or decks (California Department of Forestry and Fire Protection, n.d.-c.;

Restaino et al., 2020). Because embers are the leading cause of home loss, home hardening is arguably the best way to reduce overall wildfire risk on a property. However, retrofitting a structure with non-combustible and specialty items is often a difficult action for a community member to perform because it can be cost-, skill-, and time-prohibitive (Penman et al., 2015; Lee et al., 2022).

***Evacuation Planning.*** While defensible space and home hardening are well-researched and supported actions that a person can take to reduce the risk of a wildfire destroying a structure, evacuation planning is perhaps the most important action a person can take because it is associated with whether or not they will survive a wildfire. Planning for an evacuation often includes creating an emergency supply kit or go-bag, developing an evacuation plan with family and friends, knowing where the exit and entry points are in a neighborhood and town, preparing emergency supplies for pets, and understanding the steps to take to prepare a structure when a wildfire is imminent, such as shutting windows and doors, removing flammable window coverings, turning house lights on, and moving flammable items away from the structure (California Department of Forestry and Fire Protection, n.d.-d.; Smith & Sistare, 2014).

Planning for an evacuation helps people make decisions when they are evacuating, including when and how to evacuate. Many factors influence a person's understanding of the efficacy of evacuating, such as having trust in agencies that they will protect their home while they are evacuated (Penman et al., 2015), having recently experienced an evacuation (McCaffrey et al., 2018), and communication from agencies about the severity and timeliness of the evacuation (McLennan et al., 2018). Evacuation efficacy is challenging to gauge because consequences are so severe and context-dependent. If a person does not adequately prepare for evacuation, they could die in a wildfire or they could survive, but survival is less likely to be

used as a success metric. Evacuation efficacy is dependent upon the context of the wildfire and a person's willingness to listen to evacuation warnings and act quickly when a wildfire is imminent.

**Mental Preparation.** Mental preparation for wildfire is a growing research area that is becoming increasingly common as scholars better understand the impacts of wildfire in the context of megafires and conflagrations. Mental preparation includes a person being cognizant of the severity and susceptibility of experiencing a wildfire and being prepared to cope with the potential sensory strains related to a wildfire, which could happen to anyone, with or without a history of mental illness (Eriksen & Prior, 2013). Additionally, mental preparation does not solely include a singular community member; instead, mental preparation should be extended throughout neighborhoods and communities because of the influence people have on each other in mentally preparing (Eriksen & Prior, 2013). Eriksen and Prior (2013) suggest that community or neighborhood-wide interactions about wildfire preparation increases an individual's capacity to understand wildfire threats and the uncertainty around wildfires.

Mental preparation ahead of a wildfire is critical due to the immense mental health issues that are common before, during, and after a wildfire. A small amount of research has occurred on mental health of community members before and during a wildfire (e.g., Dodd et al., 2018), with more research on mental health after a wildfire has occurred in an area (e.g., Eisenman et al., 2015; Lollar, 2010; Brown et al., 2019; Johnston et al., 2021). Even with minimal research on the topic, initial findings suggest that there are significant increases in the rates of post-traumatic stress disorder, depression, anxiety, substance use, resilience, and environmentally related distress after exposure to a wildfire that may impact a community member's ability to prepare (To et al., 2021). Similarly, a study by Silveira et al., 2021 found that

having direct exposure to a large-scale wildfire resulted in a significant increase in mental health disorders, such as post-traumatic stress disorder, major depressive disorder and generalized anxiety. These mental health disorders develop and are exacerbated because wildfires disrupt life and often cause catastrophic loss, including loss of friends and family, pets, property, or cherished natural environments, with psychological responses to these impacts manifesting as hypervigilance, fear, guilt, and flashbacks (Hrabok et al., 2020). Some psychological responses might be short-term due to immediate trauma; however, prolonged trauma and significant impacts may result in post-traumatic stress disorder or other mental health disorders (Hrabok et al., 2020).

Mental preparation and mental health concerns before, during, and after a wildfire will determine whether or not a person is mentally-capable of preparing, which has the potential to impact how they view their wildfire-related susceptibility, severity, and efficacy, which are all criteria that must be met before a person will take action. Additionally, certain risk factors, such as socioeconomic status, education, and gender increase the vulnerability of mental health following and during wildfires (Hrabok et al., 2020), further stressing the importance of all populations understanding the severity and their susceptibility of being impacted by a wildfire.

### ***Self-Efficacy***

After the first three criteria of the Sequential Risk Judgement and Decision-Making Model have been met (susceptibility, severity, and response efficacy), the fourth and final criteria refers to the necessity of a community member to recognize that they are capable of performing a risk-reducing action (self-efficacy). Self-efficacy determines whether or not a community member has everything they need, such as skills, time, tools, and money, to perform a risk-reducing action (Martin et al., 2007). Notably, people's self-efficacy related to risk-

reduction actions is largely influenced by fear and anxiety (Prior, 2010). If a community member is unable to perform a risk-reducing action because they do not have the time, technical skills, money, or are experiencing some other barrier, they will not reduce their overall risk, which can lead to even more fear and anxiety, perpetuating a cycle (Penman et al., 2015; Prior, 2010).

Self-efficacy is where most people fall off the Sequential Risk Judgement and Decision-Making Model, stalling them from taking action. This is largely due to a lack of consistently available support for people who experience barriers associated with various aspects of preparing for wildfire. Support can include financial incentives or workshops to teach the required technical skills. Self-efficacy is also the criteria that most often creates divides between socially vulnerable populations and the general public in performing risk-reducing actions; where those who have time, technical skills, and money can perform or hire contractors to perform risk-reducing actions, and those who do not have time, technical skills, or money are unable to perform the same actions to reduce their wildfire risk (Wigtil et al., 2016).

**Financial Barriers.** Research on self-efficacy often centers on the financial barriers associated with preparing a property for wildfire. Penman et al. (2016) found that the average cost to prepare for wildfire is AUD 10,000 (about USD 6,671) the first year, and approximately AUD 1,000 (about USD 667) each subsequent year. Sanchez et al. (2022) conducted a study to determine homeowners' willingness to pay for fuel reduction programs on public and private land. The study found that cost-share rebate programs can be constraining for homeowners because many people are unable to contribute their share to qualify for the rebate. Instead, financial incentives between \$1,000 to \$1,400 would motivate people to complete risk-reducing actions on their properties, which would be the average cost of maintaining a property for one to two years, depending on the size of the property (Sanchez et al., 2022). The study also found

that people with higher incomes typically require more financial assistance than people with lower incomes, likely because people with higher incomes have larger homes and properties, resulting in increased maintenance costs spanning a larger property (Sanchez et al., 2022).

Overwhelmingly, the financial burden associated with wildfire preparation actions is a significant barrier to people, especially those with low or fixed incomes (Collins & Bolin, 2009). With approximately 80 percent of people indicating that the costs associated with implementing risk-reducing actions are a “very important” factor in determining how they will manage their property (McCaffrey, 2008), it is a critical aspect of self-efficacy that must be well understood.

**Technical Skills.** Financial constraints are often regarded as the most significant barrier for people to pursue risk-reducing actions, however, other significant barriers exist. A barrier that has not seen a significant amount of research but is of notable importance is the technical skills required to adequately reduce risks. Although many educational programs have created resources focused on educating people on specific actions (e.g., California Department of Forestry and Fire Protection, n.d.-c.; Smith & Sistare, 2014), many of the actions are nuanced and context-dependent. This is why there are consistent recommendations in the resources for people to have a wildfire professional visit their property to educate them on the specific actions that will result in the greatest reduction in risk (e.g., California Department of Forestry and Fire Protection, n.d.-b.; Smith & Sistare, 2014). Educational programs to assist people in making these decisions include federal (e.g., Firewise USA®), state (e.g., Ready for Wildfire; Living With Fire), and local (e.g., Tahoe Network of Fire Adapted Communities; local fire protection districts) agencies and organizations, many of which have free services to help people assess their risk and prioritize actions.



## **Socially Vulnerable Populations**

Moving beyond the Sequential Risk Judgement and Decision-Making Model, wildfire impacts and the viability of preparing for a wildfire can be disproportionately more difficult and impactful for certain socially vulnerable populations (Paveglio et al., 2018; Palaiologou et al., 2019; Masri et al., 2021; Davies et al., 2018). The findings of research on socially vulnerable populations and wildfires, which has been administered in various geographies across the United States and other countries, are generally inconsistent on the impacts people face, but share the commonality that social vulnerability alone does not mean a person will be disproportionately impacted (Paveglio et al., 2018). Instead, wildfire risk is largely determined by where a community member lives, the type of home they live in, and the density of their neighborhood, rather than other factors such as socioeconomic status, race, education level, or age (Palaiologou et al., 2019; Paveglio et al., 2016b; Masri et al., 2021). That said, there remains a strong correlation between socially vulnerable populations and the types of homes they live in, the location of those homes, and a person's ability to adequately prepare for wildfire, which ultimately determines an individual's vulnerability. Hrabok et al. (2020) describe this phenomenon by suggesting that socially vulnerable populations are often more likely to experience negative outcomes from natural disasters not solely due to their relationship with poverty, gender, age, disability, or ethnicity, but instead due to where they live and the type of building materials used to construct their homes.

Research by Masri et al. (2021) focused on census tract data in places that had experienced wildfires between 2000-2020 and found that on average there were lower proportions of minority groups residing in these areas, likely due to their rural nature. Of significance, however, was that there were greater proportions of older adults and low-income

residents in wildfire-prone areas overall (Masri et al., 2021). While most wildfire-prone areas throughout the United States are more likely to be populated by high socioeconomic residents given their rural nature and proximity to natural environments (i.e., resort towns), there remain large numbers of low-income community members residing in these areas that do not have the means to adequately prepare for a wildfire (Wigtil et al., 2016). Specifically, Davies et al. (2018) found that there are nearly 30 million people who live in wildfire-prone areas in the United States who reside in socially vulnerable defined census tracts.

Homeownership is also a significant consideration in a community member's ability to prepare for wildfire, with many long-term renters not receiving any wildfire preparation information or wildfire recovery support specific to their status of being renters. This is largely due to wildfire preparation resources being homeowner-focused even though there are many things renters can do to reduce their risk that are not directly associated with owning a home (Chase & Hansen, 2021). Additionally, many low-income renters and homeowners are subject to living in homes that are built cheaply using highly combustible materials, such as trailers, manufactured homes, mobile homes, and older homes, which make them even more susceptible to severe consequences when a wildfire occurs, such as a total home loss (Chase & Hansen 2021; Mockrin et al., 2018).

While a larger proportion of non-minority populations live in wildfire-prone areas overall, minority populations that do reside in wildfire-prone areas tend to experience compounding vulnerabilities, such as living in high-density neighborhoods, not having the means to implement defensible space on their property, not owning their home, or speaking a language other than English and therefore not receiving wildfire preparation or emergency

evacuation information (Davies et al., 2018). The subsequent sections provide insight into the barriers that each of these socially vulnerable populations typically encounter.

### ***Spanish-Speaking Populations***

In addition to socioeconomic status presenting a significant divide between people who have the means to prepare for wildfire and live in homes and neighborhoods that are less prone to wildfire and those who do not, in the United States there are increases in wildfire vulnerabilities based on race and language spoken (Davies et al., 2018). Specifically, communities are generally more vulnerable to wildfire impacts when the proportion of Native American, Black, and Hispanic people increases (Davies et al., 2018). As one of the few studies that have looked at wildfire vulnerabilities in communities of color, it is unclear if the results of the study span across all communities. However, what is consistent is the correlation between communities of color and increased vulnerabilities, likely due to the location of communities of color, neighborhood characteristics, and home construction materials used (Davies et al., 2018).

While it is critical for researchers to better understand the disproportionate wildfire impacts across all communities of color, the reasoning behind the disproportionate impact on Hispanic populations is much clearer. In a country where English is the primary language spoken by public agencies and organizations, it can be difficult for people who speak a different language, such as Spanish, to gain access to the information they need to reduce their wildfire risk because it is often not provided to them in Spanish (Davies et al., 2018). For example, when wildfires emerged in Washington in 2014, farm workers did not receive evacuation information from authorities and instead learned about evacuation notices and plans, something imperative for their safety, through a Spanish radio station (Gerety, 2015). Similarly, when wildfires in Northern California and Santa Barbara prompted evacuations in 2017, agencies failed to

distribute bilingual emergency notifications promptly, despite nearly half of their population being Hispanic (Axelrod, 2017). Gaining access to resources in Spanish is critical; however, it is also imperative to recognize that Hispanic populations may also face issues related to class and immigration status, which can result in compounding vulnerabilities and an inability to utilize the already minimal information available to them due to a lack of trust in government agencies or fear of immigration status consequences (Méndez et al., 2020).

### ***Older Adults & Populations With Disabilities***

With wildfire-prone census tracts typically having significant proportions of older adults (Masri et al., 2021), risk-reducing actions must involve older adults living in wildfire-prone areas. With age, it can become difficult for people to perform risk-reducing actions, such as maintaining defensible space, and reduced or restricted mobility can cause challenges during evacuations. Research by Fischer (2012) found that older adults were less likely to perform vegetation management actions to reduce the wildfire threat on their property. Cutter and Emrich (2006) and Palaiologou et al. (2019) found that older adults often lack the self-sufficiency to perform risk-reducing actions, cannot react quickly to wildfire threats, and often do not have the financial means to take action to prepare. Further, older adults might also be deaf or hard of hearing, which reduces the likelihood of them receiving wildfire preparation and emergency evacuation information during an active wildfire emergency (Neuhauser et al., 2013).

While minimal research has been completed on older adults and wildfire vulnerabilities specifically, they are consistently noted as a socially vulnerable population in literature (e.g., Cutter et al., 2000; Evans et al., 2007; Masri et al., 2011; Palaiologou et al., 2019) and are often an overlooked group. Similarly, research on populations with disabilities has been minimal; however, older adults and populations with disabilities are often understood as experiencing

similar barriers to taking action to reduce their wildfire risk. The lack of resources on these socially vulnerable populations underscores the need for location-based research on the specific impacts they face preparing for and evacuating from wildfires, which is the essence of this study.

### **Context & Place Attachments**

A person's social and local context can also be critical determinants of if they will perform risk-reducing actions ahead of a wildfire (e.g., Paveglio et al., 2016a). Meldrum et al. (2018) found that people's relationships with wildfire vary both within and across communities. This research, along with others (e.g., Paveglio et al., 2016a; Carroll & Paveglio, 2016; McCaffrey, 2015; Gordon et al., 2012), describe how a community member's social context contributes to their decision to take action. Paveglio et al. (2016a) conducted case studies on two communities and found that a community member's social context, such as being part of a homeowners' association, having specific vegetation preferences reinforced by a community, or having prior experiences with wildfire is important but does not fully predict a community member's willingness to take action. Instead, a community member's local context, such as a desire for privacy, being in a rural versus urban context, and having a willingness to collectively organize are critical determinants. Social context also includes community characteristics, such as having a sense of community or collective community problem-solving, which can predict whether or not a community member will perform risk-reducing actions (Prior & Eriksen, 2013). Research on this topic highlights the importance of social and local contexts and the need for wildfire preparation programs to foster the development of relationships within communities and among people to create a sense of community and support the narrative shared among neighbors (McCaffrey, 2015; Steelman et al., 2004).

Similarly, place attachments have been found to have both positive and negative impacts on a community member's risk tolerance and willingness to perform risk-reducing actions. Research by Flint and Luloff (2005) highlights the nuances of place attachments having the potential to increase a community member's vulnerability to wildfires, such as people evacuating slowly or not at all due to their emotional attachment to an area. People with strong place attachments might also experience a difficult time performing risk-reducing actions, such as creating defensible space because they do not want to alter the natural environment (Flint & Luloff, 2005).

### **Trusted Sources for Information**

Having trust in agencies that provide information on risk-reducing actions and emergency evacuation information is an essential aspect of a community member deciding whether or not they will take action to reduce their risk (McCaffrey, 2015). Research on the importance of trust in wildfire agencies and organizations is focused mostly on public land management decisions and communication, such as prescribed fire (e.g., Remenick, 2016; Toman et al., 2014; McCaffrey, 2015; McCaffrey & Olsen, 2012). Although important, this research does not focus on how people respond differently when they trust an organization providing them with information and when they do not.

Generally, research specific to wildfire preparation has focused on how people prefer to receive information, with most people interested in learning about risk-reducing actions and general wildfire preparation guidelines directly from a local fire protection district or other government agency (Vogt et al., 2009). Additionally, McCaffrey et al. (2011) found that people prefer to learn about their wildfire risk from neighbors or homeowners associations and public agencies. Overwhelmingly, research suggests that people prefer to receive wildfire information

from local or volunteer fire departments and do not respond as well to agencies that do not work as closely on the local level or are from outside of the area (Brenkert-Smith et al., 2012).

To this end, although research on this topic has been developed extensively over the past twenty years, research specific to socially vulnerable populations is new and has yet to be fully developed, which is why this study is imperative. Scholars consistently stress the importance of context in their research, highlighting that research cannot always be applied across geographies and instead, research specific to a location is imperative. Applying existing research to Lake Tahoe communities is difficult because of the unique dynamic rural resort towns present. Although still rural, research on rural communities does not easily translate to Lake Tahoe because of the resort aspect, which brings a significant socioeconomic divide between those who own homes (i.e., vacation homes) and those who long-term rent and work in the service industry. After several significant wildfires occurring in Lake Tahoe over the past several years, time is of the essence to better understand the nuances that exist between those who perform risk-reducing actions and those who do not.

The essence of this study is focused on the wildfire impacts socially vulnerable populations experience and the barriers that make it disproportionately difficult for them to prepare for wildfires in the ways recommended by wildfire agencies and organizations. Although public land management is a critical aspect of preparing for wildfire, community members' lived experiences with wildfires and their limitations in preparing can be considered far more critical in reducing wildfire risks due to the dangers associated with a community member not preparing.

## Methods

### Researcher Positionality

Before outlining the specific methods used in this study, I must be reflexive about my positionality related to the overall direction of the study and the methods deployed. My interest in this study began several years ago when I worked as the Fire Adapted Communities Program Coordinator for Lake Tahoe at the Tahoe Resource Conservation District. While in this position, I worked closely with the seven fire protection districts and community members within those districts to educate and encourage residents and visitors to prepare for wildfire. While conducting this work, I frequently questioned if Lake Tahoe's most vulnerable community members were being reached and if the information reaching them was relevant to their specific situations. Ultimately, I stopped working in wildfire preparation programs altogether because I struggled with the ethics of performing work that only reaches people who fit into a very specific demographic. After leaving this work, I continued conversations with the wildfire agencies and organizations who administer programs about what could be done to prepare more diverse community members for wildfire, and inevitably attended graduate school and focused my thesis on just that.

In addition to having a career in wildfire preparation programs, I also live at Lake Tahoe and have been evacuated from my community due to wildfire, which influences the way I think about wildfire preparation actions and wildfire threats. As a community member and recipient of public services and community education about wildfires, I can have a strong opinion about how wildfire programs are administered and the people they do and do not reach. That said, I recognize my positionality as being deeply involved and invested in this work, both as a wildfire professional and as a community member, and the biases that I inevitably hold. For these



reasons, I employed several techniques during data collection and analysis in an attempt to remove my personal biases from the study and to allow the findings to remain unhampered by my personal opinions or assumptions. Although I do recognize the inherent biases that I hold, I also recognize that my positionality has the potential to make me a stronger researcher on this topic.

## **Procedures**

### ***Identifying the Study Direction***

Before beginning data collection, it was critical to involve the local fire protection districts at Lake Tahoe to better understand the populations they believe to be the most vulnerable to wildfire impacts in their communities. Informational interviews were conducted with fire prevention officers and/or foresters from local fire protection districts at Lake Tahoe based on their involvement in administering wildfire preparation and prevention programs to their communities. During the informational interviews and while reviewing the literature, it became evident that there is often a distinction between people who are vulnerable to wildfire based on where they live (i.e., geographic location, the density of a neighborhood, construction materials used in a home) and there are others who are vulnerable to wildfire because they have not been provided with an opportunity to prepare due to existing programs not having been tailored to reach them specifically.

As confirmed through informational interviews and a thorough review of literature on the topic, there are many newly created tools for identifying wildfire vulnerability based on the location a person resides (e.g., Land Tender; Planscape; Wildfire Risk Index), and there are typically straightforward ways for programs to adapt their programs to target their efforts to

those areas (i.e., target work in areas with heightened wildfire risk). However, it is more difficult to adapt programs to reach socially vulnerable populations due to the lack of a one-size-fits-all approach, which is how the focus of this study was established. The informational interviews confirmed that there are socially vulnerable populations who are not currently supported by wildfire preparation educational programs and that wildfire agencies and organizations are unsure of how to adapt their programs to reach these diverse populations. The populations identified by the local fire protection districts as being the most vulnerable for this study, were populations with disabilities, Spanish-speaking populations, and older adults.

After the three populations were identified, I presented the study to the Tahoe Resource Conservation District and the Tahoe Fund to request funding for participants and a Spanish interpreter. Both entities were excited to support research that will help socially vulnerable populations prepare for wildfires because they recognize the gap that currently exists in wildfire preparation educational programs. The Tahoe Fund committed to funding \$100 to each participant for their time and \$600 to the Spanish interpreter, and the Tahoe Resource Conservation District agreed to pay the researcher to incorporate the findings of the study into the Lake Tahoe Community Wildfire Protection Plan (CWPP) update, which is planned to be completed by the end of 2023. With the study direction identified and the funding secured, the study was submitted to the University of Nevada, Reno's Institutional Review Board (IRB) with the support of my thesis committee. The study was deemed IRB-exempt and after IRB approval, research began.

### ***Data Collection***

With the assistance of social service organizations that support Spanish-speaking populations, older adult populations, and populations with disabilities at Lake Tahoe, I identified

the most appropriate data collection method for each population following the guidelines in Tracy (2013). The data collection methods approved by the IRB included in-person interviews, virtual interviews, and in-person focus groups for up to 50 participants spread equally across Lake Tahoe, intending to reach 10 participants with disabilities, 20 participants who speak Spanish as their primary language, and 20 participants who are older adults. Due to the unique differences associated with each priority population, the subsequent sections outline how each population was recruited and the rationale behind the research method that was deployed for each. Although the interview and focus group moderator's guide (see Appendix A) remained the same across populations, there were slight nuances in recruitment techniques that deserve recognition.

Each participant, regardless of the research method used (in-person or virtual interviews, or in-person focus groups), was provided with the IRB consent form (See Appendix B) and asked the same set of questions following the interview or focus group moderators guide. Per the IRB guidelines, Spanish-speaking participants completed the IRB consent short form (See Appendix C). Before interviews and focus groups began, each participant was assured that all information shared would remain confidential and that the interview or focus group would be recorded only for the researcher to utilize for data analysis purposes, then destroyed. At the end of each interview or focus group, participants received \$100 and were provided with the researcher's and the IRB's contact information in case they had follow-up questions or concerns about how their information would be used. Participants were also provided an opportunity to ask questions related to preparing for wildfire and were offered print and/or digital resources they could use to assist in their preparation endeavors. Overwhelmingly, participants appreciated the opportunity to ask specific questions, and many participants shared that they

had never received this type of information previously and were eager to continue to learn more.

**Spanish-Speaking Populations.** To gain access to Spanish-speaking populations at Lake Tahoe, I worked with the South Lake Tahoe Family Resource Center, Boys and Girls Club of Lake Tahoe, and Sierra Community House. The directors of each of these programs were contacted and I worked with them to secure a location for the in-person focus groups and they provided support letters for IRB review and approval. Each entity scheduled a time for the focus groups that worked best for their clients and distributed the consent forms ahead of each focus group. I identified a Spanish interpreter who was raised in South Lake Tahoe in a Spanish-speaking household, shares a cultural competency with the participants, and has experience with wildfire preparation. After conversations with the Spanish interpreter and the agencies and organizations that support this population, it was determined that the interpreter would conduct the focus group following the moderator's guide and later translate the recording instead of doing in-the-moment translations. I was present during each interview to answer any specific questions and to ensure consent forms were completed. At the end of each focus group, the Spanish interpreter translated the recordings into English so I could transcribe them for data analysis.

**Populations With Disabilities.** To gain access to populations with disabilities, I worked with agencies and organizations that support this population, including the California Department of Rehabilitation, Alta California Regional Center, and Lake Tahoe Community College's Student Accessibility Services Program. In the early stages of recruiting participants, I learned how protected this population is. Due to the Health Insurance Portability and Accountability Act of 1996 (HIPAA), it was not feasible for agencies or organizations to put me

into direct contact with their clients and it was also not permissible to conduct focus groups with this population because of their privacy protections. Instead, the organizations agreed to share my contact information with their clients to recruit participants. Each participant preferred to meet virtually and were evenly distributed throughout Lake Tahoe. Before conducting interviews, each participant was provided the consent form and asked if any special accommodations were required by them to meet with me. To remain HIPAA compliant, the social support agencies and organizations were not involved in any of the interviews, nor were they aware of the individuals who agreed to participate. After the interviews were complete, I transcribed the interviews for data analysis.

**Older Adult Populations.** To gain access to older adults, I began by working with senior centers throughout Lake Tahoe. Unfortunately, due to the protections that older adult populations have, many personnel who work at senior centers were unwilling to allow the study to occur with their clients. Instead, I worked with the North Tahoe Events Center to host a focus group during an existing senior-focused activity, and recruited additional participants for interviews using snowball sampling (Tracy, 2013), beginning with personal contacts and colleagues at Lake Tahoe Community College. Some older adults preferred to meet virtually due to unprecedented snowfall and others preferred to meet in person after their exercise classes or gym sessions. After the interviews and focus groups were complete, I transcribed the recordings for data analysis.

### ***Data Analysis***

Ultimately, 45 people throughout Lake Tahoe participated in the study, including 7 participants with disabilities (virtual interviews), 20 participants who speak Spanish as their primary language (in-person focus groups), and 18 older adult participants (virtual and in-person

interviews and in-person focus groups). Although the sample sizes for each population were relatively small, I felt confident in progressing with data analysis after theoretical saturation occurred across all three populations, with no new relevant data or categories emerging (Tracy, 2013). In total, I conducted over 13 hours of interviews and focus groups that resulted in 186 pages of single-spaced transcriptions. Each interview lasted between 25 to 55 minutes and focus groups lasted around 1 hour. The interviews included 1-2 participants each and the focus groups included 6-12 participants.

After the recordings from the interviews and focus groups were transcribed, I used a two-phased manual coding process to analyze the 186 pages of transcriptions following coding and analysis tactics in Tracy (2013). First, primary-cycle coding was completed on each population (Spanish-speaking, older adults, and populations with disabilities) to initially sort the data into several categories and to examine how the data collected fit within the study. The transcriptions then went through secondary-cycle coding to establish key themes within each population. Finally, a third-cycle analysis between populations was then completed to compare and contrast data between the three populations for ease of summarizing findings to agencies and organizations.

### **Findings**

The following section identifies key findings, including themes and sub-themes, to address the research questions posed for this study. For context, a majority of participants have lived at Lake Tahoe for ten to over fifty years, are deeply ingrained in the community, and have experienced many close calls with wildfires throughout their lives. The findings compiled below represent patterns of responses from focus group participants and interview participants across all populations. Direct quotes from participants are included because they succinctly express

sentiments expressed by multiple participants. Where direct quotes are not present, there are summaries of themes that were expressed by multiple participants.

### **Natural Environment Brings Comfort & Discomfort**

Discomfort between living at Lake Tahoe because of a love for the natural environment and a deeply ingrained fear of the natural environment was persistent across all populations. Overwhelmingly, participants, or their families, moved to Lake Tahoe for the natural environment and suggested that the natural environment is the best part of living at Lake Tahoe. Participants used words such as nature, mountains, outdoors, recreation, beauty, trees, and lake to describe their favorite part of living in one of Lake Tahoe's communities. Others, mostly participants who are Spanish-speaking, added that they also believe the best part of living at Lake Tahoe is how peaceful, calm, and safe it is, whereas older adult populations tended to focus on the community and how much they value knowing that if they were sick or needed support, their community would jump into action by providing transportation or meals. However, participants with disabilities expressed that it is difficult to live at Lake Tahoe, providing examples of the difficulties they face building a community and having minimal support available to them, which is ultimately why many people with disabilities are choosing to not live at Lake Tahoe.

Although all populations highlighted the natural environment as being what they enjoy the most about living at Lake Tahoe, participants across all populations also shared that the natural environment is causing them significant discomfort and might ultimately become the reason they leave. A majority of participants are scared of wildfires occurring at Lake Tahoe and experience significant anxiety during the summer and fall months as they await wildfires and subsequent smoke impacts. Several participants commented on the irony of the trees being the

reason they moved to Lake Tahoe and the trees now being the primary reason they may leave. Those who experienced the 2021 Caldor Fire in South Lake Tahoe are especially aware of this juxtaposition with many of the areas they previously enjoyed recreating in having been burned and the burn scar in their backyards serving as a daily reminder of the fear they felt thinking that the fire would take their homes, community, and the places that make living at Lake Tahoe enjoyable.

### **Existing Wildfire Preparation Knowledge**

During interviews and focus groups, it quickly became evident that residents of Lake Tahoe have a thorough understanding of wildfires and wildfire impacts and have received a significant amount of information from wildfire agencies and organizations about the actions they should be taking to prepare themselves, their families, and their properties for wildfire. It was overwhelming to hear participants from all populations dive into the technicalities of creating defensible space and packing an evacuation go-bag. Looking beyond themselves, many participants also expressed a thorough understanding of how the work they perform on their property supports the work of their neighbors and public land management agencies to protect entire communities from wildfire. Their comprehensive understanding of wildfire preparation actions and forest health techniques highlighted that information is being disseminated from wildfire agencies and organizations to these populations, but that community members often do not have the support they need to implement the work that they know they should be doing, and they often live in fear because they are unable to prepare in the ways they would like.

There was one significant gap in existing knowledge across all populations, and that was about the concept of home hardening. Many participants had never heard of this term previously and were unaware that there are things they can do to their homes that will



significantly reduce the risk of wildfire. They were also largely unaware that many of the home hardening techniques are low-cost and do not require a significant amount of maintenance or upkeep. Of the participants who did understand that home hardening as being a critical part of preparing, a majority had written it off as being too expensive or difficult for them to complete due to the technical nature of the construction techniques that may be required (i.e., replacing a roof). Participants expressed excitement to learn more about home hardening but did not consider it a priority action unless absolutely necessary.

Of the majority of the participants who shared a depth of existing knowledge on wildfire preparation activities, many expressed their frustration in wildfire agencies and organizations in the ways that they simplify wildfire preparation actions and do not dive deeper into specific scenarios or technicalities associated with preparing. Participants shared that they have complex questions related to forest health, evacuations, defensible space, and home hardening, but that they do not know who to go to for answers to these more complex or personalized questions. Many participants were eager to understand more about evacuation decisions, but have been told many times by different agencies that although law enforcement has a plan for evacuations, it was on a need to know basis and that they should trust the agencies. This type of response has clearly been shared with many of the participants, and they all found it to be inadequate. Participants desperately want to be equipped with the most amount of information possible, regardless of technicalities.

### ***Past Wildfire Experiences***

It was surprising to learn that a majority of participants, especially people who reside on the South Shore of Lake Tahoe, have experienced multiple close calls with wildfires. Participants shared stories about wildfires they had been evacuated from, including the 2007 Angora Fire

and the 2021 Caldor Fire, and commented on the fires that had been close calls, including the 2002 Gondola Fire, the 2016 Emerald Fire, the 2021 Tamarack Fire, and other small fires that have occurred in meadows and forests around communities throughout the years. Participants reflected on their direct experiences with wildfires as children and adults outside of Lake Tahoe, with one participant sharing that they have been evacuated by five different wildfires at different locations throughout the United States over their life. These past wildfire experiences have scared participants and have motivated them to continue preparing for wildfires. Although participants expressed their overall lack of preparedness ahead of each of these notable wildfires, they shared that each experience has encouraged them to prepare for the next wildfire. One participant exemplified these sentiments by stating:

We learned from this last time. Nobody expected that this was actually going to happen, but we've learned and with this information we hope it doesn't happen again. But we will have a plan in place. We know what to do in case of an evacuation. We know we have to have a foot out the door, just in case.

However, even with this motivation, many people remain underprepared due to various reasons, which will be discussed in subsequent sections.

### ***Community Members Know What to do***

Overwhelmingly, community members' existing wildfire preparation knowledge is quite extensive, and assumptions that circulate throughout wildfire agencies and organizations about community members not taking action due to a lack of knowledge were immediately found to be incorrect. Often, community members are living in fear for their lives because they are unable to adequately prepare, especially when they deeply understand what could happen if they are underprepared. Community members have thoroughly considered the logistics of an evacuation, including the various scenarios that could occur, and are carefully planning their

annual defensible space work based on what they see as being the most significant threat to their home and any barriers that may exist that prohibit them from preparing the ways they would like.

Participants also shared that they understand what can happen to people who do not prepare, with a great deal sharing stories they had heard from the 2018 Camp Fire. Participants specifically referenced the 2018 Camp Fire as being a wake-up call for themselves and their community because of the similarities between Paradise, California, and Lake Tahoe, and they desperately want to avoid finding themselves in a similar situation. Participants shared that they began preparing for wildfire after watching what unfolded during the 2018 Camp Fire and when the Caldor Fire began, many participants made comments similar to, "I thought about the Paradise Fire and I did not want to go through the same experience," and "I know that I could easily be in a Paradise situation." The outcomes of wildfires that have occurred locally, regionally, and nationally have contributed significantly to how community members understand the seriousness of imminent wildfires. Participants also highlighted that they typically begin preparing their evacuation go-bags and raking their pine needles each year when they see wildfire smoke in the air, with the smoke serving as a reminder of what could happen at Lake Tahoe at any moment during the summer and all months.

Community members deeply understand what they need to do to prepare themselves, their family, and their homes for wildfire and recognize it is their responsibility to prepare. However, many obstacles exist that prohibit them from preparing in the ways they would like, which leaves them in fear throughout the summer and fall months. Of the handful of participants who admitted that they do not know what to do to prepare or who have chosen to not heed wildfire agency and organization recommendations, they expressed an understanding

that it remains their responsibility to educate themselves and to do the work and is not the responsibility of wildfire agencies or organizations. One participant put this succinctly by saying, “I feel that's a little bit up to me to be more prepared; to educate myself about, you know, defensible space and how to protect myself, because I know I live in an area that could have a wildfire.”

### **Wildfire Preparation Actions**

Although preparing for a wildfire requires several preparation actions that are unique to wildfire alone, participants across all populations commented on the similarities between preparing for wildfires and preparing for other types of natural disasters. Numerous actions a community member should perform are the same, such as packing an emergency go-bag or preparing a house. Similarly, participants shared that being prepared for natural disasters is merely part of living at Lake Tahoe or any other disaster-prone area. If you live in these areas, you know what you should be doing, and preparing for one disaster is not unlike preparing for another. Contrary to my initial assumptions, many community members are preparing themselves, their families, and their properties, but few are doing it specifically for wildfires. Participants shared that they are maintaining defensible space because they like the way it looks, while others were honest about how they updated their roof or some other part of their home not because of the wildfire risk, but because they were required to due to leaks or insurance requirements. Several participants were embarrassed to admit that they needed a little push to force themselves to make upgrades to their homes due to the high costs and the amount of time it takes to complete such actions, and if it weren't for enforcement or for fear of losing insurance coverage, they likely would not have undertaken such actions.

Furthermore, there was a clear connection between participants who described themselves as being well-prepared for wildfire and those who described themselves as being well-prepared in all aspects of their lives. Participants who felt they were prepared shared stories about how they were Boy Scouts or in the military and inherently felt the need to be prepared for all scenarios, wildfire or otherwise. These participants admitted that although they appreciate the reminders they receive from wildfire agencies and organizations about how they should be preparing, they would be preparing regardless because it is in their nature and they do not need to be told how or why to prepare. These are both inherently prepared people and people who are required to be prepared due to specific circumstances, such as having a disability. These participants deeply understand how to be prepared, and if they are unable to prepare as well as they would like, they live in fear and are embarrassed that they are underprepared.

### ***Evacuation***

All populations, regardless of homeownership status, talked extensively about evacuation planning and packing a go-bag. Oftentimes, packing a go-bag or making evacuation plans with family members felt much more attainable than maintaining defensible space or hardening a home, with many participants eagerly sharing what they had done because it felt like the one thing they could truly be in control of. When people discussed what they are doing to prepare for evacuations, they noted that they have a go-bag in their vehicle at all times. These go-bags change minimally between summer and winter, with more warm weather gear in the winter months and more water and food supplies in the summer months. Others shared examples of go-bags that they had hastily created ahead of an evacuation that they kept packed after returning home. The contents of participants' go-bags were generally similar, with

clothing, toiletries, medications, important documents, chargers, and phone numbers being the most important items to have packed. Of note, several participants shared stories of pulling items out of their go-bag at various times because they needed something, such as batteries, and failing to replace those items but feeling confident that they could grab what they need on a moment's notice. Overall, participants felt as though they could evacuate on a moment's notice with their existing go-bags, and could quickly pack other essentials, similar to going on vacation, if they had a few minutes.

In addition to preparing themselves and their families, participants with pets shared the evacuation plans they have made for their pets. Some of the items pet owners noted having packed for their pets include food, water, extra collars, leashes, vaccine records, and pet carriers. Many participants admitted that their pets are typically more prepared than they are because pet supplies are easy to grab quickly, especially if the pets travel frequently. Other pet owners shared that they would not and have not considered preparing themselves for wildfires until they ensured that their pets are adequately prepared. A participant shared, "I didn't start considering packing a go bag for myself until I considered packing one for the pets."

Looking beyond an emergency go-bag for people and pets, participants shared their concerns with evacuations due to not fully understanding where they would be evacuated to or what agencies and organizations have planned for evacuations. Spanish-speaking populations were particularly concerned about the details of an evacuation due to their family members frequently being spread across Lake Tahoe at work and school, and unsure of how they would become reconnected with their families. Additionally, all participants shared concerns about congestion on roads and a fear of being stuck in gridlock traffic during a wildfire. All of these unknowns about evacuations have left people feeling unsure about the things they could do to

prepare and this fear of the unknown has subsequently resulted in many people not preparing for evacuations at all.

Spanish-speaking populations uniquely identified documents as being the most important aspect of preparing for evacuations, with all participants sharing stories about how they had gathered all important documents into one location so they would be easy to grab on a moment's notice. Others shared that they would not leave their home without a copy of their important documents saved on their phones. Many Spanish-speaking participants were lacking an evacuation go-bag and instead were hyper-focused on ensuring that there was a plan for them to be reconnected with their families after an evacuation and that their documents were safe.

### ***Defensible Space***

When asked what participants already know about actions they can take to prepare for wildfire, participants shared that they like to rake their pine needles every year, trim trees as needed, and try to keep their properties generally clean. A notable difference across populations in the types of preparation they partake in differs based on whether or not they own a home and/or if they feel it is their responsibility or the responsibility of their landlord to prepare their home. While a majority of older adult participants owned their homes, nearly all Spanish-speaking participants and participants with disabilities rented a house or apartment. Those who owned a home felt empowered to maintain the property for wildfire. Those who rent expressed that are less inclined to consider defensible space or home hardening as being their responsibility and often feel helpless about the state of their homes. Several participants shared sentiments similar to, "most of my ability to prepare for fires is kind of on my packing a go-bag and getting myself ready, because I can't really affect what happens to the house," and

“we don't really have a say since we just rent. I just live in an apartment, and I don't really get to say anything else.” Of those who own their home, they provided examples of times when they saved a small amount of money for years to afford the high costs of removing a tree and their techniques for bagging pine needles versus using a truck or trailer to transport them to the landfill. Most participants have a thorough understanding of what needs to be done, however, all populations face unique challenges prohibiting them from being successful in maintaining defensible space, which is described in detail in subsequent sections.

### ***Home Hardening***

When participants were asked about things they have done to prepare their homes for wildfire, a vast majority of participants had never heard the term “home hardening” and were not sure what they could do to prepare their homes. Several participants mentioned replacing the screening on their vents and having replaced their roof at some point in the last thirty years, however, these participants noted that they had updated them not because of the wildfire risk associated with the outdated materials, but instead because it was time to update them due to leaks or to maintain insurance coverage. After being provided with more information about home hardening, participants wrote it off as something they would never focus on unless forced to do so due to the high costs associated with home hardening techniques, the skills required to implement the techniques, and the inability to make upgrades to their home due to being a renter.



## **Obstacles**

### ***Disappointment in Wildfire Agencies and Organizations***

Across all participant groups, but especially among older adult populations, participants expressed their continuous disappointment in wildfire agencies and organizations for not doing enough to help them prepare for wildfire. Some comments were focused specifically on outdated narratives of wildfire agencies and organizations not allowing certain types of defensible space activities due to erosion control regulations, while others expressed continuous frustration with the lack of forest management occurring on the public land in their communities. These obstacles are preventing community members from maintaining defensible space on their properties and encouraging complacency among community members due to agencies not maintaining defensible space on public land. Participants shared statements such as, “If they aren’t doing their defensible space, why should I do mine?” and are frustrated by public agencies and organizations not managing public land in communities.

In situations where agencies and organizations are managing forests in communities, participants feel as though they are not provided with enough information about the forestry projects to feel comfortable with the work being completed. Although all participants expressed a thorough understanding of what proper forest management should look like, many are eager for more technical and detailed information before forest management activities, such as prescribed fire and mechanized forest thinning, occur. Some of the frustrations stem from participants having conversations with the forestry professionals performing the work, and the forestry professionals not knowing why they are implementing specific forest management techniques. For example, participants shared negative encounters with forestry professionals, such as times when forestry professionals were cutting certain trees without the ability to

provide a science-based reason as to why they were using a certain technique or removing a certain tree or shrub species. Without offering sound reasoning for forest management actions, participants expressed frustration that stems from public agencies and organizations not being required to follow the rules and regulations that the general public is required to follow.

Many participants, specifically older adult participants, shared their experiences performing defensible space work on adjoining public lands under an agreement with an agency (i.e., stewardship agreements). Under these agreements, a property owner is granted permission to maintain up to 100 feet from their home of defensible space on public land. A handful of participants shared that they have taken advantage of these agreements for many years but that wildfire agencies and organizations make it difficult to understand what the forest management limitations are, and are concerned that if the agencies knew what work they had completed on the public land adjacent to their homes, that they would receive significant fines. Participants understand what work needs to be completed, and don't want to wait years for a public agency to complete the work, so they do the work themselves under an agreement, even with the imminent risk of significant fines or even jail time due to not following the terms of the agreements.

Aside from how agencies and organizations manage public land at Lake Tahoe, participants expressed frustration in defensible space inspection programs administered through local fire protection districts. Several participants shared that when defensible space inspections occur in their neighborhoods, the inspectors approach homeowners with an attitude that assumes the homeowners do not know what they are doing. Many participants expressed feeling insulted by the inspectors and not receiving empathy about the specific obstacles they might be facing. A participant expressed this frustration by sharing, "When someone like the

county comes and tells me to do these things like I've never heard of it, I'm kind of somewhat shocked, you know.”

Although participants shared their overall appreciation of free defensible space inspection programs as a learning opportunity, they also feel that they are not provided with enough advance notice to prepare the property ahead of inspection and that there is a general lack of follow-up by agencies after inspections. One participant expressed their frustration with a lack of follow-up by stating:

Don't you feel that they should do a follow-up? They have no follow-ups. None. They'll come around, they'll point out that this tree should come down, that limb should come down, it should have more space, but they have no follow-ups.

This lack of follow-up results in many participants either not maintaining defensible space because they know there won't be any repercussions if they don't and if they do create defensible space, a lack of an opportunity to establish a plan for the next steps with a wildfire professional/inspector.

Similarly, participants feel that the defensible space inspection programs are not working because ultimately, it does not matter if homeowners complete the work. After all, wildfire agencies and organizations never enforce the defensible space codes. Because of this, participants do not feel that they or their neighbors are receiving the motivation they need to maintain their defensible space. Although participants did express empathy toward themselves and other socially vulnerable community members who might need additional assistance in completing their defensible space work, they also understand that without enforcement, there is no incentive to complete the work in the absence of a wildfire occurring and testing the efficacy of the work they completed. A participant detailed this sentiment comprehensively in

the following statement, which emphasizes the need to enforce while also providing ample opportunities and support for socially vulnerable community members to prepare:

Enforcing a little bit of what they are doing. They've been doing good with inspections and before inspections, they got a lot of people in our neighborhood cutting their trees. When they figured out they didn't pass inspection, they didn't do more work. Maybe give flyers like in the spring so people know, you know, we're gonna inspect you next fall and you have between now and this fall to do this, this, this, and give them a specific list of things to do to fireproof their house.

***Assumption That Wildfires Won't Happen***

Across all populations, participants admitted that they consistently hold the mentality that wildfires will not happen at Lake Tahoe, even after experiencing several close calls with wildfires. Participants shared stories of procrastinating wildfire preparation activities and not evacuating promptly under the mentality that a wildfire will not occur at Lake Tahoe.

Participants made several comments similar to this statement shared by one participant, "This is an interesting kind of topic because, you know, never in my life did I, in my wildest dreams, I never thought we would be evacuated and we certainly were, and that was, that was pretty crazy." Participants shared their disbelief and the ensuing fear when mandatory evacuations did occur, despite their belief that it would not happen. One participant shared their disbelief during the Caldor Fire evacuations by stating, "Yeah, the day we left it was crazy. All these emergency personnel cars were coming into town while we were leaving. It seemed like a scene out of a horror movie. It was so real, though."

Notably, Spanish-speaking populations admitted that they have not previously taken wildfires seriously, even when they are imminent. Participants expressed the shock they experienced during the Caldor Fire evacuations, not believing they would be evacuated until a police officer was ordering them to evacuate. Contrastly, many older adult participants and participants with disabilities had evacuated several days before receiving a mandatory

evacuation order because they recognized the unique evacuation challenges they faced. Spanish-speaking participants made comments such as, "I don't know, as Latinos, I think our culture, sometimes we don't feel urgency during an emergency." Similar sentiments were shared by other Spanish-speaking participants through statements such as, "As Hispanics, sometimes we don't inform ourselves of resources." These two statements exemplify many other comments made by participants regarding how Spanish-speaking populations at Lake Tahoe are underprepared for wildfires and do not treat them with the seriousness they deserve and consistently hold the attitude that wildfires will not occur.

### ***Preparing for Wildfires is Cost-Prohibitive***

When asked what barriers exist that prevent community members from preparing for wildfire, all populations and a majority of participants shared that they lack the financial capacity to prepare in the ways recommended by wildfire agencies and organizations. Many of the participants, especially older adults and participants with disabilities, shared that they are living on social security or disability checks and that they barely have enough income to support themselves, let alone the costs associated with tree removal for defensible space work, which can cost thousands of dollars per tree, or evacuating to a hotel for an extended period. One person shared that their only income is from disability checks and that they do not have enough money to purchase a \$20 pet carrier for their cat, so the cat can be safely evacuated during an emergency. Because of this \$20 deficit, the participant with a disability shared that they are unable to prepare themselves due to the lack of preparedness they can provide for their pet. This is one example of many that were shared related to the relationship between not having adequate funding for one aspect of wildfire preparation and therefore not preparing for wildfire at all.

Nearly all home-owning participants identified a lack of finances as being the most significant barrier they face in maintaining defensible space. Participants shared that they either can't do the work themselves and need to hire a contractor, which is costly, or they need to remove trees that require specialized equipment and crews. Many participants shared stories of how they saved a small amount of each social security or disability check over many years to eventually hire a contractor to remove their dead or dying trees, while others applauded defensible space rebate programs that allowed them to share the cost of tree removal using public funding. One older adult participant provided the following example of how a rebate was useful for them:

The first time we worked in our yard it was with a matching grant, and I'm not sure we would have done it without that incentive. And then, of course, the fires got worse after that so we, you know, put out more money. But I think the initial incentive, the matching funds, got us started.

Rebates were a popular topic across all populations, with participants having participated in rebate programs previously. Several participants shared that the rebate program was the only reason they were able to complete their defensible space work at all.

Home hardening was shared by participants across all populations as being unobtainable due to the high costs associated with completing home renovations to reduce wildfire risks. Participants shared that it is highly unlikely that they would save money for home hardening and instead would put any saved money toward tree removal or related defensible space work. Although there are several retrofits homeowners can do to their homes that are low-cost, there is a significant assumption across these populations that it would not be financially feasible and therefore home hardening is not currently considered a viable option.

Participants shared that packing a go-bag was not necessarily cost-prohibitive, but that the act of evacuating causes significant financial strains on themselves and their families. The

population that spoke the most extensively about the high costs of evacuations was the Spanish-speaking population. Spanish-speaking populations shared that because they did not recognize the Caldor Fire as being a significant threat until law enforcement was ordering them to evacuate, by the time they did evacuate all of the nearby lower-cost hotel options were already full. This forced this population to find further away and more expensive hotels that were unaffordable for themselves and their families. One participant shared their Caldor Fire evacuation story by stating:

I started thinking, what are we going to do? Where are we going to go? Because I started hearing people had already evacuated to Carson, and all the rooms and hotels were booked. I left early the next morning but we had to leave all the way to Reno and we went to a hotel for two nights. But since I saw that we were going to be out longer, I said, I need to find a place to stay with my family because this is way too expensive. Some hotels were offering a discount but it was only 20%.

In addition to not recognizing the severity of the wildfire until the last moment, Spanish-speaking participants expressed their inability to evacuate until it was mandatory because they were unable to go unpaid from their jobs to evacuate early. Many participants shared that if they would have evacuated earlier, they might have found a lower-cost hotel to stay in, but would not have gone unpaid for several days, and that would have resulted in their families not having adequate food, lodging, and/or transportation when they were inevitably ordered to evacuate.

Because of the high costs associated with evacuations (i.e., lodging, transportation, food, lost wages), many Spanish-speaking participants offered stories of people they know who chose not to evacuate because they did not have enough money to support their families while evacuated. Many of those who did not evacuate stayed in their homes, hiding from law enforcement and hoping that the fire would not reach them. Spanish-speaking participants shared that they had not heard of any financial assistance programs, even though many existed,

and they blame this on emergency relief information not being provided in Spanish. Many of this population did not have options because they could not afford to evacuate and instead were required to put themselves in a potentially life-threatening situation by evacuating at the last moment or not evacuating at all.

### ***Socially Vulnerable Populations Experience Unique & Compounding Obstacles***

One thing that became evident during interviews and focus groups is that all socially vulnerable populations experience far more challenges than others when preparing for wildfires. Whether or not they recognize it, each population faces challenges that make preparing for wildfires uniquely difficult. Each population expressed concern for other populations, stating that their unique situation isn't as difficult as another's, highlighting how community members are far more concerned for the safety of other community members than themselves. One participant shared an example from someone they knew who was evacuated during the Caldor Fire to bring to light the unique challenges vulnerable populations experience:

Think if someone just had their husband or wife pass away, and now they're evacuated from the Caldor Fire. I am sure that it happened. And then what if they built this home from the ground up? They want to die there, right? And, you know, all these things are real, right? It's just we don't see it unless we're in those shoes, and we may peripherally think about it, but it's not part of the plan. How can we move the mood and the mindset of everyone equally? I think it will never be right. However, we can kind of help change those minds to have that epiphany, right?

In addition to participants expressing an immense amount of empathy toward other community members and the unique obstacles they may be experiencing, many of the obstacles specific to each population were focused on personal safety during evacuations instead of preparing a home or property to survive a wildfire. Participants recognize that human safety is the most important aspect of being prepared, and at the end of the day personal possessions are far less important.



Additionally, many people from these populations carry immense long-term emotional distress after surviving a wildfire evacuation due to the traumatic experiences they encountered as a direct result of the things that make them more vulnerable, such as having mobility issues or a lack of funds to evacuate. Overall, it was clear that all populations experience a multitude of hardships in their daily lives that make preparing for wildfire uniquely challenging, each of which is described in detail in the following paragraphs.

**Spanish-Speaking Populations.** The most evident challenge shared by Spanish-speaking populations is difficulty accessing wildfire preparation and evacuation information in Spanish, with most, if not all, wildfire preparation educational materials and emergency alerts only available in English. Of all populations, Spanish-speaking participants shared their immense fear of wildfires, with many of their fears stemming from a lack of knowledge of how they can prepare themselves, their families, and their homes to reduce wildfire impacts. Participants from this population are concerned for themselves but are also concerned for their community, noting that there are many more vulnerable community members who are in worse shape than they are and are not receiving this potentially life-saving information. At the end of each focus group, participants expressed gratitude to have had an opportunity to learn about things they can do to prepare because they had never before been provided with an opportunity to learn about preparing for wildfire.

During the Spanish-speaking focus groups, participants were hyper-focused on house fires and not wildfires, which was not present as a topic during focus groups and interviews with the other two populations. Participants shared personal experiences with house fires and the things they had learned to do to prevent them from occurring. Participants discussed the importance of never leaving a candle burning without supervision, techniques to keep dryer

vents clean, and keeping vegetation around outdoor grills clear. When asked questions about wildfire preparation actions, a majority of participants provided information that made it evident that they had only ever received wildfire prevention information, likely a direct result of wildfire prevention information being the only wildfire-related information available in Spanish. After participants realized they were not receiving wildfire preparation information, they expressed frustration at having been left out, but also optimism in knowing that there are things they can do to protect themselves and their families.

Spanish-speaking participants shared that because they are not receiving information about how to prepare in Spanish, they are also not receiving information about where to get help or who to go to during an evacuation. Several participants from the North Shore shared that during the Caldor Fire, there were many Spanish-speaking residents from the South Shore showing up at churches and social service agencies and organizations trying to receive financial support and updates on the fire's progression. Many Spanish-speaking participants shared that even if they knew where to go for assistance, it was unlikely that those wildfire agencies and organizations would have employees on staff who could have a discussion with them in Spanish. Participants also shared their discomfort with people in uniforms and admitted that they would likely not approach someone in a uniform to ask questions during an emergency, especially if they had failed to evacuate with their documents.

**Older Adult Populations.** While older adult participants are receiving wildfire preparation information and understand what they should be doing to prepare, a majority of participants shared that wildfire preparation activities are difficult for them to complete because they lack the energy or physical ability to perform the recommended tasks. Many older adult participants made comments about their inability to climb onto their roofs to remove pine

needles and the lengthy amount of time it can take them to completely rake the pine needles from their yards due to them needing to perform the task in small increments of time over many weeks or months. Some admitted that they have stopped maintaining their defensible space altogether because they are unable to perform the tasks themselves and can't afford to pay a contractor to do the work for them, which leaves many with feelings of guilt and fear. Similarly, evacuation planning can be more complex for older adult populations if they are on oxygen, use a CPAP machine, or have reduced mobility. Some older adult participants also shared that they can no longer drive and would require public transportation to get them safely evacuated from their homes.

While mobility issues are a significant barrier to preparing for wildfire, motivation was also described as being a significant challenge. Older adult participants shared that they are often tired and, as one participant stated, "The obstacle is my own mental state. I don't, I never did my homework in school, why should I start now?" Similar statements shed light on the complacency that many older adult community members experience, especially if they have successfully dodged several catastrophic wildfires throughout their lifetime. A small group of participants shared that although they did evacuate during the Caldor Fire, they would not likely evacuate again due to the significant amount of effort the evacuations required, both physically and mentally. As shared by one participant, "I will not leave next time. What for? If I die, I die. My time's coming already, and that's life." Although this sentiment was shared only by a handful of participants, many admitted that wildfire scares them, and their past experiences with wildfires continue to encourage them to prepare, despite having significant mental and physical obstacles. One participant succinctly stated this phenomenon by stating, "You're a fool not to

evacuate. A lot of these people, they don't know what wildfire does. I do. I'm gone. I'm upwind and out of here.”

Overall, older adult participants are mixed in their responses as to whether or not they feel they should and can continue to evacuate after having lived a life full of wildfires. Many older adult participants held strong opinions about what other community members should be doing to prepare but admitted that they are failing to prepare themselves as they age. This population highlights the nuances between and across community members and populations, with obstacles resulting in fears and anxieties about not being capable of preparing in the ways they know they should be.

**Populations with Disabilities.** Participants with disabilities experience challenges that are often unique to the disability they are living with. One participant shared that evacuating safely would be impossible due to a chemical sensitivity that requires them to only reside within purified air and avoid all items packaged in plastic, while other participants shared mobility challenges, transportation challenges, and mental barriers. Participants with disabilities recognized the unique challenges they face, which often require them to be more prepared than the general public. One participant shared this succinctly by stating, “It would be super hard for me to evacuate. I know it is for other people, but I think it's even harder for somebody with my condition to get anywhere.”

These unique challenges often empower people with disabilities to be more prepared for evacuations, however, other aspects of preparing for wildfire are often not considered within a person with a disability's realm of possibility. Similar to older adult populations, populations with disabilities struggle to find the motivation to perform preparation activities,

especially if they live with Attention-Deficit/Hyperactivity Disorder (ADHD) or some other disability that makes it difficult for them to focus. As one participant shared,

My ADHD distracts me quite a bit. So then it'd be like I'm focusing on like other things, instead of that. So picking up the rake and actually moving those needles would be like the last thing I'd think of, mostly because I'd be focused on something else.

Aside from the above-mentioned difficulties that populations with disabilities experience, many participants shared that preparing for wildfire is emotionally distressing, especially after having been evacuated previously. Participants shared statements such as, "I'm in survival mode. So, facts, that level of planning stuff is beyond my scope." Because many participants with disabilities recognize that they must be more prepared for evacuations due to their unique circumstances, they live with significant anxiety when they are unable to prepare due to physical or mental barriers.

These mental and physical barriers often result in people with disabilities freezing when an emergency is imminent, or, as shared by several participants, if a person is already in "survival mode," they will not be able to add anything else to their life, including a life-saving action. One participant hesitated and confirmed that their information would not be shared with law enforcement before sharing that they chose not to evacuate during the Caldor Fire and instead hid from law enforcement in their home and hoped for the best. When asked why they decided to stay behind, they shared that the thought of evacuating was more distressing than staying home and potentially losing their life while putting firefighters and law enforcement in danger. This participant was not proud that they had stayed behind, but could not add one more emotionally distressing thing to their life. They shared, "I wasn't sitting on my hands. So yeah, I was diligent, looking at the fire every day. And still, you know, my life could have been taken, right? You know, I'm not perfect. We're all human." Participants discussed the importance of

contingency plans for themselves and loved ones with disabilities as being critical for agencies to consider due to the poor decisions that are often made when a person is in crisis.

### **Recommendations for Programs**

Scattered throughout interviews and focus groups across all populations were recommendations participants shared regarding what programs could do to help socially vulnerable populations better prepare for wildfire. Although several key themes emerged, many participants continuously returned to the need for wildfire agencies and organizations to understand that community members can only do what they can do with what they have. In other words, people need individualized support and need to be provided adequate time and opportunities to implement wildfire preparation actions. Similarly, participants drove home that wildfire agencies and organizations should not assume that they do not want to prepare for wildfire, but instead need to recognize that obstacles are preventing them from preparing, and programs should be malleable enough to address those obstacles on an individualized basis.

Participants also expressed the need for wildfire agencies and organizations to plan for community members who are not able to prepare before a wildfire occurs or evacuate effectively under a mandatory evacuation order. One participant encouraged agencies to create contingency plans in their statement, "Always have contingencies. And then the people, the populations that you're trying to address, Spanish-speaking, elderly, and disabled have a contingency. If you miss the bus, there is another bus coming, right? Literally and figuratively as well." These contingency plans also point to the need for individualized support for socially vulnerable populations due to the unique situations people find themselves in. In addition to individualized support, participants recommended that the two most significant areas for

improvement in wildfire preparation programs are financial support and improved communication, which are both described in detail in the following paragraphs.

***Financial Assistance is Critical***

The most significant recommendation that was shared across all populations was the need for wildfire agencies and organizations to provide financial assistance to people to help them prepare for wildfire, including for maintaining defensible space, hardening their homes, and evacuating. Participants applauded free green waste disposal programs and encouraged the continuation of community-wide green waste dumpsters to offset the costs associated with maintaining defensible space. Others emphasized the usefulness of defensible space rebate programs for those who have matching dollars to put forward; however, a majority of participants shared that they would not be able to afford the matching dollar amount to take advantage of a program designed in that manner. Instead, they recommend designing a rebate program that is specifically for socially vulnerable populations, where a person who can prove low-income status and/or social vulnerability making it difficult for them to prepare receives a non-matching rebate to complete the necessary work. Alternatively, participants expressed that they would be happy to have wildfire agencies and organizations hire contractors on their behalf to complete the work and do not need to be as involved in the work that is completed, as long as it follows wildfire preparation recommendations.

A large number of the Spanish-speaking participants stressed the importance of in-the-moment emergency assistance for evacuations. Several shared their experiences with previous evacuations and expressed their concerns about evacuating again due to the financial constraints associated. This population recommended communicating with socially vulnerable populations, both in English and Spanish, about emergency assistance funds well ahead of an

emergency so decisions can be made knowing they will receive financial support if necessary. Many participants shared stories of their family members, friends, or coworkers who could not evacuate from the Caldor Fire due to monetary reasons, and feel confident that they would have evacuated if there were known emergency relief funds available for them to utilize during an emergency. Having emergency relief funds readily available during an emergency would allow community members to make better decisions about evacuations that are not dependent upon financial constraints.

Aside from the recommendation of wildfire agencies and organizations providing rebates and on-demand financial assistance during evacuations specifically to socially vulnerable populations, several participants emphasized the importance of educating the community on the importance of maintaining an emergency fund that can be utilized during all types of natural disasters. This recommendation was shared across all populations, with several participants noting how they were previously unaware of the high costs associated with evacuating and wished that wildfire agencies and organizations would have prepared them for the financial reality of an evacuation so they could have adequately saved for it. However, as one participant shared, "People say that you need to have 3 months worth of savings ready. But I don't know, that's really hard." Because saving money for emergencies or for maintaining a property for wildfire is an unattainable goal for many socially vulnerable community members, participants recommend a multi-pronged approach where additional education, rebates for preparing, and emergency funds during an evacuation can be utilized to help community members during all aspects of preparing for wildfires.



### ***Opportunities for Improved Communication***

Throughout the interviews and focus groups across all populations, participants shared anecdotes about where and how they have received wildfire preparation information in the past. Participants explained how they typically receive information through churches, wildfire agencies and organizations, neighbors, schools, friends, family, coworkers, and children. This indicates that wildfire preparation information is being distributed through many avenues and that wildfire is an important enough topic to be making its way into many areas of a community member's life. Although the information is being distributed widely, not all of the information is accurate, with some participants sharing stories of rumors circulating about programs, agencies, and best practices. Because of these rumors and misconceptions, participants shared that they aren't always confident about who they should be trusting or turning to for wildfire preparation questions or guidance. Several participants, specifically older adult participants, highlighted that they do not trust what agencies tell them about preparing for wildfire because the agencies have been incorrect in the past and instead, they prefer to listen to their neighbors and churches. Many Spanish-speaking participants shared similar feelings about agencies, except they shared that they do not typically turn to them for guidance because they do not always have Spanish-speaking staff, so they instead get their information from work and churches. Many participants shared that they do not think every community member will ever trust one entity for information sharing, so wildfire preparation information should be shared widely through all of the avenues people tend to learn information through.

When asked how participants prefer to receive information and if they have recommendations for adapting existing programs, an overwhelming majority of participants shared the importance of keeping wildfire preparation on people's minds year-round and

ensuring that it comes up as part of people's daily conversations. As one participant shared, we must, "try to evolve our community to have a normal, healthy communication where this does come up in the average home." Similarly, one participant provided insight on how information needs to continue to be distributed to every community member:

But how will they keep triggering, triggering their minds to keep on thinking about it, learning from it and their direct experience, or hearing it on the news in the community nearby to keep that in the back of their head? I don't care if you're a 5-year-old child or a 98-year-old person, right, regardless of ethnicity or socioeconomics, or language barriers, you know, everyone, you know, all these divides need to kinda coalesce because it is important.

Participants continuously assured me that there is no way to over-communicate this information, especially if communications are adapted to reach and support more socially vulnerable community members. Similarly, participants expressed that wildfire agencies and organizations must avoid drawing assumptions about what people may or may not know, as shared by a participant, "We can't make assumptions that other people know what we know because it's second nature to us." While other older adult participants were surprised by the notion that wildfire agencies and organizations should be doing more and shared:

You know if people just paid attention, there's plenty of information out there right now, you know, and I think a lot of people are just complacent because they don't know. You know, I think that to emphasize it more, I don't know how they can, except by what they're doing now. I don't know how they could do anymore. There's plenty of warning to people.

Participants also emphasized the importance of partnering with social support agencies and organizations to educate and communicate with socially vulnerable community members through avenues they are already receiving information through. And finally, participants expressed the importance of accessible content, whether that be ADA-accessible websites and events, or language-accessible, the content reaching people must be in a format that they can read and understand.

As for more specific areas of communication-related program improvements, participants expressed concern and shared opportunities for improvement in the ways wildfire agencies and organizations communicate through emergency alert systems. For those who expressed concern, they shared that the system might not work in an emergency because it is rarely tested in the absence of an emergency. Participants recommended that wildfire agencies and organizations send alerts more regularly to test the system, and to find those community members who are not currently signed up for alerts. Testing the emergency alert systems was recommended as a way to calm the anxiety of those who are unsure if they are signed up for alerts, and to provide wildfire agencies and organizations an opportunity to test the systems. It was also recommended that the emergency alert system should be used before an emergency is imminent to add a level of seriousness to an impending emergency. Many Spanish-speaking participants admitted that they did not take the Caldor Fire seriously until law enforcement personnel were knocking on their door ordering them to evacuate, and they wish they would have heard from public officials through the emergency alert system days before the wildfire became an imminent threat so they could have adequately prepared.

In-person events, such as public presentations and workshops, were identified across all populations as helpful tools to reach community members. Many participants shared that although they likely would not attend a workshop specific to preparing for wildfires, they would appreciate hearing from wildfire agencies and organizations at events they are already attending. Participants recommended wildfire agencies and organizations have a more significant presence at community events, such as farmer's markets and community fairs, and during senior center activities through partnerships with social support agencies and organizations. Participants recommended these as more successful avenues to reach people due

to many community members, especially socially vulnerable community members, already regularly attending these events, which removes the burden of them needing to attend a separate wildfire-specific event. Being present at as many existing community events as possible was highlighted as being one of the most important things wildfire agencies and organizations can do to distribute information to community members.

When asked where people typically receive community-related information, many shared that they receive information informally through in-person conversations with neighbors, coworkers, and family members. Many participants across all populations shared the importance of their religious congregation as an information-sharing hub and recommended that wildfire agencies and organizations begin educating church officials on wildfire preparation actions so they can adequately prepare their congregations. Similarly, people highlighted the importance of wildfire agencies and organizations distributing information to children in schools, who can then pass the information along to their parents, and to homeowners associations (HOAs) who can provide mass information to homeowners. Participants also shared the missed opportunity of educating landlords and property management companies on wildfire preparation actions renters can perform, which appears to be minimal but valuable for renters to be aware of.

A majority of participants recommend wildfire agencies and organizations distribute printed materials through mass mailings, especially before summer begins to give people time to adequately prepare. When asked if these items might be thrown out without reading, participants also suggested sending printed materials with utility bills that are already being distributed to ensure that people open them. Similar to the recommendation to partner with social support agencies and organizations for in-person events, participants also suggested

distributing printed resources through the same entities, especially through programs such as Meals on Wheels or Bread and Broth, which typically reach socially vulnerable populations who are not leaving their homes or receiving information through in-person events.

Finally, participants recommend wildfire agencies and organizations distribute resources digitally through social media and local e-news. However, participants admitted that it is less likely that they would jump into action as a result of seeing social media or other digital advertisements. However, these avenues provide another opportunity to remind community members that they should be preparing for wildfires. Aside from social media, many participants expressed frustration about the lack of local news coverage throughout Lake Tahoe and the problems they have encountered in the past when trying to receive updates on emergencies without a local news source. Participants recommend finding ways to distribute advertisements about preparing for wildfires through regional news stations, such as those based out of Sacramento and Reno because many community members watch those news stations and it is a missed opportunity.

### **Discussion**

Wildfire preparation programs at Lake Tahoe, such as the Tahoe Network of Fire Adapted Communities, provide meaningful information and support services to community members to learn about wildfires and the actions they can take to reduce their overall risk. However, these programs were not designed to reach all community members, especially socially vulnerable populations who speak Spanish, are older adults, or who have disabilities. Additionally, these programs have not been designed to assist people who do not own their homes or are physically or mentally unable to prepare for wildfire. It is not that these programs were designed to intentionally exclude socially vulnerable populations, but that they were

developed to reach the most community members as possible, even though the socially vulnerable community members need different types of educational resources and support and are typically more vulnerable to wildfire risks than the general public.

While a majority of socially vulnerable community members know what they must do to prepare for wildfire, they are often facing unique obstacles that make preparing uniquely difficult. Davies et al. (2018) suggest that translations of emergency preparation resources and strategies to effectively prepare populations for wildfires must be tailored to reach specific socially vulnerable populations and that there is not, nor should there be, a one-size-fits-all approach to emergency preparation tactics. Davies et al. (2018) also suggest that translating and distributing resources into Spanish, or another prevalent language, is a prerequisite to creating equitable wildfire preparation programs, something that has yet to occur in the wildfire preparation programs at Lake Tahoe.

Similarly, when disseminating wildfire preparation information through print or digital resources, workshops, or other avenues, it is critical to also understand that there is no one-size-fits-all approach to how people will respond to certain outreach tactics, policies, or support services. McCaffrey (2015) recognizes this as being a critical aspect of creating meaningful wildfire preparation programs and recommends programs that exchange information from community members to wildfire professionals and vice versa. McCaffrey (2015) also recommends that instead of attempting to reach community members through single outreach tactics, programs should instead focus their efforts on connecting community members to assist in the recognition of shared risk and ensuring community members have access to wildfire professionals and the unique support they need to prepare. This was seen in the findings of this

study, where people were learning far more from each other rather than from wildfire agencies and organizations.

Something that became abundantly clear during the facilitation of interviews and focus groups is that socially vulnerable populations are situated at the intersections of many identities that make them more vulnerable than the one identity that qualified them for this study (i.e., speaking Spanish at home, being an older adult, or having a disability). Méndez et al. (2020) and others have begun to recognize that, “Within a given area, these inequalities intersect along the lines of race, gender, indigeneity, immigration status, health care access, and income” (p. 51). In this study, many participants expressed compounding inequities, including a majority of participants across all populations also being low-income, many participants with disabilities also being an older adult, and a majority of participants being female. These intersecting identities should not be ignored and instead, could be used to empower wildfire agencies and organizations to create wildfire preparation programs that reach all community members through uniquely individualized ways and to stop grouping community members into neat categories.

With there being many actions community members can take to prepare themselves, their families, and their properties for wildfire, and many socially vulnerable community members not having the time, finances, or ability to complete all of the recommendations, they are often faced with selecting which actions to focus on based on time, money, and motivation. Some of these actions are easier, such as discussing evacuation plans with family, friends, and neighbors, while other actions are far more involved and might require a contractor, such as replacing a roof or enclosing eaves (Restaino et al., 2020). These wildfire preparation actions are mostly optional; however, some jurisdictions are beginning to enforce compliance with public

resource codes regarding maintaining defensible space. Although less popular than defensible space requirements, several jurisdictions also require compliance with codes that require new construction or renovations to meet wildland-urban interface building codes, which can elevate building costs (Restaino et al., 2020). Whether wildfire preparation actions are required or not, it is clear that many socially vulnerable community members will be unable to meet such requirements and will need assistance from wildfire agencies and organizations. Without support from wildfire agencies and organizations, preparing for wildfire could become a significant issue of equity.

### **Practical Implications**

The findings of this study will ultimately be incorporated into Lake Tahoe's Community Wildfire Protection Plan (CWPP) update, which is expected to be completed by the end of 2023. CWPPs typically identify and prioritize locations for fuel reduction treatments across land ownerships that will protect at-risk communities and infrastructure during a wildfire. These plans also provide details about how agencies will collaborate across jurisdictions to better serve all community members within a geographic area. It is best practice to include a chapter in a CWPP on socially vulnerable populations that identifies who the populations are and strategies to reach those populations. The primary objective of this study is to provide a comprehensive chapter in the CWPP that Lake Tahoe wildfire agencies and organizations can utilize to adapt their existing and future programs to better serve socially vulnerable populations. The existing CWPP does not have a chapter on socially vulnerable populations and the addition of the socially vulnerable populations chapter of the CWPP will allow wildfire agencies and organizations to apply for funding that requires this chapter that focuses more specifically on reaching these identified socially vulnerable populations.



After the CWPP is complete, I will host a series of workshops with wildfire professionals from Lake Tahoe's wildfire agencies and organizations to share the findings of the study and recommendations for their wildfire preparation programs. This will allow an opportunity for in-depth conversations about the study and recommendations so Lake Tahoe wildfire agencies and organizations can confidently adjust their existing programs to better serve the socially vulnerable populations studied. Finally, the CWPP chapter and the full thesis will be provided to wildfire agencies and organizations outside of Lake Tahoe that do not have the means to complete their own study. While there are likely significant differences between the socially vulnerable populations at Lake Tahoe and those in other communities, key themes may be helpful for other communities to utilize until they can complete a study of their own.

#### **Limitations & Direction for Future Research**

Although this study had significant findings within its original scope, limitations in the study do exist, which pave the way for further research on the topic. The most significant limitation identified by wildfire agencies and organizations during informational interviews before research began was defining "socially vulnerable populations." Through conversations with wildfire agencies and organizations, many wildfire professionals shared that wildfire vulnerability (i.e., where a person is located) is weighed much heavier than the specific characteristics that make someone more vulnerable (i.e., Spanish-speaking, older adult, or disabled). This problem is consistently included in research on socially vulnerable populations and wildfire (e.g., Paveglio et al., 2018), where vulnerability is difficult to characterize due to the compounding interactions between social vulnerabilities and wildfire vulnerabilities. Wildfire-vulnerable was weighed against socially-vulnerable and, for this study, the two were separated. In this area of research, it is common to separate the two vulnerabilities based on the goals of a

specific study. Although all of Lake Tahoe is considered a wildfire-prone area and at a heightened wildfire risk, it would be meaningful for future studies to address the two vulnerabilities in tandem using mapping software, such as Land Tender, to identify the exact locations of wildfire-vulnerable and socially-vulnerable populations throughout Lake Tahoe to better prioritize wildfire preparation support across communities.

A second limitation of this study is that it included a relatively small sample size across the three populations studied. However, given the size of Lake Tahoe communities, it would have been challenging to have recruited more participants from any of the three populations. The population that had the least participation was the population with disabilities. This population proved to be difficult to identify and interview for a few reasons. First, the population is well protected by HIPAA, so they are not easy to identify. Second, many people who live at Lake Tahoe with disabilities typically end up moving to a different location due to the limited social support services available at Lake Tahoe and the challenges associated with navigating a non-ADA-accessible community. Finally, the definition of “populations with disabilities” was broad and resulted in difficult conversations with social support agencies and organizations regarding the ethics of interviewing people with significant disabilities versus someone with a lesser disability. Originally, I had hoped to interview caregivers of people with significant disabilities, however, I was unable to gain access to this population and therefore the data in this study reflects information collected from only high-functioning people with disabilities. Even with seven high-functioning participants with disabilities interviewed, I feel there were enough themes to include their data. However, more in-depth interviews with this population and their caregivers would provide deeper insight into the unique challenges they face.

As described countless times to the wildfire agencies and organizations supporting this study, the findings of this study should be viewed as the first of many studies on socially vulnerable populations at Lake Tahoe. To date, there have been very limited studies on this topic, and none at Lake Tahoe, so I hope this study can be used as a launching point for future research that takes a closer look at each of the priority populations, and others, in more detail to ensure nothing was overlooked in this study, especially as community dynamics change over time. Additionally, further studies should re-center on homeowners and landowners. While this research was critical in gaining insight into socially vulnerable populations, who typically rent homes, future research must consider the disconnect between socially vulnerable populations' reliance on non-socially vulnerable populations, who typically own and manage property and homes at Lake Tahoe.

To conclude, wildfires at Lake Tahoe are inevitable and community members must take action to prepare. Many things could make a community member more vulnerable to wildfire, such as being Spanish-speaking, an older adult, or having a disability, and wildfire agencies and organizations should adapt their existing wildfire preparation programs to meet the unique needs of these populations, and others at Lake Tahoe through individualized educational programs and support services. Community members at Lake Tahoe understand the wildfire problem and what they need to do to prepare themselves, their families, and their properties, they just need individualized support from wildfire agencies and organizations to be fully prepared ahead of the next wildfire.

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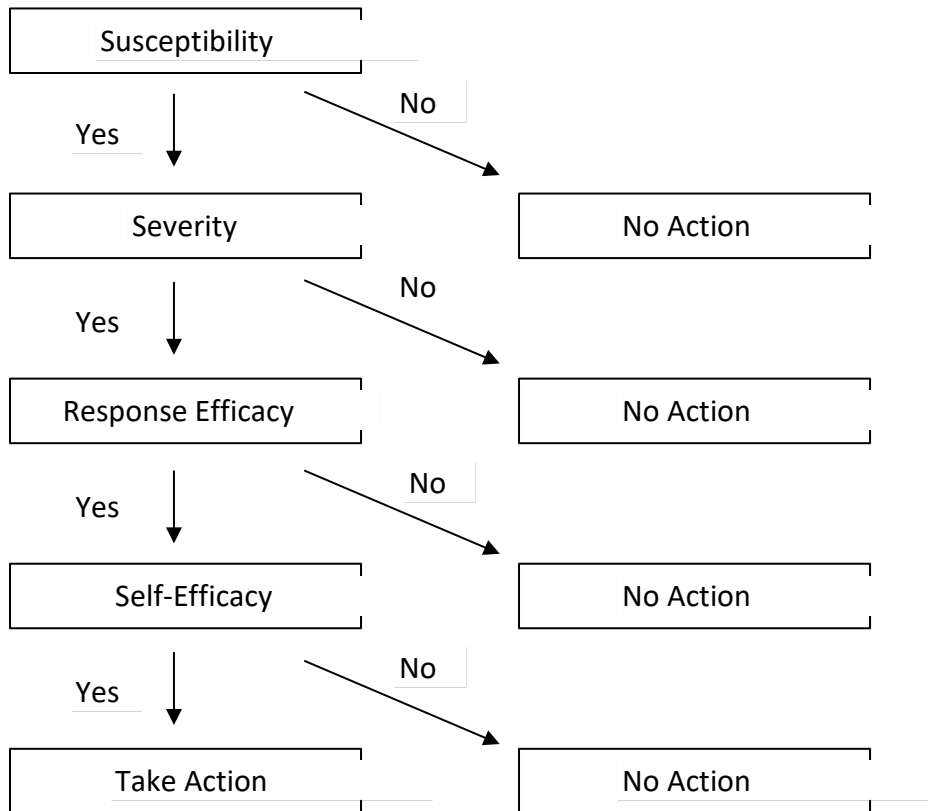


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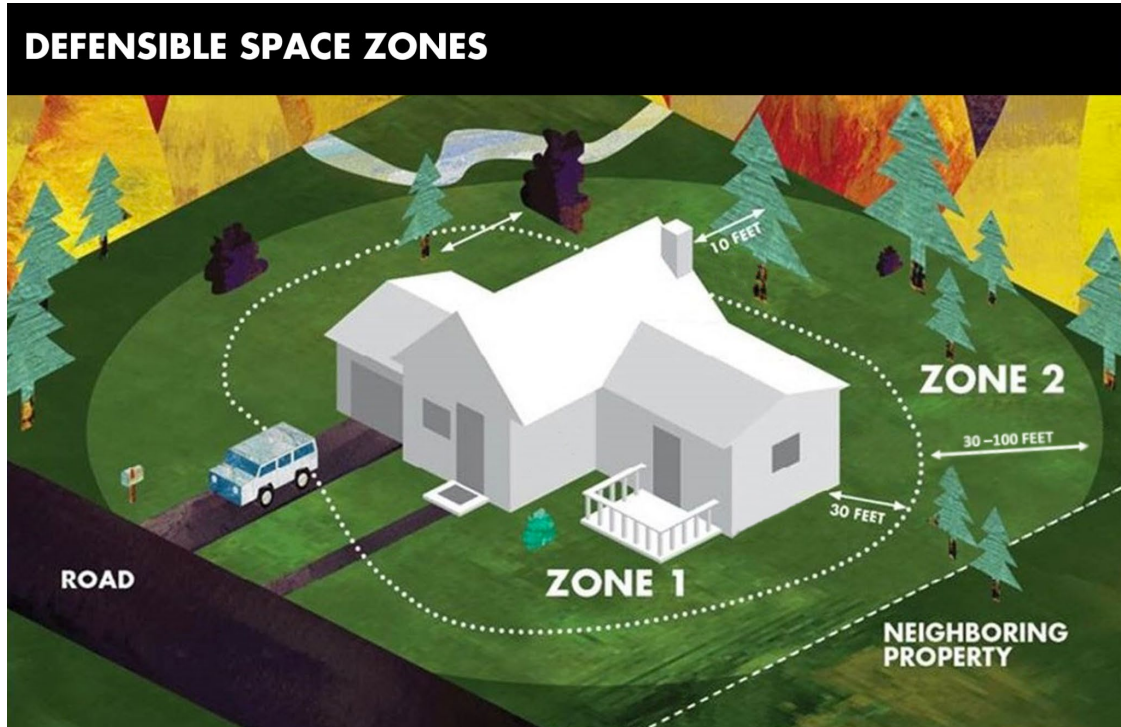
**Figure 1**

*Sequential Risk Judgment and Decision-Making Model*



*Note:* Figure 1 is an iteration from Fletcher and Lovejoy (2018, p. 136). *Natural Disaster and Risk Communication: Implications of the Cascadia Subduction Zone Megaquake*. Lexington Books.

Figure 2

*Defensible Space Zones*

Note: From California Department of Forestry and Fire Protection. (n.d.-b). *Defensible Space*.

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## Appendix A

### Focus Group & Interview Moderator's Guide

Welcome and thank you for coming. I'm Carlie Murphy, and I am a graduate student in Communication Studies at the University of Nevada, Reno. For my thesis, I am interested in learning more about how effective wildfire preparation programs throughout Lake Tahoe are for Spanish-speaking, older adult, and disabled community members. I am conducting this research because I used to work for a local nonprofit that administered wildfire programs and I was concerned that the programs were not helpful for all community members. The results of this research will help provide direction to fire agencies on their programs and how they can adapt them to make them work better for all community members. Your input is critical in ensuring fire agencies reach all community members today and in the future.

I will be audio recording the conversation today so that it can be transcribed for analysis at a later date. Does anyone have any questions before we begin? [Answer any questions]  
 You all have had a chance to review and sign the consent form before today. Does anyone have any final questions about the consent form that I can answer? [Answer any questions]

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#### Existing Knowledge

1. How long have you lived in Tahoe and what is the best part of living here?
2. There are actions people can take to minimize damage to their homes and protect their personal safety before and during a wildfire. What have you heard, or what do you know, about things people can do to prepare their homes and protect themselves from wildfire?

*After hearing what participants already know about preparing for wildfire, the researcher will briefly pause the questions to provide information on how participants can prepare for wildfire and what support is currently available, including information specific to defensible space, home hardening, and evacuation planning.*

#### Actions

1. Have you or your landlord created defensible space around your home? Examples include raking pine needles, cutting low-hanging tree branches, or removing bushes from under trees.
2. Have you or your landlord made any changes to your home to make it more fire-resistant? Examples include replacing the roof, adding screens to vents, or removing wooden fences attached to homes.
3. Have you ever created an evacuation plan or emergency go-bag for yourself and your family? Examples include planning escape routes, saving phone numbers of an outside contact, or creating an emergency go-bag.

#### Obstacles

1. What obstacles exist that have prevented you from preparing for wildfire in the ways that we have discussed (i.e. defensible space, home hardening, evacuation planning)?

2. Have you ever received an evacuation warning or evacuation order? What was that experience like for you? Do you feel you had everything you needed to evacuate?
3. If agencies could do one thing to help you prepare ahead of the next wildfire, what would be the most helpful?

#### Trusted Sources for Information

1. We've learned today that there are actions you can take to prepare yourself and your family for wildfire. Where should agencies share this information in the future so you will hear about it? Where do you typically receive information?
2. Before we leave, do you have any questions I can answer about wildfire or keeping yourself, your home, and your family safe before the next wildfire?
3. Is everyone feeling okay after discussing these topics? I have a counselor's information if you would like to talk with someone about anything that came up for you today.

## Appendix B

### University of Nevada, Reno Consent Form, Social Behavioral or Educational Research

<b>Title of Study:</b>	Wildfire Impacts on Spanish-Speaking, Elderly, and Disabled Populations at Lake Tahoe
<b>Principal Investigator:</b>	Shawn C. Marsh (shawnm@unr.edu)
<b>Co-Investigators / Study Contact:</b>	Carlie K Murphy (carlie.kay.murphy@gmail.com)
<b>Study ID Number:</b>	1973617-1
<b>Sponsor:</b>	Communication Studies, College of Liberal Arts

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#### **SUMMARY OF KEY ELEMENTS:**

This document indicates the following: 1) Your consent is being sought for focus group research; 2) participation is voluntary; 3) the purpose of this research is to better learn how fire agencies can serve community members with wildfire preparation programs; 4) we expect minimal risks for this research – although some participants might have negative memories related to wildfire – and expect that the information provided can be useful to individuals and families preparing for wildfire; and 5) there are not alternatives available to participation in this research other than not doing this study.

#### **Introduction**

You are being invited to participate in a research study. Before you agree to be in the study, read this form carefully. It explains why we are doing the study; and the procedures, risks, discomforts, benefits and precautions involved.

At any time, you may ask one of the researchers to explain anything about the study that you do not understand.

You do not have to be in this study. Your participation is voluntary. If you do not agree to participate, or wish to withdraw at any time, then we will stop the research process immediately.

Take as much time as you need to decide. If you agree now but change your mind, you may quit the study at any time. Just let one of the researchers know you do not want to continue.

#### **Why are we doing this study?**

We are doing this study to learn more about the barriers and opportunities for fire agencies to better address the needs of Spanish-speaking, elderly, and disabled populations at Lake Tahoe so fire agencies can adapt wildfire programs to support these specific populations.

Benefits of research cannot be guaranteed but we hope to learn more about how fire agencies can be supportive and effective in their existing programs to reduce the impact of wildfire.

#### **Why are we asking you to be in this study?**

We are asking you to be in this study because you have indicated that you are Spanish-speaking, elderly, disabled, or care for someone with disabilities in the Lake Tahoe Basin. I believe your insights will be helpful.

**How many people will be in this study?**

I expect to enroll 50 participants from across the Lake Tahoe Basin in focus groups and 5 participants for interviews.

**What will you be asked to do if you agree to be in the study?**

If you agree to be in this study you will be asked to participate in a focus group with 9 other participants that lasts about 60 minutes. The focus group will be audio recorded and then transcribed. Once the transcription process has finished, the recording will be destroyed. Any information that will identify who you are will be changed in the transcript to help ensure confidentiality. Focus group transcripts will be kept on secure servers or locked cabinet when they are not being used for data analysis. At the close of 3 years all transcribed focus groups will be destroyed.

**How long will you be in the study?**

The study will take about 60 minutes of your time. You will only participate in one focus group.

**What are your choices if you do not volunteer to be in this research study?**

If you do not participate at this time, there are no other options available for research.

**What if you agree to be in the study now, but change your mind later?**

You do not have to stay in the study. You may withdraw from the study at any time by letting the focus group moderator know you wish to quit; or, after the focus group, if you would like to remove your data from the study you can start that process by contacting Carlie Murphy at [carlie.kay.murphy@gmail.com](mailto:carlie.kay.murphy@gmail.com) and she will accommodate your request and ensure that your data are removed.

**What if the study changes while you are in it?**

If anything about the study changes or if we want to use your information in a different way, we will tell you and ask if you want to stay in the study. We will also tell you about any important new information that may affect your willingness to stay in the study.

**Is there any way being in this study could be bad for you?**

If you participate in this study, you may recall negative incidents related to wildfire and wildfire evacuations that could cause psychological distress. If you believe that doing this study would be too uncomfortable or that remembering wildfire incidents from that past will be too much, then please do not participate in the study. This research is important, but your safety and comfort come first.

**What happens if you become injured because of your participation in the study?**

In the event that this research activity results in psychological distress, a referral to counseling can be provided for you. Care for such discomfort will be billed in the ordinary manner to you or your health insurance carrier.

**Will being in this study help you in any way?**

We cannot promise you will benefit from being in this study but you may feel good about helping to make fire agencies more aware of the unique challenges Spanish speaking, elderly, and disabled populations encounter when preparing for wildfire.

**Who will pay for the costs of your participation in this research study?**

No costs are associated with participation in this study.

**Will you be paid for being in this study?**

You will receive \$100.00 for participating in this study.

**Who will know that you are in this study and who will have access to the information we collect about you?**

The researchers and the University of Nevada, Reno Institutional Review Board will have access to your study records.

**How will we protect your private information and the information we collect about you?**

We will treat your identity with professional standards of confidentiality and protect your private information to the extent allowed by law. We will do this by keeping un-transcribed recordings in a locked box or on a secure server; de-identifying personal information such as names or other highly-personal characteristics when transcribing the data; and keeping all data in a locked cabinet or on a secure server when not in use.

We will not use your name or other information that could identify you in any reports or publications that result from this study. The transcripts from the study will not be made publicly available.

Your information will not be used or distributed for future research studies even if identifiers are removed.

**Do the researchers have monetary interests tied to this study?**

The researchers and/or their families have no monetary interests tied to this study. The study is sponsored by the California Tahoe Conservancy, Tahoe Resource Conservation District, and the Tahoe Fund, but they have no financial interests.

**Whom can you contact if you have questions about the study or want to report an injury?**

At any time, if you have questions about this study or wish to report an injury that may be related to your participation in this study, contact Carlie Murphy at 775-397-5151 or at [carlie.kay.murphy@gmail.com](mailto:carlie.kay.murphy@gmail.com).

**Whom can you contact if you want to discuss a problem or complaint about the research or ask about your rights as a research participant?**

You may discuss a problem or complaint or ask about your rights as a research participant by calling the University of Nevada, Reno Research Integrity Office at (775) 327-2368. You may also use the online *Contact the Research Integrity Office* form available from the [Contact Us page](#) of the University's Research Integrity Office website.

**Agreement to be in study**



If you agree to participate in this study, you must sign this consent form. We will give you a copy of the form to keep.

---

Participant's Name Printed

---

Signature of Participant

---

Date

---

Signature of Person Obtaining Consent

---

Date

## Appendix C

### Universidad de Nevada, Reno Consentimiento para Participación en Investigación

<b>Título del Estudio:</b>	Impactos de los incendios forestales en las poblaciones de habla español, ancianos, y poblaciones discapacitadas en Lake Tahoe
<b>Investigador Principal:</b>	Shawn C. Marsh (shawnm@unr.edu)
<b>Co-Investigadores o Contactos del Estudio:</b>	Carlie K. Murphy (carlie.kay.murphy@gmail.com)
<b>Número del Proyecto en IRBNet:</b>	1973617-1
<b>El Patrocinador:</b>	Estudios de Comunicación, Facultad de Artes Liberales

Se le está solicitando participar en una investigación con propósitos de estudio.

Antes de que otorgue su consentimiento, el investigador debe decirle a usted (1) el propósito, procedimiento y duración de la investigación; (2) cualquier procedimiento que pudiera ser experimental; (3) cualquier riesgo, malestar o beneficio de la investigación razonablemente previsible; (4) cualquier tratamientos o procedimientos alternativos; y (5) como se deberá mantener la confidencialidad.

Cuando esté disponible, el investigador debe también informarle a usted acerca de; (1) cualquier compensación o tratamiento médico en caso de que ocurra algún daño; (2) la posibilidad de riesgos imprevistos; (3) las circunstancias en las que el investigador puede parar su participación; (4) cualquier costo adicional para usted; (5) qué pasa si usted decide dejar de participar; (6) cuándo se le informará a usted acerca de nuevos resultados que pudieran afectar su decisión de participar; (7) cuántas personas participarán en el estudio.

Si usted está de acuerdo en participar, se le debe entregar una copia firmada de éste documento y un resumen por escrito de la investigación.

Puede comunicarse con Shawn Marsh (shawnm@unr.edu o 775-682-7987) o Carlie Murphy (carlie.kay.murphy@gmail.com o 775-397-5151) a cualquier hora que tenga preguntas sobre el estudio o si desea reportar una herida. Puede comunicarse con la oficina de Research Integrity al 775.327.2368 si tiene una queja sobre el estudio o preguntas sobre sus derechos como un sujeto del estudio.

Su participación en esta investigación es voluntaria y no será penalizado o perderá beneficios si rehusa participar o decide dejar de participar.

La firma de éste documento significa que la investigación del caso, incluyendo la información que se encuentra arriba, le ha sido oralmente descrita y que accede a participar voluntariamente.

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Firma del Participante

Fecha

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Firma del Testigo

Fecha

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Firma de Persona Obteniendo el Consentimiento

Fecha