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UNDERSTANDING WILDFIRE HAZARD VULNERABILITY OF RESIDENTS  
IN TETON COUNTY, WYOMING

by

Lucas Kanclerz

A Thesis  
Submitted to the  
Faculty of The Graduate College  
in partial fulfillment of the  
requirements for the  
Degree of Master of Arts  
Department of Geography  
Advisor: Dr. Lisa DeChano-Cook

Western Michigan University  
Kalamazoo, Michigan  
April 2012

## UNDERSTANDING WILDFIRE HAZARD VULNERABILITY OF RESIDENTS IN TETON COUNTY, WYOMING

Lucas Kanclerz, M.A.

Western Michigan University, 2012

The research examines significant differences in wildfire home protection activities between local and seasonal residents in Teton County, Wyoming. Significant differences of wildfire home protection activities results in hazard vulnerability to a whole community. An extensive literature review establishes the purpose and hypothesis of the research to understand if seasonal residents are creating wildfire hazard vulnerability to local residents. A survey-based methodology using nominal YES/NO questions and ordinal Likert-type scale questions were used to understand residents past wildfire experiences, perceptions on the effectiveness of home protection activities, and if residents actually do these activities. Statistical analysis revealed that seasonal residents do not create wildfire hazard vulnerability to residents. Other significant results include residents' reasons for not completing home protection activities and what how outside agencies could help residents complete these activities. Researcher observations and experiences do indicate that wildfire vulnerability does exist to some extent between residents and provides recommendations to reduce the risk.

## ACKNOWLEDGMENTS

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I really need to thank my mother, father and brother for their support during the past two years. I am glad my parents were able to come to visit me in Wyoming and have a wicked good time. Hopefully we can all do that again soon. Finally, I need to thank all those who participated in my research. Your time and input was very valuable and I enjoyed meeting and taking to everyone I visited.

Lucas Kanclerz

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## CHAPTER I

### INTRODUCTION

Many regions of the American West have seen substantial growth in population and development. The expansion of urban areas and migration of people from cities has led to more development in close proximity to natural landscapes such as forests and wildlands. Residences in these regions may be private and secluded, but unfortunately there is a threat to many of these people and their homes, wildfires.

With the increasing losses of property due to wildfires in addition to the continued and expected expansion of people into fire prone landscapes, the U.S. government created the National Fire Plan (NFP) in 2000. The Healthy Forests Initiative and Healthy Forests Restoration Act followed shortly after the implementation of the NFP to create plans of action to reduce hazardous fuels that have accumulated in wildlands. The main goal of these acts is to reduce the wildfire hazard to communities in these landscapes (Schoennagel, *et al.*, 2009).

Although federal agencies have been proactive by reducing fuels in wilderness areas, the fuel reduction plans only pertain and have jurisdiction to federal land such as national forest, parks, and rangelands. Private land must be managed and cared for by home and property owners to reduce hazardous wildfire fuel such as downed trees, limbs, and other organic material that is combustible. Modifications to homes using non-flammable building material should also be completed to protect homes from ignition during a wildfire. These protection activities are known as Firewise activities (Firewise Wyoming, 2003).

One would think that residents would be inclined to do whatever is necessary to protect their homes against wildfires. Unfortunately, this may not occur depending on the experiences and perceptions individual residents have toward wildfires and home protection activities. Experiences are likely to affect varying perceptions of actual risk and how effective mitigation strategies would be to reduce the risk of wildfires. If a perceived action is going to reduce risk and protect a home from burning, a person is more likely to do that action to benefit themselves compared to an action they perceive to have little benefit (Martin, Bender, and Raish, 2007).

Experience is the fundamental factor driving the way hazards are perceived and how people prepare for a natural disaster (Martin, Bender, and Raish, 2007). Length of residency will have an impact on how many experiences a person has had with a particular disaster in certain areas. For this research, it is believed residency type of Teton County, Wyoming residents, such as local, full-time residents and seasonal, part-time residents, will have an effect on experiences with wildfires. Different experiences may influence perceptions and actions toward wildfire mitigation practices.

These differences, particularly differences of actually completing home protection activities, may create hazard vulnerability between residents. If one resident is not proactively being Firewise, they may be increasing the wildfire hazard vulnerability toward neighboring homes.

### Purpose

Research was completed to understand if there are significant differences of wildfire experiences, mitigation perceptions, and actual mitigation between local, full-time residents and seasonal, part-time residents of Teton County, Wyoming. Significant differences between residents may lead to increased wildfire hazard vulnerability for the whole community. The research could possibly help officials from Teton County, Jackson Hole Fire/EMS, the U.S. Forest Service, and the National Parks Service make future decisions about methods of educating the public and understand what Teton County residents are doing or not doing to protect themselves against potential wildfire hazards.

### Hypothesis

There could be significant differences of past wildfire experiences, perceptions about the effectiveness of home protection activities, and differences of completing home protection activities between local and seasonal residents of Teton County, Wyoming. It is hypothesized that seasonal residents, with second homes who do not live in Teton County year round, do not have the same past wildfire experiences, and, as a consequence do not perceive Firewise activities as effective methods of protecting homes. These differences may indicate that seasonal residents do not complete Firewise activities compared to local residents who live in Teton County full-time and are proactive in preparing their homes and property against wildfires.

## CHAPTER II

### LITERATURE REVIEW

#### Introduction

Forests of the intermountain west of North America rely on disturbances for the removal of older trees and growth of younger tree and forest floor species. Wildfires are thought to be the most significant disturbance agent in western forest, especially for coniferous trees (Page and Jenkins, 2007). Yet the effects a wildfire are not always positive. From 1999-2010, the average number of acres burned in the United States was 6.53 million acres. In addition to the millions of acres consumed by wildfires, an average of over 2,377 residences, outbuildings, and businesses were destroyed from wildfires during this time period (Gabbert, 2011).

Of course, some wildfire seasons are worse than others. Late October of 2003 was particularly devastating in San Diego County, California, where three fire complexes burned over 375,000 acres while destroying 3,241 structures and claiming the lives of 16 people (United States Forest Service and California Department of Forestry, 2003). Although fires such as this are an extreme event, the destructive nature of any sized wildfire to homes, property, and lives should not be underestimated. While one season may be active with many fires and losses, others years are relatively “quiet”. The 2010 U.S. fire season was below the 10-year average of acres and structures destroyed when 3.42 million acres burned and 788 structures were lost (Gabbert, 2011).

## Wildland Urban Interface (WUI)

Structures lost in wildfires are typically located in areas called the wildland urban interface or WUI. The WUI is defined numerous ways; this causes occasional controversy with respect to identifying areas that are actually considered to be within the WUI. For the purpose of this research, the WUI will be defined as “two traditional land uses (e.g., forestry and urban development) occurring near or adjacent to one another” (Winter,1993,1).

WUI area expansion has increased substantially over the latter half of the 20<sup>th</sup> century. From 1970-2000, analyses of census tract scale data illustrate that development into the WUI has expanded by 52% to include 12.5 million homes with an expected 10% increase by 2030 (Theobald and Romme, 2007). Population relocation from urban locations into suburbs and exurbs is the most prominent change driving WUI expansion (Hammer, Stewart, Radeloff, 2009).

In the United States, 60% of the WUI is located in the eastern half of the country, but only 7% of the land cover is consists of highly flammable vegetation such as spruce, fir, Douglas fir, hemlock, lodgepole pine, chaparral, and pinyon-juniper trees. Inhabited WUI of the western U.S is located in areas with 90% of these highly flammable fuels (Theobald and Romme, 2008). Development in high severity locations has greatly increased the exposure of humans to wildfire hazards despite a much smaller overall WUI area in the Western part of the U.S.

## Amenity Migrants of the WUI

With the increase of second homes and suburbs, expansion of the WUI in the western U.S. has been caused from a shift from the “Old West” that was driven by ranching and farming to the “New West” that relies on tourism and recreation (Paveglio *et al.*, 2009). Growth in tourism and recreation sectors in the western U.S. is a direct result of people seeking natural amenities. Natural amenities gain value based on human perceived values and aesthetics including forests, open spaces, bodies of water, and various topographic features including mountains and valleys (Marcoullier, Clendenning, and Kedzior, 2002).

Preferences for natural amenities in dense forest environments are in relation to people seeking privacy, shade, and preferred climates. Unfortunately, these preferences may work to increase wildfire hazards (Collins and Bolin, 2009). Amenity migrants are defined as “those who make locational residence and travel decisions based on the availability of amenities and create demand for development for amenity rich areas” (Marcoullier, Clendenning, and Keidzor, 2002, 517). Recreational use homeowners make up the majority of amenity migrants. Amenity migration is expected to increase as the oldest baby boomer population reaches retirement and seeks amenity rich communities where they can enjoy the natural environment (Collins and Bolin, 2009).

## Hazard Perception

As the population within the WUI continues to increase, so does the variability of perceptions in regards to wildfires. Years of successful fire suppression have contributed to feelings of human control of wild lands and also to the perception that wildfires are rare events (McCaffery, 2004). In the WUI, residents are often reluctant to acknowledge wildfires as a hazard out of fear and anxiety. Residents have the idea that technology and government agencies are responsible for protection, whereas in reality, mitigation and protection efforts are actually the responsibility of the homeowner (Kumagai, Carroll, and Cohn, 2004).

Homeowners have diverse perceptions and assessments of the risk of wildfire hazards. Risk assessment involves judging the potential frequency of the occurrence of an event as well as the expected damage from the fire. If an individual deems risk to be low, the person is likely to take few preventive steps (McCaffery, 2004). Variation in individual risk assessment can create different actions toward mitigating homes and property in the WUI. Protection Motivation Theory, or PMT, describes how people can be motivated to take part in beneficial behaviors to avoid health, social and interpersonal risk (Martin, Bender, and Raish, 2007). In the case of wildfires, increased mitigation efforts can be attributed to the belief that an individual is vulnerable to a wildfire. Motivational factors for home mitigation include considering the severity of the risk, having the confidence that homeowners can prevent a fire from consuming their home, and that risk reduction will be an effective tool.



Diverse levels of PMT lead to choices made in what Martin, Bender and Raish (2007) called the Transtheoretical Model (TTM), which is the decisional stage of determining what effective actions will prevent and reduce risk. Steps of TTM can be categorized as pre-contemplation, contemplation, preparation, action, maintenance, and termination of mitigation practices to reduce wildfire risk. Significant differences may exist in beliefs and actions between local and seasonal residents. This could translate into different levels of hazard vulnerability between the two groups. Individual response to a risk is very complex and people have different perceptions and ways to balance tradeoffs on hazard mitigation (McCaffery, 2004).

Perceptions on the fire hazard will certainly vary between groups, but the way fire is managed is viewed similarly. Focus groups in Crawford County, Michigan, have shown that most residents believe the government is responsible for educating visitors and residents about fire hazards and for managing the public land for fire safety (Winter and Fried, 2000). Residents in Massachusetts also feel the public land should be managed through prescribed fires or mechanical thinning, but that no regulations should be imposed on private land to reduce the fire risk (Blanchard and Ryan, 2007).

#### Local versus Seasonal Residents and Hazard Vulnerability

Without regulating private land for fuel reduction, hazard vulnerability can occur. Hazard vulnerability is characterized as the biophysical hazard exposure and susceptibility to harm and loss from a hazard event (Collins and Bolin, 2009). Hazard

vulnerability can be linked to the differences between local (fulltime/permanent) and seasonal (part-time) residents based on social and economic boundaries creating fragmentation of residents within WUI communities (Paveglio *et al.*, 2009).

Residents' different perceptions lead to complex, varied definitions, explanations, and solutions to the wildfire problem (Hammer, Stewart, and Radeloff, 2009). Local residents may feel one action will be beneficial to the mitigation of wildfires compared to seasonal residents who feel mitigation removes the natural characteristics of the environment.

Past wildfire experience or the lack of experience could be another driving factor in residents mitigating homes against fires. Seasonal and part-time residents have different degrees of subjective knowledge. This is based on their respective direct experience. Past experiences become the foundation for individual beliefs in their own knowledge about risk (Martin, Bender, Raish, 2007). Although past hazard experiences may lead to a heightened hazard perception, there is often continued risk-taking behavior (Vitek and Berta, 1982). This may be attributed to the temporal distribution of a particular hazard. If an individual has not experienced a hazardous event in a long period of time or never experienced an event, they may perceive the risk from any given hazard event as low. If risk is deemed low, the individual is less likely to reduce the exposure of themselves and property to the risk (McCaffery, 2004).

Length of residency would likely increase the amount of hazard experiences and knowledge. From this perspective, a fulltime resident can be considered to be an

“expert” who has the necessary knowledge to respond to fires properly based on past experiences. Such residents make thoughtful decisions on what steps to take to protect their property. Opposite of the “expert”, are the “novices” or seasonal residents. They are given this tag because it is believed that seasonal residents do not have competent knowledge to make reasoned decisions on mitigation practices to prevent risks (Martin, Bender, and Radish, 2007). Experts and novices living in the same community create fragmentation of correct wildfire mitigation leading to hazard vulnerability for everyone. Different stages of prevention and mitigation on homes and property leads to vulnerability between those who act to properly mitigate their homes, compared to residents who take few or improper actions.

Studies conducted by Collins and Bolin (2009) in communities of the White Mountains in Arizona depict the differences between local and seasonal residents. Structured surveys and semi-structured interviews were used to reveal additional disproportions in understanding disparity between expert and novice homeowners. Results indicated that affluent seasonal homeowners have the economic power to transfer risk away from them to generate security for their own lifestyle preferences. Seasonal residents rely on fire insurance for their homes during a wildfire event where valuables and homes can be replaced and rebuilt. Local residents are at a disadvantage and possibly cannot afford insurance costs with increased property values through the building of large, valuable homes nearby (Collins and Bolin, 2009). Understanding differences of knowledge of wildfire risk between local and seasonal residents can show government officials that specific communities are not a

homogenous group when protecting homes. Communities become fragmented with variable knowledge levels and motivations among resident groups and should be taken into consideration by community planners when planning fire mitigation strategies (Martin, Bender, and Radish, 2007).

Residency differences can also affect the adaptive capacity of a community. Adaptive capacity describes the factors that allow a system to perceive change or hazards, the ability to understand the problem, make decisions, and to follow through with adopted solutions to maintain original identity. Heterogeneous communities of local and seasonal residents reflect different adaptive capacities with respect to the perception and prevention measures directed to a threat or hazard due to varied socio-economic factors between some lower income locals and a few wealthy part-time residents.

With respect to mitigation strategies, conflicts evolve due to community differences in the type of residence based on residency pattern. Part-time, amenity seeking residents may believe amenities offered in fire prone landscapes and wooded property or wooden roofs are worth more in aesthetics than safety from wildfires or the construction of resistant homes given an unknown level of risk. In some cases, amenity-seeking migrants are typically portrayed as “ignorant tourist” or seasonal residents from “downstate” urban areas (Winter and Fried, 2000). Studies have revealed that part-time, amenity-seeking migrants are not place dependent, but rather include all who have a low perception of wildfire risks in the area. Lack of concern has placed locals into “subordinate positions” of appeasing to seasonal residents

lifestyle preferences within a two tiered “mountain playground economy” (Collins and Bolin, 2009, 451). Similar research in northern Minnesota revealed that more local residents believe completing home protection activities would reduce fire damage and enhance the aesthetics of property as compared to seasonal residents (Bright and Burtz, 2006). Locals must accept that part-time residents are going to reside in their communities at some time during the year and therefore face the consequences of seasonal residents’ limited knowledge regarding the potential of fires destroying lives or property for all residents. Neighboring residents can also reduce the risk of wildfire damage through sharing knowledge between individuals. Knowing that home protection activities cannot only save your home, but potentially protect a neighbor’s home as well can be a contributing factor to residents completing home protection activities (Bright and Burtz, 2006).

### Wildfire Basics

Wildfires need three basic elements for combustion to occur and continue: fuel, oxygen, and heat (National Wildfire Coordinating Group (NWCG), 2006). Fuels are the energy source that fires need to burn. The fuel type and amount available determine the rate of fire spread and intensity. Wildfire fuels can include anything from living or dead plant material to homes and structures (NWCG, 2006). Oxygen supply can be influenced by topography and winds. When more oxygen is present, fires will burn hotter. Heat is the source of ignition which can be natural such as

lightning or anthropogenic such as a cigarette or abandoned campfire. Remove one of these elements and there will no longer be a fire (NWCG, 2006).

One of the greatest concerns related to wildfires is how fires spread and the possible effects on homes and or property. Wildfires produce radiant heat that can prime fuels in advance by drying vegetation out and making fuels vulnerable to combustion (NWCG, 2006). Fire movement through transmission by radiant heat is why clearing property of potential fuel is important to minimizing the spread of fire toward home and other structures. Wildfires create considerable amounts of convection, where fire heats the air and this warm, lighter air rises (NWCG, 2006). Warm, rising air from a wildfire is typically associated with smoke and firebrands. Firebrand are burning embers which can be especially dangerous to homes where they can fall ahead of the main fire and create spot fires (Hyndman and Hyndman, 2008) or fall on roofs and ignite untreated or flammable roofs (Firewise Wyoming, 2003). This direct contact of a heat source such as a fire on a home is then considered conduction, the final heat transfer of fire.

### Homeowner Mitigation

Proper home and property mitigation is essential for not only the protection of a home, but for the protection of nearby homes. Structural Ignition Assessment Modeling (SIAM) has determined how a severe wildfire can destroy entire neighborhoods in a matter of hours (Cohen and Butler, 1996). Such losses can be attributed to the amount of wildland vegetation and fuel available. These massive

losses are much greater because the spreads faster than even the fastest response time and suppression efforts of firefighting agencies (Cohen and Butler, 1996).

Losses can be reduced by creating a defensible space with home protection activities also known as Firewise activities (Firewise Wyoming, 2003). Research has indicated that a home with proper mitigation is 85% more likely to survive a wildfire than a home that is not properly defended (Firewise Wyoming, 2003). Most homes lost within the WUI during wildfires occur from burning embers and firebrands falling on flammable roofs, direct flame contact under homes, such as decks and eaves, and through damage by radiant heat created from the burning of vegetation. To eliminate the ignition of residences, home protection activities should be completed.

Home protection activities include but are not limited to:

- Clearing down debris from property such as fallen trees, limbs, cast needles, and leaves
- Pruning tree limbs 6-10 feet to eliminate trees from torching
- Clearing roofs and gutters of fallen leaves and needles
- Maintaining an irrigated green space around a home
- Planting fire resistant ornamental plants and shrubs
- Building with fire resistant material
- Stacking wood or lumber at least 30 feet from structures
- Burying LPG propane tanks underground (Bright and Burtz, 2006)

These activities are the most important to the survival of a home and should be completed within 30 feet of a home (Firewise Wyoming, 2003).

The Federal government has acknowledged the increasing danger of wildfires to the public. In 2000, the U.S. government developed the National Fire Plan (NFP) in reaction to the continued expansion of residences and development into the WUI.

Goals of the NFP include reduction of fuels around homes, communities, and natural resources to slow or stop wildland fires from threatening valued areas (Schoenngel *et al.*, 2009). Unfortunately, adjusting to potential fires and creating defensible space can be physically difficult for older, permanent residents or financially impossible for those with low or fixed incomes (Collins and Bolin, 2009). Local residents are often forced to take a cost-benefit approach toward mitigation. Costs toward fire mitigation cannot only create a financial burden, but depending on the property can also, be very time consuming (McCaffery, 2004).

People living in the WUI or any other hazard-prone location can be threatened by hazards at any time. Human interaction with the environment will always occur as well as natural hazards and disasters. To minimize the impact and losses from wildfires, floods, earthquakes, etc, educational programs are needed to inform the public on how to prepare and mitigate for any of these events (Vitek and Berta, 1982).



## CHAPTER III

### METHODS

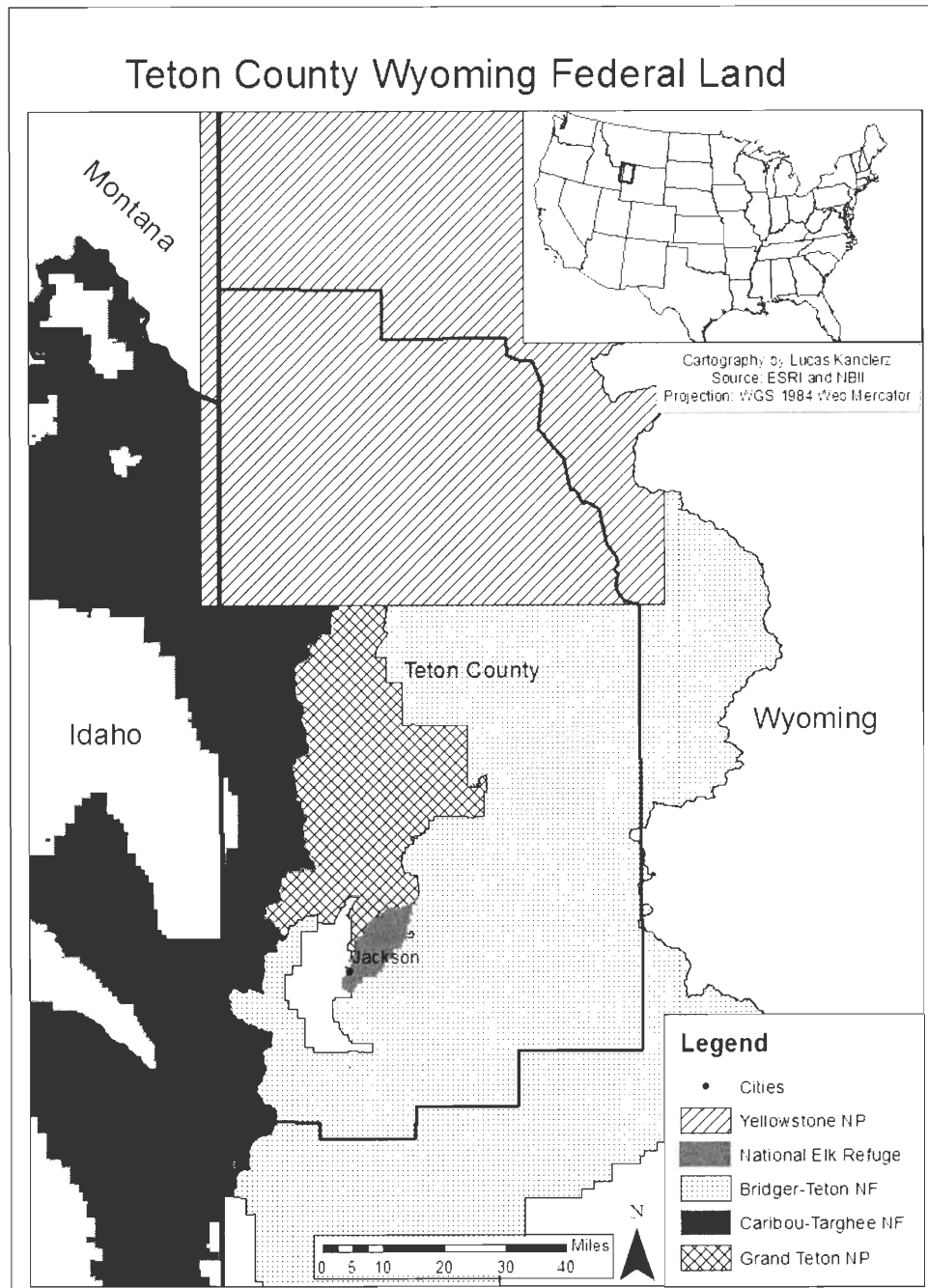
#### Study Area

Teton County is located in the northwest corner of the state of Wyoming. The northern section of the county encompasses part of Yellowstone National Park while the Grand Teton National Park is in the west-central section of the county. The Bridger-Teton National Forest (BTNF) and Targhee-Caribou National Forest (TCNF) are also located in the county as is the National Elk Refuge (Figure 1). The 2010 U.S. Census reported 20,000 people living in Teton County with a concentration of people living in and around the towns of Jackson and Wilson (U.S. Census Bureau, 2010). Within the county, there are over 50,000 acres identified as the Wildland-Urban Interface (United States Forest Service (USFS), 2011).

The climate is considered dry continental having short summers with moderate temperatures and cold winters when most of the annual precipitation falls as snow. Teton County is slowly recovering from a severe drought that occurred from 1999-2004. Drought conditions have led to the drying and curing of flammable vegetation that can become fuel for future wildfires (USFS, 2011). Approximately 56% of the county is covered by potentially volatile coniferous trees such as lodgepole pine, Douglas fir, and spruce/subalpine fir. Shrublands cover approximately 18% of the county consisting mostly of highly flammable mountain big sagebrush (USFS, 2011). Past fire suppression of all fires has created a buildup of fuel in both the BTNF and TCNF. Recent tree mortality due to multiple bark beetle

infestations has potentially increased the amount of fuels available to burn. Both the Douglas fir beetle and mountain pine beetle have killed stands of Douglas fir and lodgepole pine trees (USFS, 2011).

Figure 1. Teton County, Wyoming Federal Land



Teton County has experienced the gamut of low to high severity fires. Most fires that occur are small, low severity fires with high severity fires occurring only during very dry and windy conditions. One of the most notable high severity fires occurred near the town of Wilson during late July 2001 (Figures 2 and 3). The Green Knoll Fire consumed approximately 4,700 acres of the BTNF and nearly destroyed numerous subdivisions (USFS, 2011). Many areas at risk of large scale wildfires contain many homes and structures. Wildfires could destroy part of the \$1.5 billion in building and property value located in Teton County. Current estimates consider that a single, large scale wildfire could cost over \$10 million due to losses of property, natural resources, recreation/tourism revenue, and firefighting costs (Teton Conservation District, 2008).

Teton County has adopted the 2006 Wildland Urban Interface (WUI) Code which is designed to protect homes against wildfires. The WUI Code impacts areas of human development within regions of flammable vegetation by providing guidelines and building codes for people planning on building new or adding onto existing homes (Jackson Hole Fire/EMS, 2011). Teton County does have designated WUI areas which need to meet building codes of the 2006 WUI code. WUI areas can be viewed on Teton County's GIS server at [www.tetonwyo.org](http://www.tetonwyo.org).

Figure 2. Green Knoll Fire Crescent H Ranch Subdivision (Source: Lucas Kanclerz)



Figure 3. Green Knoll Fire Indian Paintbrush Subdivision (Source: Lucas Kanclerz)



## Survey Site Selection

Surveyed subdivisions and communities were chosen with the aid of the county's online GIS. Areas chosen for this study were all located within the WUI fire zone (Figures 4 and 5). Communities were also chosen based on the recommendations of local and federal government officials who specifically work with WUI communities and wildfires throughout Teton County. These helpful key informants are:

- **Kathy Clay**, Fire Marshal: Jackson Hole Fire/EMS
- **Lesley Williams-Gomez**, Fire Information Officer: Bridger-Teton National Forest
- **Traci Weaver**, Fire Communications and Education, Grand Teton National Park
- **Rich Ochs**, Teton County Emergency Management Coordinator

Subdivisions of focus are located near the towns of Jackson, Wilson, and Moran.

The following subdivisions were surveyed:

### Moran Area (Figure 6)

- Buffalo Valley Estates
- Teton Wilderness Ranch
- Pacific Creek Road

### Jackson Area (Figure 7)

- Snow King Estates
- Aspen Highlands

### Wilson/Fall Creek Road Area (Figure 7)

- Heck of Hill Road
- Indian Paintbrush
- Crescent H Ranch
- Rivermeadows
- Hidden Hills Ranches (Butler Creek)
- Highland Park Estates (Butler Creek)
- Redtop Meadows



Figure 4. Wildland Urban Interface in Jackson, Wyoming (Source: Lucas Kanclerz)



Figure 5. Wildland Urban Interface Fall Creek Road (Lucas Kanclerz)



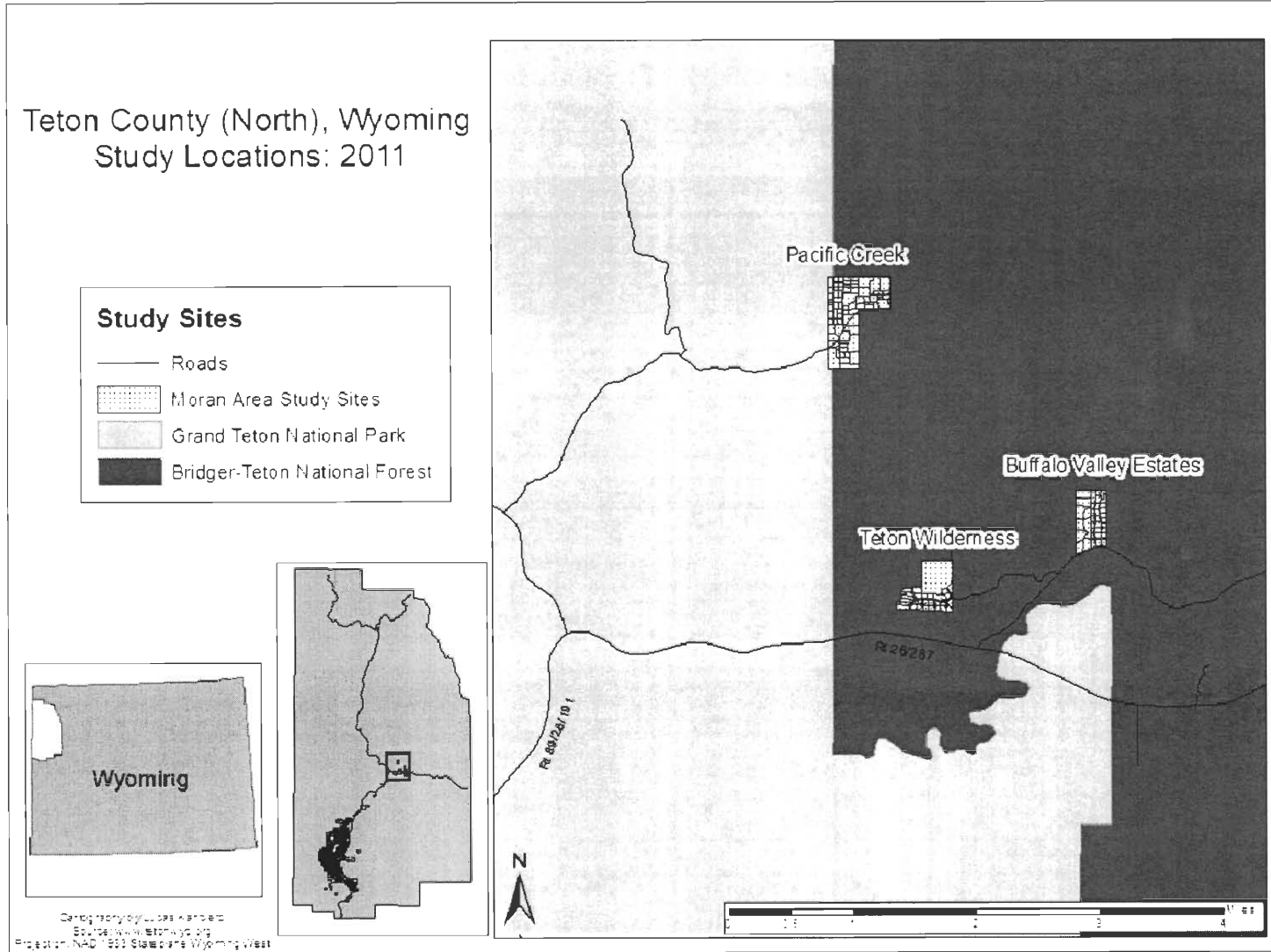
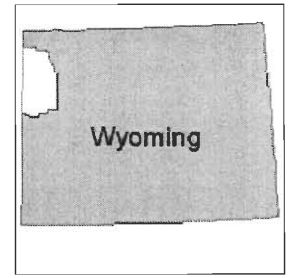


Figure 6. Teton County (North), Wyoming Study Locations: 2011

Teton County (South), Wyoming  
Study Locations: 2011

**Study Sites**

- Roads
- Jackson Sites
- ▨ Wilson/Fall Creek Rd Sites
- Bridger-Teton National Forest
- Property Ownership



Copyright by James Kander  
Source: www.tetonwyoming.org  
Projection: NAD 1983 StatePlane Wyoming West

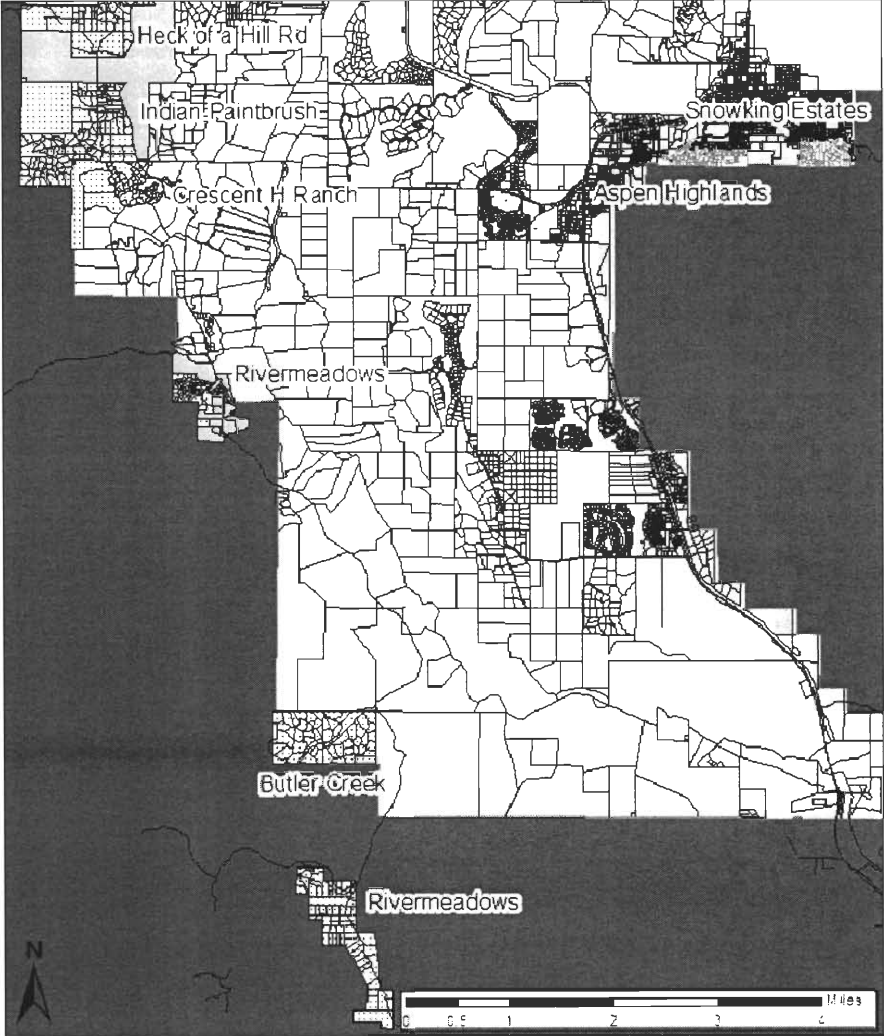
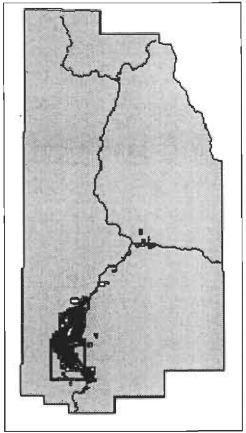


Figure 7. Teton County (South), Wyoming Study Locations: 2011



## Survey

The survey (Appendix A) used in the research is an adapted version of a survey developed by Bright and Burtz (2006). The survey was originally used to study local and seasonal resident's perceptions and activities about wildfire home protection in Northern Minnesota. The survey used in Teton County was modified to ask residents about their past wildfire experiences. To ensure confidentiality and anonymity no names or addresses were included and the three page survey was kindly approved by Western Michigan University's Human Subjects Institutional Review Board (HSIRB) (Appendix B). A list of wildfire home protection activity effectiveness questions were asked using a 1-5 Likert-type scale where 1= "Not at all effective" and 5= "Extremely effective". Residents were then asked if they do the same home protection activities with YES/NO questions. Originally, residents were to rank reasons why they do not do home protection activities where: 1 = the most important reason and 9 = the least important reason for not completing home protection activities. Residents were unsure of how to complete this ranking so the question was modified to a YES/NO questions after survey #17. A qualitative response question was asked to see how local and federal government agencies could help residents protect homes. Demographic questions concluded the survey asking if residents were full-time or part-time residents, how long they have lived in Teton County, gender, age, highest level of education, and approximate annual household income.

### Data Collection

Surveys were collected by going door-to-door and completing the survey face-to-face from mid-May through mid-August of 2011. Homes were visited between 10 a.m. - 6 p.m. Monday through Saturday. Response rates were highest later in the afternoon during the week with the exception of Saturday, where response rates were consistent throughout the entire day. Response rates were greatest in late July and August, especially when collecting seasonal resident's responses. If a home was visited, and no homeowners were present, the researcher returned at a later date to attempt to have a survey completed.

Surveying initially started out on foot in the town of Jackson where participant responses were good during the first week of data collection. A mountain bike was used to visit participant's homes as many residents live on long, rough, and steep roads in subdivisions in the town of Wilson along Fall Creek Road and in subdivisions around the town of Moran. Survey participants were generally very friendly and were pleased to see the researcher completing surveys on a bike. High response rates may attribute to the idea that many participants are either road or mountain biking enthusiasts based on conversations with participants. Response rates would have likely been lower if a vehicle was used drive to each individual household.

When contact was made with participants, a statement was made to communicate the researcher's name, affiliation with Western Michigan University,

and the purpose of the research. Many respondents invited the researcher into their homes and conversations would ensue about past wildfire experiences, what the residents currently doing to protect their homes against wildfires, or other interests or life stories they were willing to share.

Participants were either given the survey to fill out or had the researcher orally read survey questions and record the responses. Some residents were short on time at the moment of the initial visit and asked that the survey be left with them and asked that the researcher return at a more convenient time to pick up the completed survey. Some residents asked to return the completed survey by mail which was sent to the address provided on the HSIRB approval form.

### Analysis

Survey question responses were coded numerically and placed in a spreadsheet. Data was analyzed with PASW Statistics 18 (SPSS Inc., 2010) software provided by Western Michigan University's Department of Geography. Survey results were stratified into two independent groups of full-time residents (local/permanent) and part-time residents (seasonal). The null hypothesis ( $H_0$ ) for the research was that seasonal residents would self report similar wildfire experiences, the same perceptions about home protection activities, and carry out the same protection activities as local residents. The alternative hypothesis ( $H_1$ ) was that seasonal residents do not have the same wildfire experiences, the same perceptions about home protection activities, and do not do the same home protection activities.

Chi-squared tests were used to examine the association of past wildfire experiences and home protection activities between resident groups to see if the groups are significantly different. Chi-squared tests are useful to examine the independence of two variables by looking at differences or similarities between the variables (Bluman, 2009). Chi-squared test are also not affected by differences in sample size between groups. A significant difference between past wildfire experiences could be the causation of differing perceptions about home protection activities and if residents actually do home protection activities.

A student t-test was used to compare the means of the ranked responses about the effectiveness of wildfire home protection activities between local and seasonal residents. Given the number of responses, student t-test is not affected by differences in sample size. Significant differences between perceptions could have a direct impact on a homeowner's decision to complete home protection activities. If a homeowner perceives an action as an effective method of wildfire home defense, the homeowner is more likely to complete the activity compared to an action perceived as less effective. Again, the hypothesis is that seasonal residents do not have the same perceptions about the effectiveness of home protection activities in saving a home during a wildfire event.

## CHAPTER IV

### RESULTS and DISCUSSION

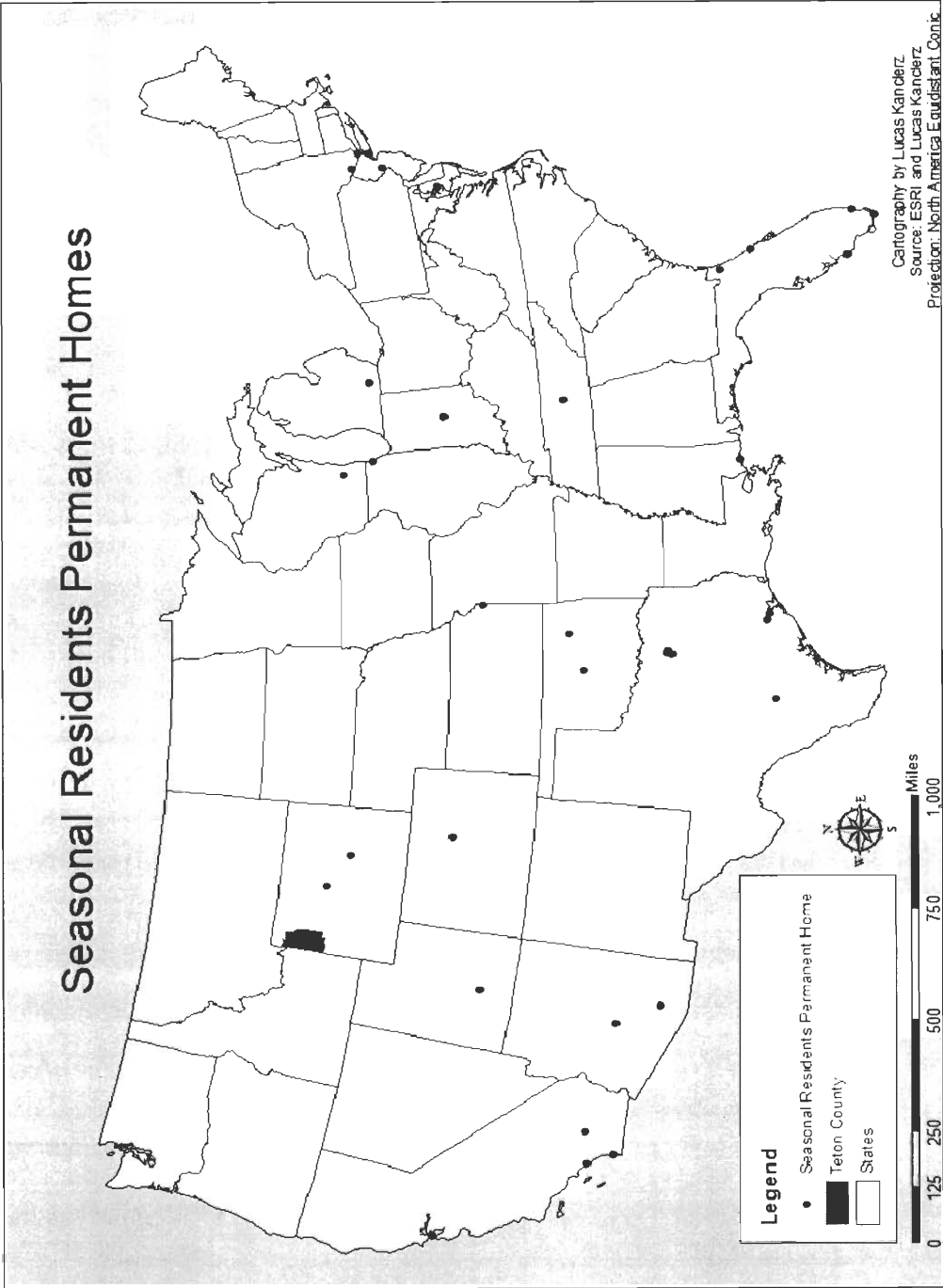
#### Survey Collection and Demographic Results

Two-hundred and nineteen surveys were collected face-to-face from mid-May through mid-August. Ten renters were surveyed but removed from the dataset as the research developed decided that home and property owners were the appropriate target group. A total of 169 local residents (n=169) were surveyed and have been living in Teton County for an average of 22.7 years. Sixty-two local participants are female and 107 are male. Participant's average age is 57 years old and the average education level attained by local residents is at least some college or a bachelor's degree. The approximate annual household income of local residents is \$100,000-\$124,000.

A total of 40 seasonal residents (n=40) completed the survey and reported owning a second home in Teton County for an average of 14.2 years. Fourteen seasonal participants participating in the survey are female while 26 participants are male. Seasonal resident's average age is just over 63 years old. The average education level attained by seasonal residents is a bachelor's degree or higher, and many respondents noted they have attained a Master's and Doctoral degrees. Approximate mean annual household income is \$150,000. Many of the seasonal residents' permanent places of residence is distributed across the United States with many living in larger cities and or the suburbs of the cities such as Dallas, TX , New York, NY,

and Los Angeles, CA (Figure 8) which supports Collins and Bolin (2009) claim of amenity migration from urban areas.

Figure 8. Seasonal Residents Permanent Homes



## Past Wildfire Experiences

Survey results indicate little proportional difference of past wildfire experiences between local and seasonal residents of Teton County. Most residents in both groups (~97%) report seeing the smoke from a wildfire at one point or another and at least 92% of both groups have witnessed first-hand the effects of a fire on a forest (Table 1). Some residents have had more direct experiences with the threat of losing their home due to a wildfire. Approximately 33% (56) of local and 40% (16) of seasonal residents have been evacuated from their home due to a threatening wildfire. Both groups appear educated on wildfire hazards as percentages are high for both when reading literature about wildfires or listening to a ranger or forest officials talk about fire. These experiences could have an impact on future decision making when deciding to do home protection activities.

Table 1

Proportion Differences of Local and Seasonal Residents Past Wildfire Experiences

<b>Past Wildfire Experience</b>	<b>Local</b>	<b>Seasonal</b>
No Experience	12.4%	11.0%
Observed smoke From a wildfire	97.0%	97.5%
Observed the effects of fire on forests	94.7%	92.5%
Been evacuated from my house due to a wildfire	33.0%	40.0%
Had personal property destroyed by wildfire	5.3%	5.2%
Been injured as a result of a wildfire	1.7%	0.0%
Had my work or livelihood affected by a wildfire	19.4%	8.1%
Changed plans for a recreational trip due to wildfire	47.9%	47.5%
Read literature about wildfire	82.2%	82.5%
Worked with wildfire as part of my job	15.9%	11.1%
Listened to ranger or other forest official talk about wildfire	68.6%	57.5%
Had other wildfire experiences	32.5%	37.5%
<i>*Green Knoll Fire</i>	13.6%	17.5%

The Chi-squared test ( $\chi^2$ ) of independence is used to analyze the association between resident groups and understand if there is a significant difference in past wildfire experiences between the groups. The null hypothesis ( $H_0$ ) is that local residents and seasonal residents will report the same wildfire experiences while the alternative hypothesis ( $H_1$ ) is that local and seasonal residents do not have the same wildfire experiences. A two tailed Chi-squared tests is completed using a confidence interval of 95% with a 'p value' of  $\leq 0.05$  being statistically significant. Table 2 does not indicate any statistically significant differences of past wildfire experiences between the two groups of local and seasonal residents. The p values are all greater than 0.05 and so  $H_0$  is accepted

Past wildfire experiences are important for creating a foundation of individual beliefs about the risk of wildfires for residents in WUI communities (Martin, Bender and Raish, 2007). A large percentage of both local and seasonal residents do have similar wildfire experiences (Table 1). The length of residency in the WUI is believed to increase the amount of hazard experiences and knowledge (Martin, Bender and Raish, 2007). Local residences' average length of residency in Teton County is 22.7 years while seasonal residents' length of part-time residency is 14.2 years. The approximate eight year difference between resident groups may not be significant due to the Green Knoll Fire that occurred in July of 2001. Experiencing the Green Knoll Fire is another wildfire experience listed most often by residents. Although a low percentage of residents listed the Green Knoll Fire as a wildfire experience (Table 1), many participants the researcher spoke with did mention the



Green Knoll Fire. Based on the length of residency for both groups, most participants would have been living or owned a home in Teton County during the Green Knoll Fire in 2001. This could lead to the conclusion that county residents know the risk and threat of wildfires is real. Based on similar past wildfire experiences and length of residency between the groups, Martin, Bender and Raish's (2007) belief of "novice" seasonal residents likely would not pertain to seasonal residents' of Teton County who were likely affected or at their second home when the Green Knoll Fire occurred. Considering past wildfire experiences are similar between both groups, it is likely that seasonal residents do the same home protection activities and believe they are effective.

These initial conclusions based on past wildfire experiences are not definite. Viteck and Berta (1982) believe that past hazard experiences may increase hazard perception, but not reduce overall risk. There is often continued risk taking which would indicate residents may not be doing home protection activities even though they know that wildfire risks are present.

Table 2

 $\chi^2$  Test of Past Wildfire Experiences Between Resident Groups

Past Wildfire Experience	$\chi^2$ Result (Sig. p <0.05)
No Experience	$\chi^2 = 0.171, p = 0.679$
Observed smoke From a wildfire	$\chi^2 = 0.146, p = 0.702$
Observed the effects of fire on forests	$\chi^2 = 0.023, p = 0.880$
Been evacuated from my house due to a wildfire	$\chi^2 = 0.716, p = 0.397$
Had personal property destroyed by wildfire	$\chi^2 = 0.006, p = 0.940$
Been injured as a result of a wildfire	$\chi^2 = 0.716, p = 0.397$
Had my work or livelihood affected by a wildfire	$\chi^2 = 3.235, p = 0.072$
Changed plans for a recreational trip due to wildfire	$\chi^2 = 0.000, p = 0.987$
Read literature about wildfire	$\chi^2 = 0.012, p = 0.913$
Worked with wildfire as part of my job	$\chi^2 = 0.890, p = 0.345$
Listened to ranger or other forest official talk about wildfire	$\chi^2 = 0.008, p = 0.928$
Had other wildfire experiences	$\chi^2 = 0.328, p = 0.567$

Wildfire Home Protection Effectiveness Perceptions

Residents were asked how effective they believed the wildfire home protection activities would be in defending their home in the event of a wildfire. A 5 point Likert-type scale was used to determine residents' perceptions with 1=Not at all effective through 5=Extremely effective. Each home protection activity (Table 3) is extremely effective in protecting homes against wildfires (Bright and Burtz, 2006). The average response rates for both groups of local and seasonal residents to these sets of questions are similar. Results indicate that most residents perceive these activities as moderately effective (3) to quite effective (4). Both local and seasonal residents perceive building with non-flammable material as the most effective home protection activity (4.3 for both groups). The lowest ranked wildfire home protection activity is the cleaning of roof surfaces to avoid accumulation of leaves, twigs, or

other organic material (Local=3.5 and Seasonal=3.4). This should be of greatest concern of homeowners because a large percentage of homes destroyed or damaged during a wildfire occur when burning embers landing on roofs of homes (Firewise Wyoming, 2003). Response rates about the effectiveness of burying LPG propane tanks underground was lower due to the fact that many residents were unsure on how effective burying a propane tank underground would be during a wildfire or why propane tanks should be buried.

Table 3

Perceived Wildfire Home Protection Effectiveness Averages on 5 point Likert Type-Scale Question (1=Not at all effective though 5=Extremely effective)

Home Protection Activity Perceptions	Local	Seasonal
Cleaning roofs surfaces to avoid accumulation of leaves and twigs	3.5	3.4
Remove dead and overhanging branches from within 10ft of your roof	4.2	4.2
Use non-flammable building materials	4.3	4.3
Stack wood or lumber at least 30ft from house	3.8	4
Prune trees up to 10ft to eliminate ladder fuels on property	4	4.1
Maintain an irrigated green area around your home using grass, a flower garden, or ornamental shrubs	4	3.7
Reduce the density of trees within 100ft of your home	4	4.2
Clear vegetation and dead leaves from property	3.8	3.9
Bury propane tanks underground	3.8	4.1

A Student's t-test was completed on ranked results to analyze wildfire home protection perceptions and understand if there are significant differences of perceptions between local and seasonal residents. A two tailed significance of 95%

( $p \leq 0.05$ ) is used to determine if there is a significant difference in responses between local and seasonal residents.

No home protection activities have a significance level equal to or lower than 0.05 (Table 4). Burying propane tanks underground has the most variance of perceived effectiveness ( $t = -1.550$ ,  $p = 0.069$ ). Greater variance could be attributed to the issue of many participants telling the researcher they had no knowledge of the effectiveness of burying a propane tank underground and were unsure how to perceive the effectiveness. This could be a problem for homeowners who have a large propane tank above ground or are planning to have one in the future. Burying propane tanks is very effective when mitigating a home against wildfires as propane in the tank expands from the radiant heat of a wildfire which then is vented and can add dangerous heat and fuel to a wildfire. Burying the tank underground can provide enough protection to keep the propane gas from heating, expanding, and being leaked and adding fuel to a fire (Jackson Hole/Fire EMS, 2012).

It is interesting that the results of the analysis are insignificant. Understanding that both groups have similar perceptions and that there is little to no significance indicates that the null hypothesis of local and seasonal residents having the same perceptions of wildfire home protection effectiveness cannot be rejected. On average both groups have perceived most activities as moderately to quite effective in protecting homes against wildfires. These results potentially indicate that since there are no significant differences in perceptions, wildfire hazards between local and seasonal residents may be a smaller problem than initially hypothesized (McCaffery,

2004) at least in this geographic area. Wildfire home protection activities are related to the Protection Motivation Theory (PMT) where people are motivated to do beneficial activities to avoid risk, which in this case is home destruction from wildfires (Martin, Bender, and Raish, 2007). Higher perceptions about the effectiveness may coincide with the Transtheoretical Model (TTM) where the decision process and actions to prevent risk of wildfires are more likely to be completed. When residents perceive Firewise activities as very effective in protecting their home against wildfire, they are more likely to do that activity compared to a different activity deemed as not very effective.

Table 4

Student's T-test on Wildfire Home Protection Activity Effectiveness Perceptions

Home Protection Activity Perceptions	Student t-test Result (2-tailed) (Sig. p <0.05)
Cleaning roof surfaces to avoid accumulation of leaves and twigs	t = 0.448, p = 0.654
Remove dead and overhanging branches from within 10ft of your roof	t = -0.254, p = 0.800
Use non-flammable building materials	t = -0.170, p = 0.865
Stack wood or lumber at least 30ft from house	t = -1.099, p = 0.273
Prune trees up to 10ft to eliminate ladder fuels on property	t = -0.528, p = 0.598
Maintain an irrigated green area around your home using grass, a flower garden, or ornamental shrubs	t = 1.338, p = 0.259
Reduce the density of trees within 100ft of your home	t = -0.952, p = 0.342
Clear vegetation and dead leaves from property	t = -0.095, p = 0.924
Bury propane tanks underground	t = -1.550, p = 0.069

### Resident Wildfire Home Protection Completion

Residents were next asked if they completed the wildfire home protection activities listed in Table 5. Proportionally, results are similar between local and seasonal residents. A large percentage of residents for each group reporting do complete the listed wildfire home protection activities. The home protection activities of using non-flammable building material and the precaution of stacking wood or lumber at least 30 feet from a resident's home appear to have the least difference as responses were split almost evenly for both groups with respect to participation for two activities within each group.

When describing the differences within the groups, many residents pointed out the higher associate costs of building with non-flammable materials such as Class A roofing. Most Class A materials require gypsum under a non-combustible roof surface which provides one hour of ignition protection (Slack, 2000). Some residents acknowledged that their homes are built with flammable materials such as wooden shake shingles or their home is built from wooden logs. Many stated that they like the aesthetics of their home and how it blends in with their natural surroundings.

The marginal variance of stacking wood or lumber at least 30 feet for residents of each group is likely associated with the dry continental climate where most precipitation falls as snow in the study area (USFS, 2011). Residents who did not stack wood 30 feet from their home specifically explained that they did not feel this was necessary and kept wood or lumber close to their home so access would be

easier during the winter. Some residents explained that if a wildfire were occurring they would relocate wood or lumber a farther distance from their home.

Participants who did not answer specific activities or activities that could not pertain to a homeowner were recorded as non-applicable (N/A) in Tables 5 and 6. The highest rates of N/A responses were found with cleaning roof surfaces to avoid accumulation of leaves and twigs and burying propane tanks underground. Many residents stated that their roof had a high pitch which allowed materials to slide off and that snowfall would slide off roofs cleaning any debris that was present. Burying propane tanks underground also received a large percentage of N/A responses due to many residents not using propane fuel to heat their home.

Table 5

Local Resident Wildfire Home Protection

<b>Home protection activity (Local Residents : n =169)</b>	Yes	No	N/A
Cleaning roofs surfaces to avoid accumulation of leaves and twigs	68%	21%	11%
Remove dead and overhanging branches from within 10ft of your roof	72%	26%	2%
Use non-flammable building materials	52%	45%	3%
Stack wood or lumber at least 30ft from house	50%	45%	5%
Prune trees up to 10ft to eliminate ladder fuels on property	60%	36%	4%
Maintain an irrigated green area around your home using grass, a flower garden, or ornamental shrubs	80%	20%	0%
Reduce the density of trees within 100ft of your home	56%	40%	4%
Clear vegetation and dead leaves from property	80%	18%	2%
Bury propane tanks underground	31%	28%	41%

Table 6

## Seasonal Resident Wildfire Home Protection

Home protection activity (Seasonal Residents: n=40)	Yes	No	N/A
Cleaning roofs surfaces to avoid accumulation of leaves and twigs	45%	25%	30%
Remove dead and overhanging branches from within 10ft of your roof	80%	12%	8%
Use non-flammable building materials	50%	47%	3%
Stack wood or lumber at least 30ft from house	47%	47%	6%
Prune trees up to 10ft to eliminate ladder fuels on property	65%	32%	3%
Maintain an irrigated green area around your home using grass, a flower garden, or ornamental shrubs	78%	22%	0%
Reduce the density of trees within 100ft of your home	70%	30%	0%
Clear vegetation and dead leaves from property	77%	20%	3%
Bury propane tanks underground	40%	12%	48%

The Chi-squared test ( $\chi^2$ ) analyzes the association and independence between both groups and activities to determine if there is a significant difference with wildfire home protection completion between the groups. The null hypothesis is that local residents and seasonal residents participate in the same wildfire home protection activities while the alternative hypothesis and claim is that local and seasonal residents do not complete the same activities at the same rate. Two tailed Chi-squared tests were completed using a confidence interval of 95% with a 'p value' of  $\leq 0.05$  being statistically significant.

Firewise activities in Table 7 have little significance between the two groups of local and seasonal residents. Burying propane tanks underground is the only activity that is statistically significant between the groups ( $\chi^2 = 4.151$ ,  $p = 0.042$ ). Significance likely relates to the varied perceptions of residents as the result show in



the previous section. Many residents do not know how effective burying a propane tank underground would be which could lead to residents' not burying propane tanks underground. These results then indicate that wildfire hazard vulnerability between local and seasonal residents may not be a substantial problem in Teton County, Wyoming. Data indicates that seasonal residents do have similar knowledge when compared to local residents to mitigate homes and reduce the risk of wildfires. This result, however, contrasts with the findings of Martin, Bender and Raish (2007) described in WUI communities of northern and central Colorado and central Oregon.

Both resident groups have similar perceptions regarding the effectiveness of wildfire home protection activities in Table 7. As mentioned in the previous section, the Transtheoretical Model (TTM) is directly related to perceptions and the actual action of doing an activity to reduce risk (Martin, Bender and Raish, 2007). Local and seasonal residents of Teton County have similar perceptions and solutions to the wildfire problem which do not coincide with the results and conclusions that Hammer, Stewart, and Radeloff (2009) found for the majority of the western U.S WUI. Small variances in perceptions have led to similar actions for both groups which thus reduces wildfire hazard vulnerability for the whole community.

Survey results suggest different types of residents of Teton County do not have different perceptions and solutions to the wildfire problem. Similarities between local and seasonal residents indicates that seasonal residents are not the 'ignorant tourists' of the stereotype and clearly recognize wildfire threats and take necessary

steps to reduce risk for their homes and to neighboring properties (Winter and Fried, 2000).

Table 7

$\chi^2$  Test of Wildfire Home Protection Completion

Home protection activity completion	$\chi^2$ Value (Sig. $p \leq 0.05$ )
Cleaning roofs surfaces to avoid accumulation of leaves and twigs	$\chi^2 = 1.637, p = 0.201$
Remove dead and overhanging branches from within 10ft of your roof	$\chi^2 = 2.789, p = 0.095$
Use non-flammable building materials	$\chi^2 = 0.053, p = 0.817$
Stack wood or lumber at least 30ft from house	$\chi^2 = 0.075, p = 0.784$
Prune trees up to 10ft to eliminate ladder fuels on property	$\chi^2 = 0.244, p = 0.621$
Maintain an irrigated green area around your home using grass, a flower garden, or ornamental shrubs	$\chi^2 = 0.178, p = 0.673$
Reduce the density of trees within 100ft of your home	$\chi^2 = 1.881, p = 0.170$
Clear vegetation and dead leaves from property	$\chi^2 = 0.078, p = 0.780$
<b>*Bury propane tanks underground</b>	<b><math>\chi^2 = 4.151, p = 0.042</math></b>

*\*Indicates Significant Difference*

Reasons for not Completing Home Protection Activities

Participants were asked about what would keep them from completing wildfire home protection activities to understand other potential causes of hazard vulnerability. Of the participants who responded, the 84% of local and 90% of seasonal residents (Table 8) acknowledged that they do some or all of the wildfire activities described in the previous sections of this chapter. Data does suggest that the financial burden of home protection activities is a greater impediment to completing home protection by local residents as compared to seasonal residents. Approximately 20% of local residents believe not having enough money would be a cause for not

completing home protection activities compared to 5% of seasonal residents (Table 8). Seasonal residents have an average annual household income of \$150,000 which indicates seasonal residents have the economic capabilities to hire a contractor to complete Firewise landscaping or buy the proper non-flammable building material for their home. These results are similar to those found by Collins and Bolin (2009) with WUI communities of the White Mountains in Arizona. Affluent seasonal residents had the economic power to reduce wildfire risks while many local residents with a lower income were less able to complete and pay for home protection activities.

A higher proportion of seasonal residents (31%) felt wildfire home protection activities were also not practical on their property as compared to local residents (18%). Discussions with seasonal residents about why they believe some home protection activities are not practical on their property revealed they know they should do those activities but choose not to. Seasonal residents stated that they own a second home in Teton County for the beauty, nature, and environment that their home provides in the WUI. Completing home protection activities such as reducing the density of trees within 100 feet of their home would detract from the natural beauty and reason why they have property in the county. Residents are willing to take the risk despite recognizing that ignoring these measures might result in the loss of their home and homes of their neighbors.

There was a large range of qualitative responses from both local and seasonal residents who listed other reasons for not completing home protecting activities (Table 8). Some residents were very honest and upfront saying they are just too

“lazy” to perform Firewise activities. Some felt doing these activities would lower their property value and reduce the aesthetics and so they chose not to. Other participants believe that if a wildfire is going to occur, there is little that can be done to protect homes from being destroyed. One local resident was very opposed to home protection activities. The participant believes that home protection activities will not be effective in defending his home and wants the U.S. Forest Service to provide evidence that these activities are effective. This local resident also believes that people who live in the WUI need to be willing to accept the risk of losing their home during a wildfire. It is likely that this one resident’s beliefs are not isolated, but that other residents share the same belief. For future research, residents could be asked about why they do not do home protection activities, even if there is one activity that is not completed.

Table 8

Residents Reasons for Not Completing Home Protection Activities

<b>Reasons for not completing home protection activities</b>	<b>Local</b>	<b>Seasonal</b>
I don't have enough time	20%	13%
I don't have enough money	20%	5%
I don't have the physical ability	12%	13%
I already do some or all these activities	84%	90%
I think it is the fire department's/forest service responsibility to do these activities	5%	0%
It is not practical on my property	18%	31%
I don't know what kind of activities to do	1%	5%
I don't know how to perform the activities	2%	0%
Other	20%	18%

## Qualitative Responses

Residents were also asked to share ideas regarding about how government agencies such as Teton County, Jackson Hole Fire/EMS, the U.S. Forest Service, and National Parks Service could help in carrying out home protection activities.

Responses were analyzed by examining common themes and ideas that residents felt would be beneficial to reducing wildfire risks. Some responses were in-depth and had more than one theme and therefore analyzed based on all content within the response (Appendix C). Of the 177 responses to this question, the most common responses were “education” and “distribution of information” (Table 9).

Table 9

How Teton County, WY Residents Feel Local and Federal Agencies Can Help Carry Out Wildfire Home Protection Activities

Common Themes of Residents Responses	
Education/Information	45%
Fuel Reduction	25%
Already doing good job	12%
Home Owner Responsibility	5%
Home Visits/Assessments	12%
Other	10%

Many survey participants appeared eager to learn what they could do to protect their home and acknowledged they could be more proactive when mitigating their home and property against wildfires. In terms of educating home owners about the importance of Firewise activities, some residents suggested numerous mediums and methods of public outreach. Distributing brochures/literature illustrating what

home protection activities to complete and how they defend the home against a wildfire was the most common method suggested to provide information to the public.

Others mentioned using media such as newspapers, television, and radio as other methods to remind and inform residents what to do each season. Public service announcements similar to changing batteries in your smoke detector were some useful suggestions, except the announcement would be done to remind people to do Firewise landscaping before the peak of the upcoming wildfire season. Others would like see more information or advertisements for seminars, demonstrations, and public meeting so they can interact with government officials and learn what home protection activities apply most to their home and property.

Some residents would like to see more onsite visits and inspections by experts and forest officials on what they can do to become more Firewise. Professional consultation could boost homeowner confidence of home protection activities compared to residents guessing on their own what activities would be effective on their property. Information could possibly spread to neighboring residents which may further reduce wildfire vulnerability for a whole community with more residents participating in home protection activities. One resident believed the more people who recognized the benefits of Firewise activities, the more “sense of belonging”, would emerge. These suggestions allude to positive peer pressure as an educational method of reducing the risk of losing homes during a wildfire event. Creating

homogenous beliefs and actions though knowledge sharing could potentially reduce hazard vulnerability (McCaffery, 2004).

Many residents voiced their concerns related of downed and dead trees in the adjacent wildlands of the Bridger-Teton National Forest and Grand Teton National Park. Bark beetle infestations have led to numerous dead trees within these federally managed areas. Page and Jenkins (2007) measured lodgepole pine stands in different national forests of the American West and found that surface fire spread, fireline intensities, and crown fire potential increased in current and post-epidemic stands. Increased fire activity is likely associated with dead needles that have fallen to the forest floor, which can burn easily and at high intensities from the increased fuel load.

Approximately 25% of residents would like to see more fuel reduction projects directed at bark beetle infested trees and downed timber take place within federally owned lands adjacent to homeowner's private property. Responses consisted of general suggestions directed at agencies such as the U.S. Forest Service and National Park Service of becoming more "proactive" and to "lead by example" by managing forest fuels and reducing the fire hazard next to WUI subdivisions. Proactive activities mentioned ranged from helping residents remove "slash" or fallen limbs from private and public land, reduce ladder fuels, or complete small controlled/prescribed burns to eliminate fuel loads next to residences. Other suggestions for fuel reduction are to offer "grants", "subsidies" or "funding" to homeowners or subdivisions to reduce potential wildfire fuel on private property. Some residents claimed they wanted to remove trees killed by bark beetle, but that

hiring a contractor to remove these trees is too expensive. If residents are not able to remove infested trees and fuels continue to build up, potential does exist for large fires to occur in these areas. Overall concern about forest fuels and fuel education among Teton County residents surveyed is similar to what Brenkert-Smith, Champ, and Flores (2005) observed in Larimer County, Colorado.

Residents who described fuel reduction as a way agencies could help homeowners were informed by the researcher of the Proposed Action Teton to Snake Fuels Management Project (USFS, 2011). The fuel management project is a proposed action to implement fuel management practices of approximately 80,000 acres to insure firefighter and public safety, reduce wildfire hazards to 1,579 private property plots plus the Bonneville Power Administration powerline, and allow forest management to move from fire suppression activities to a natural fire regime (USFS, 2011). The majority of both local and seasonal residences held a favorable view of the Teton to Snake Fuels Management Project and would like to see the proposed action come to fruition.

Teton County resident's suggestions of how agencies could help carry out home protection activities compliment previous research where residents believe the wildfire education and management of public land is the responsibility of the government (Winter and Fried, 2000). Teton County residents must understand that government agencies can only do so much to help residents. Homeowners need to be responsible for their own property and be Firewise to protect their own home and their neighbors (USFS, 2011).



### Researcher Observations

During the data collection process, the researcher met residents, both local and seasonal, with varied perceptions about the extent of wildfire risk in Teton County. Although the information is anecdotal, it is important to mention. When asking residents if they do complete home protection activities, some residents believed they were completing a home protection activity whereas the researcher believed they were not. This occurred with some residents from both groups. Each resident has their own subjective belief of what activities are necessary to associate safety of home and property and how well they are doing the activity. These subjective beliefs could become a problem if one resident is not completing Firewise activities or if they are not doing activities properly. In terms of future research, a Likert-type scale survey asking residents on how well they think they are completing home protection activities may be more useful with people subjective beliefs.

Some residents voiced this concern about a neighbor not completing home protection activities. In the Indian Paintbrush subdivision, the neighbor of the participant who is opposed to all home protecting activities, is very concerned about the risk this neighbor is creating to his residence. These two participants are local residents and experienced the Green Knoll Fire but clearly this experience left very different impressions.

This was not an isolated occurrence. A participant in Buffalo Valley was very concerned about the neighboring piece of property to his home. The land is owned by a person who lived in a different state and therefore the property was not maintained.

Downed trees and limbs have accumulated on the vacant property (Figure 9). The participant gave consent to the researcher to photograph the proper landscaping and Firewise activities he completed compared to the property adjacent to his (Figure 10). The participant stated that he felt “vulnerable” if a wildfire were to occur, especially since he was not able to remove any trees, limbs, or organic debris on the vacant property.

The feelings these residents presented are representative of the relationship between differences in home protection activities and potential wildfire hazard vulnerability. The home and property owners who do not actively mitigate their home and property are placing those around them at risk (Collins and Bolin, 2009).

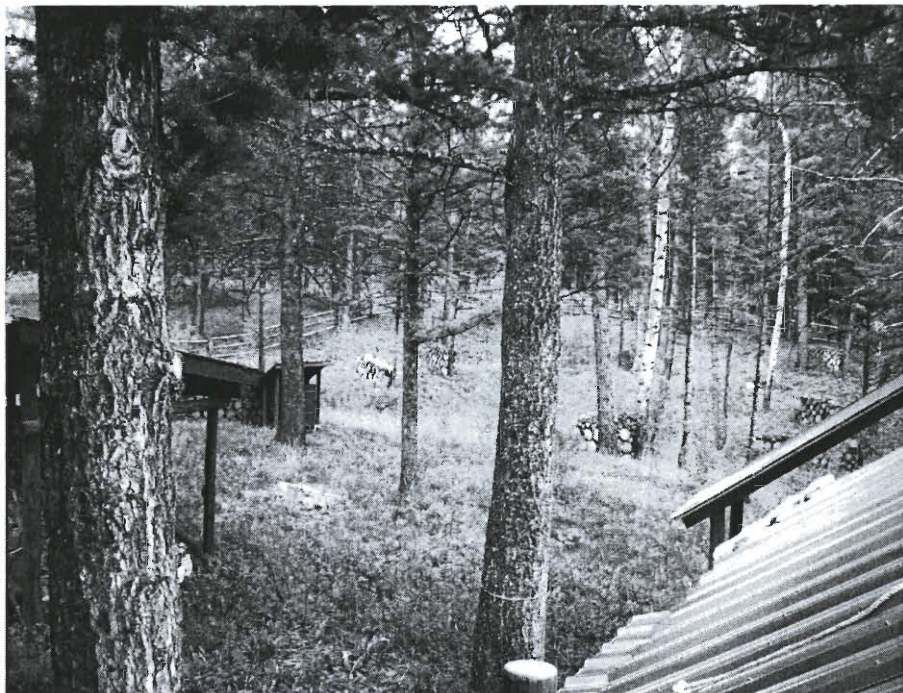
A theme or statement by some participants of both groups is that “if a fire is coming, it’s coming”. They explained there is little they believed that could be done to protect a home in some locations throughout the county. They understand their home and property are at risk and that in the event of a wildfire, the only thing they can do is pack up their most precious valuables and evacuate.

Other reasoning for not completing home protection activities, particularly reducing the density of trees from property, is that it would eliminate the natural aesthetics of their property. Shade, wildlife, privacy, and views were believed to be altered if all home protection activities were completed. Concern over property value loss was another reason for not doing all home protection activities. These preferences are what Collins and Bolin (2009) cited as factors that could elevate wildfire hazard vulnerability. Some participants refuse to maintain an irrigated green

Figure 9. Wildfire Vulnerability (Source: Lucas Kanclerz)



Figure 10. Proactive Firewise Activities (Source: Lucas Kanclerz)



area around their home and property citing that they do not like lawns or want to have to mow grass.

From conversations with residents, the researcher also could not help but notice the wide range of political views in regards to government agencies land and fire management programs. As data in Table 9 indicates, 12% of residents feel the U.S. Forest Service, National Parks Service, and Jackson Hole Fire/EMS are already doing a great job in helping residents deal with wildfire threats. There are also those who disagree. Some residents also voiced their negative opinions about the 2006 Wildland Urban Interface Code. Citing cost and irrelevance of the code to their home, at least one resident was angered when they were required to buy and install an interior sprinkler system within a new addition built to his home which the participant did not deem necessary. This individual would like to see WUI Codes changed so codes specifically pertain to the type of community where they are being implemented instead of housing one set of codes for the whole country. There also seemed to be judgmental views among some residents based on who was a Democrat or Republican and how that person protects his or her home. These views could be a future topic of research.

Residents should be aware that completing Firewise activities cannot only save a home from being destroyed, but that wildland firefighters are more likely to protect a home with adequate defensible space depending on fire behavior. Safety is the most important concern of wildland firefighters, where safety can become easily

compromised in the WUI (NWCG, 2010). Wildland firefighters Incident Response Pocket Guide, which all wildland firefighters are required to carry, states:

“Do not commit to stay and protect a structure unless a safety zone for firefighters and equipment has been identified at the structure during sizeup and triage. Move to the nearest safety zone, let the fire front pass, and return as soon as conditions allow” (NWCG Incident Response Guide, 2010, 11)

Residents should acknowledge that safety is the most important priority for all those working to control a wildfire. It could be assumed that wildland firefighters are more likely to put forth the effort to save a home whose homeowner has taken the time to mitigate and protect a home before a wildfire does occur. If a home does not have adequate defensible space, firefighters will pass on protecting a home due to safety concerns.

The more homes with defensible space, the safer a community is against the threat of wildfires. Making people mitigate homes and property against wildfires is a difficult action to achieve. The researcher recognized that peer guidance and leadership seems to be the best approach in accomplishing wildfire protection within a whole subdivision. While completing surveys in Pacific Creek, numerous residents discussed how they are very Firewise and proactive with protecting their homes. A resident within the community is a retired forest ranger with the Shoshone National Forest in Wyoming. He created a fuel reduction project for the community. Residents the researcher spoke with described how their neighbor went around individually to each resident who was willing to participate and provided recommendations and explanations as to why they should do the home protection activities. From what the



researcher observed, most residents in the community took their neighbors advice and did complete the recommended activities.

In regards to more peer-to-peer interaction, a resident described an up-front approach of having people understand the risk they are at if they do not complete home protection activities. This resident recommended having someone from outside Teton County who has lost a home to a wildfire, come and speak to WUI residents. Such an informant could explain how their home and property was in the same condition as some people living in WUI zones of Teton County. Shared experiences of someone who has lost a home to a wildfire would provide supporting evidence to the experts working to educate residents about the importance of home protection activities.

While completing surveys, the researcher did visit many residences where no one was home. The researcher did attempt to revisit these homes numerous times throughout the summer, but was unsuccessful in surveying all of these homeowners. These homes are likely seasonal residences based on the long grass in yards and that most had blinds that were pulled in front of windows. If these residences are vacant for most of the summer, it could be inferred that there is a large accumulation of down fuels around the home and property. These homes could be placing others at risk since they are not being properly mitigated through the absence of the homeowner.

The use of certain material for roofing can place homes at risk as most homes destroyed by a wildfire are ignited by burning embers falling on the roof (Firewise

Wyoming, 2006). Wooden shake shingle roofs are often used in WUI communities for their aesthetic appeal. Shake roofs are very flammable, and despite being treated with fire retardant, where new treated roofs soon lose this protection due to the elements such as sunlight and leaching which lower the fire resistance (Smith, Christopherson, and Adams, 1992).

In at least one subdivision, the homeowner's association (HOA) rules required that homes have shake shingle roofing. Some residents the researcher spoke with were not in agreement with this rule, and did everything they could while following HOA rules to make sure their roof was not going to be vulnerable in the event of a wildfire. There could be some other motivations to switch from shake roofing to a safer alternative. A resident of the Indian Paintbrush subdivision recently bought his home, but described how he could not attain homeowners insurance through a major insurance company due to the wooden shake shingles on his home.

Wildfire protection between residents, no matter if residents are full-time or seasonal, is not the same from community to community or even from home to home. Education and guidance from outside sources should be welcomed and accepted. Implementation of rules or laws may only cause resentment toward the goal of county wide wildfire protection activities. Homeowners are responsible for the protection of their home and need to make a conscience effort to mitigate and realize they not only risk the loss of their own home and property, but can affect their neighbors as well.

## CHAPTER V

### CONCLUSIONS

Research has indicated that there is not a significant difference in perceptions and wildfire home protection activities between different types of residents living in the wildland urban interface of Teton County, Wyoming. These results lead to the conclusion that seasonal residents are not creating hazard vulnerability to local residents by reducing the biophysical fuel distributed around homes and property (Collins and Bolin, 2009). Teton County residents, both local and seasonal appear to have the same experiences and knowledge. They understand that the threat of wildfire is real and how to reduce risk through Firewise activities.

Residents are able to recognize the benefits of completing home protection activities and have the adaptive capacity to perceive and understand the wildfire hazard by following through with the solutions to reduce the risk (Martin, Bender, and Raish, 2007). Most local and seasonal residents appear to have the same adaptive capacity toward wildfires which can reduce fragmentation and creates a safer, homogeneous community.

Although data suggest these conclusions, observations indicate that the ability to recognize the wildfire hazard and reduce the risk toward homes does not always transition into reality. Observing and listening to residents discuss reasons why they do not complete home protection activities indicates that some local and seasonal residents in the county have accepted the wildfire risk and are willing to lose their



home. This sentiment may not resonate with all residents, particularly those who have done everything they are capable of to protect their home.

Unfortunately there is no easy solution to the wildfire problem, and as many forest and fire officials the researcher spoke with state, it is not *if* a fire occurs, it is *when* a fire occurs, which creates problems for the future. Reducing risk through wildfire home protection activities is the best method to meet this objective. Home owners are ultimately responsible for reducing risks around their home and furthermore, reducing the wildfire risk to their neighbors and community. Not all home owners take responsibility to protect their home and that creates risk to neighboring residents in Teton County. Creating incentives may be a possible solution to have a higher rate of participation.

Forest officials and land managers could propose a friendly competition to judge which subdivision is the most Firewise. Competing between subdivisions and possibly publishing the results for the public to view may create more participation so that a subdivision is not deemed hazardous, or even worse, vulnerable to wildfire destruction. A competition could potentially build stronger community relationships as well, where neighbors may be more willing to help residents who may not have the capabilities to complete Firewise activities due to age, costs, or if neighbors are seasonal and are not in Teton County as often to protect their home on a regular basis.

Building a stronger, more homogenous community could be completed through the homeowners themselves without any outside incentive. Homeowners should value the fact that Firewise activities will increase the chance of home survival

is a wildfire were to occur, but Home Owners Associations (HOA) could take the lead and provide incentives from within, Reduction of HOA dues for a selected amount of time could be used for those who are proactive in reducing risk around their home is one suggestion. A community resident could be designated Firewise leader, with the proper training, to visit individual homes and make suggestions and alternatives to reduce the wildfire risk. This method appeared to work within Pacific Creek residential areas where peer-to-peer mentoring had a great effect on the amount of residents participating in home protection activities. A weekend or week could be designated in each subdivision for wildfire home protection activities followed by a community wide party for those who participated. This could create personal incentive to avoid being felt like a homeowner is left out of the club or group for not protecting their home and the community and missing out of reward.

Finally, the U.S. Forest Service, National Parks Service, Jackson Hole Fire/EMS and Teton County have been proactive in educating the public living in WUI areas of the county. Seminars, distribution of brochures and pamphlets, and visits by forest service personal have been greatly appreciated by many residents who were surveyed. Homeowners should not be the only people educated about wildfires. Schools within wildfire prone areas should include curriculum about not only wildfires, but all hazards and how to prepare for them (Vitek and Berta, 1982). Continued education and personal interaction of agencies with residents is the key to having county wide protection when the next wildfire threatens Teton County residents.

## Appendix A

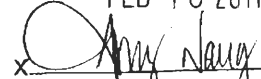
### Survey

WESTERN MICHIGAN UNIVERSITY

H. S. I. R. B.

Approved for use for one year from this date:

FEB 16 2011

X   
HSIRB Chair

## CONSENT FORM

You are invited to participate in a Western Michigan University research project entitled "Understanding Hazard Vulnerability between Local and Seasonal Residents based on Home Protection Activities in Teton County, Wyoming". The study is designed to analyze how residents protect their homes against wildfires and perceptions about doing these activities. Information may help government and private agencies understand what residents know about wildfire hazards which could lead to improved educational programs. The study is being conducted by Dr. Lisa M. DeChano-Cook and Mr. Lucas J. Kanclerz from the Department of Geography of Western Michigan University. The research is being carried out for part of the thesis requirements for Mr. Lucas J. Kanclerz.

Your responses will be completely anonymous, please do not put your name or address anywhere on this form. You may choose not to answer any question by leaving the question blank. If you do not want to participate in the survey, please tell the researcher and return the survey. Returning the completed survey indicates your consent for the use of the answers you supply. If you have any questions, you may contact Dr. Lisa M. DeChano-Cook at (269-387-3536 or [lisa.dechano@wmich.edu](mailto:lisa.dechano@wmich.edu)), Mr. Lucas J. Kanclerz at (315-886-1330 or [lucas.kanclerz@wmich.edu](mailto:lucas.kanclerz@wmich.edu)), the Human Subjects Institutional Review Board (269-387-8293) or the vice president for research (269-387-8298).

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Subjects should not participate in this project if the stamped date is more than one year old.

### Contact Information:

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Survey Code: \_\_\_\_\_

## Wildfire Vulnerability Survey

1. Do you rent this residence? \_\_\_\_\_ YES \_\_\_\_\_ NO

2. Please tell about your experiences you have previously had related to wildfire in a National Forest or other natural area.

*Please check all that apply.*

- \_\_\_\_\_ Have had no experience with wildfires of any kind.
  - \_\_\_\_\_ Observed smoke from a wildfire
  - \_\_\_\_\_ Observed the effects of fire on forests
  - \_\_\_\_\_ Been evacuated from my house due to a wildfire
  - \_\_\_\_\_ Had personal property destroyed due to a wildfire
  - \_\_\_\_\_ Been injured as a result of a wildfire
  - \_\_\_\_\_ Had my work or livelihood affected by a wildfire
  - \_\_\_\_\_ Changed plans for a recreational trip due to a wildfire
  - \_\_\_\_\_ Read literature about wildfire (books, brochures, newspaper/journal)
  - \_\_\_\_\_ Worked with wildfire as part of my job
  - \_\_\_\_\_ Listened to a ranger or other forest official talk about wildfire
  - \_\_\_\_\_ Had other wildfire experience (please describe below)
-

3. Please indicate how EFFECTIVE you think each of the following home protection activities would be in protecting from wildfire. *Please circle the number of your response for each statement.*

Activity	Not at all effective	Slightly effective	Moderately effective	Quite effective	Extremely effective
Cleaning roof surfaces/gutters to avoid accumulation of leaves and twigs	1	2	3	4	5
Remove dead and overhanging branches from within 10ft of your roof	1	2	3	4	5
Use non-flammable building materials (tile, slate, brick, stone)	1	2	3	4	5
Stack wood/lumber at least 30ft from house	1	2	3	4	5
Prune trees up to 10ft to eliminate ladder fuels on property	1	2	3	4	5
Maintain an irrigated green area around your home using grass, a flower garden, or ornamental shrubs	1	2	3	4	5
Reduce the density of trees within 100ft of your home	1	2	3	4	5
Clear vegetation and dead leaves from property	1	2	3	4	5
Bury propane tanks underground	1	2	3	4	5

4. Please indicate if you DO each of the following home protection activities. *Please circle YES or NO.*

<b>Activity</b>	<b>YES</b>	<b>NO</b>
Cleaning roof surfaces/gutters to avoid accumulation of leaves and twigs	YES	NO
Remove dead and overhanging branches from within 10ft of your roof	YES	NO
Use non-flammable building materials (tile, slate, brick, stone)	YES	NO
Stack wood/lumber at least 30ft from house	YES	NO
Prune trees up to 10ft to eliminate ladder fuels on property	YES	NO
Maintain an irrigated green area around your home using grass, a flower garden, or ornamental shrubs	YES	NO
Reduce the density of trees within 100ft of your home	YES	NO
Clear vegetation and dead leaves from property	YES	NO
Bury propane tanks underground	YES	NO

5. Please check the following reasons that would keep you from doing home protection activities.

\_\_\_\_\_ I don't have enough time

\_\_\_\_\_ It is not practical on my property

\_\_\_\_\_ I don't have enough money

\_\_\_\_\_ I don't know what kind of activities to do

\_\_\_\_\_ I don't have the physical ability

\_\_\_\_\_ I don't know how to perform the activities

\_\_\_\_\_ I already do some or all of these activities

\_\_\_\_\_ I think that it is the fire department's/forest service responsibility to do these activities

Other (Please describe) \_\_\_\_\_

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6. In what ways do you think Teton County, Jackson Hole Fire/EMS, the U.S. Forest Service and National Parks Service would help in carrying out home protection activities?

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*Please answer some questions about yourself. This information will remain completely confidential.*

7. Which of the following two statements best describes you? *Please check either statement A or B and answer the associated questions.*

\_\_\_\_\_ A. I am a full time, year-round resident of Teton County. (If you checked this choice, please answer the following two bulleted questions.

- How long have you lived full time in Teton County? \_\_\_\_\_ years
- \_\_\_\_\_ months
- Did you own a second or seasonal home prior to moving to Teton County?  
\_\_\_\_ YES \_\_\_\_ NO

\_\_\_\_\_ B. My primary place of residence is elsewhere, but I own a second home in Teton County. (If you checked this choice, please answer the following two bulleted questions.

- How long have you owned a second home in Teton County? \_\_\_\_\_ years  
\_\_\_\_\_ months
- Where is your primary residence (city, state, zip)?  
\_\_\_\_\_

8. Gender: \_\_\_\_\_ Female \_\_\_\_\_ Male

9. Age: \_\_\_\_\_ years

10. What is the highest level of education that you have attained?

\_\_\_\_\_ Less than high school diploma \_\_\_\_\_ some college  
\_\_\_\_\_ High school diploma or GED \_\_\_\_\_ Four-year college degree  
\_\_\_\_\_ Technical/vocational degree \_\_\_\_\_ Advanced degree beyond  
4-year degree

11. What is your approximate annual household income before taxes?

\_\_\_\_\_ Less than \$50,000 \_\_\_\_\_ \$100,000 to \$124,999 \_\_\_\_\_ \$200,000 to \$249,999  
\_\_\_\_\_ \$50,000 to \$74, 999 \_\_\_\_\_ \$125,000 to \$149,999 \_\_\_\_\_ \$250,000 or more  
\_\_\_\_\_ \$75,000 to \$99,999 \_\_\_\_\_ \$150,000 to \$199,999

*Thank you for your time and participation in this important research project.*

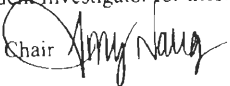
Appendix B  
HSIRB Approval Letter



Human Subjects Institutional Review Board

Date: February 16, 2011

To: Lisa DeChano-Cook, Principal Investigator  
Lucas Kanclerz, Student Investigator for thesis

From: Amy Naugle, Ph.D., Chair 

Re: HSIRB Project Number 11-02-33

This letter will serve as confirmation that your research project titled "Understanding Wildfire Hazard Vulnerability of Local and Seasonal Residents based on Home Protection Activities in Teton County, Wyoming" has been **approved** under the **exempt** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: February 16, 2012

Walwood Hall, Kalamazoo, MI 49008-5456  
PHONE (269) 387-8293 FAX: (269) 387-8276

Appendix C  
Question #6 Responses

Survey	In what ways do you think Teton County, the U.S. Forest Service, and National Parks Service would help in carrying out home protection activities?
1	Have Classes
2	Awareness-do community wide clean up
3	Removal of dead tree's and bordering property
4	More necessary information, provide handbooks, community meetings (use mailings, TV, to let people know)
5	Help with brush, limbs, and dead tree removal on property near national forests
6	Education, warnings
8	Public meetings - already good
10	Publicity
14	In urban interface clearings and reducing ladder fuels as an example for home owners would be great
15	Public education/outreach/reminders; potential county regulations to mandate building material choice or landscaping
17	Education and awareness, good talks and demonstrations
18	More communication with the public, newspaper articles
20	Do assessments of property
22	Providing education on what to do to make homes fire safe. Providing free pickup of trees/shrubs that have been cleared.
23	Partner in removal of dead trees that may fall on property, individuals, and/or public pathways and streets. Many huge Douglas -Fir dead trees will fall or may cause injury to people and property on Snow King and in the adjacent forests in proximity to the property to the town of Jackson. It is a real hazard and should be addressed. Beyond damage to life and property the sheer amount of fuel for wildfire near the town is of extreme concern
24	Have an official weekend nationwide for mitigation and brush removal
25	Primarily education and building codes
27	Have a free day with info aimed @ kids and families
28	Educate the populace to prevention methods. Schedule seasonal burns.
31	Information
32	Not their job, can only tell us
33	Make more information available about consequences of ignoring safety
34	Consulting homeowners
36	more door to door mentoring
38	The Forest Service needs to do more campaigning
39	Extremely helpful, provide suggestions
40	They presently do a good job
41	Sent Forest Service representative, mailings
43	organize meetings to explain to people
45	Please advise us more, don't allow us to build in forest

48	Distribute information that is available and have public meetings stressing importance
49	Take major effort to help us
50	Advise on best measures to protect home based on site to site basis
51	Notification of high fire danger during dry years
52	Telling us to leave so you don't die
55	Volunteer fire fighters can do what they can but if a fire is out of control the professional crews must be brought in to get things under proper firefighting equipment and procedures
56	Not applicable
57	Informing landowners on what activities
58	They are right there for us
59	Visit homes and give assessments of property
61	Homeowner education
62	The USFS used to mark pine beetle trees and give homeowners associations money back once the HOA's hired someone to remove the dead trees, would be great to reinstate that program
64	No I think they do a lot
66	Educate us, make a film
68	Play a role in getting people involved, priorities on people's property, sensing of joining the club, similar to noxious weed programs, people need to understand
70	Education
71	Education
72	Thinning beetle kill
74	Funding for fueling reduction
75	Random inspections
76	Education
77	Education on county level
78	Onsite visits, offering help
79	Respond to fire
80	Put more money into fighting fires, larger water resources
81	F.S. needs to remove beetle killed trees, near development
83	I have read emergency preparedness literature The Forest Service does an annual forest cleanup of dried branches from fire cutting
84	Allow selective logging on the forest to remove excess time and beetle kill
87	Encourage small burns on private properties to help protect private residences
88	Grants towards outside sprinkler systems, ask other mountain communities to create new urban interface codes
91	I think its ridiculous to remove perfectly good healthy trees
92	Provide information
93	Play public service announcements on the radio of tips for decreased fire danger

	when it is appropriate time
95	Provide info and home consolation
96	Not much more than they already do
97	By providing a brochure outlining ways to carry out home protection
98	Controlled burns in national parks and education of property owners
100	Training, Communication
101	Continue with fire safety information
102	Allow logging in the National Forests to cut down on fuel supply and better manage resources- Would also cut down on beetle infestations. Reintroduce back country access roads and maintain them to give better access for fire prevention. Reestablish fire lookout towers. Allow better access to forests for small sawmills to manage resources and keep fuel supplies for wildfires at a minimum. As homeowners next to the national forests, we cannot do all things necessary to protect our homes without better forest management strategy's adopted by the government agencies in charge of our resources. We have allowed too much of a wildfire source to build up with no infrastructure in place in the national forests to stop huge wildfires the west is currently experiencing. We are spending huge amounts of money on extinguishing the fires and very little seems to be spent on prevention. We are also losing a valuable resource to fire and not benefitting from the resource. Would in not make more sense to constructively log areas than to take the 100 years required to recover from the damaging and out of control wildfire?
103	More group/public awareness meetings on quarterly basis instead of yearly basis on disaster management
104	Education
105	Caution neighbors including USFS and State allow lots of deadwood to buildup adjacent to neighborhoods. Burning slash and removing down timber periodically would help.
106	Do weed chipping services for property owner, for no fee
107	Additional info by email/website
109	Sending representatives around to talk to people. Having a homeowner who lost home come and speak with people (peer-to-peer) which would be backing the experts.
110	Continued education for homeowners
111	More effective initial suppression activities at the wildland urban interface
112	Provide education
113	County regulations, beetle eradication
114	Remove dead trees on the border (national forest)
115	Clean up forest
116	Subsidize part of the expenses
117	Requiring homeowners/vacant lot owners to reduce fuels to protect neighbors, forest service need to do better job in reducing fuels on property, lead by example
118	Provide grants for those who wish help
119	Public education and demonstration, removal of fuels within 300' of USFS/private

	property boundaries, grants to apply firewise principles in urban/interface areas.
120	More info available
121	Arrange a meeting for the entire subdivision
122	They are doing a fine job
123	Advise and council, hauling debris, make clear that the fire department will not protect home without defensible space. Forest service needs to take care of own property, give grants after home protection in completed
124	We need to have controlled burns in some areas around our area (Buffalo Valley)
125	Public awareness, send people door-to-door
126	Seminars, dead tree disposal
127	Printed Materials, visit the site, education. I think the local dept's do a good job.
128	More public awareness would be helpful
129	Homeowners responsibility, too much government involvement
130	Limit and patrol forest campers and close those camping areas in high fire danger times
131	Free inspection and make individual recommendations
135	None
136	Remove deadfall on public property
138	They already are pretty proactive
139	Continue to thin tress around property
140	Outreach programs, especially during high fuel index years
141	Education, public service announcement
142	They will if you don't have a shake shingle roof and if they have access to all sides of your cabin so that they can get a fire truck close enough to do some good. But they are a long way away so don't expect to o much. The Nat. Park Service has thinned trees around the perimeter of Pacific Creek properties, so that should help in case of nearby forest fire.
143	Keep families updated and lecture, reading materials
144	Continue to work around subdivisions to remove fire hazard outside sub division boundary
145	Education
146	Evaluations, make/maintain buffer zone against private property
147	Educating the public on potential for fires and how to avoid damage
150	Education
151	They do an excellent job!
152	Educating homeowners and general public through door to door conversation, educational courses. Important to make it well known to the community of educational opportunities through publications, as well as clarifying why it is important
153	They are good!
154	evaluation/suggestions on above



155	"Firesale" audits
156	They try to help people who are willing to listen
157	Proactive fire treatments-Education
160	Evaluate homes
163	Disseminate literature, hold an open question answer meeting
165	Clear Dead Trees
167	Provide wood chipper for slash/debris, allow residents to go 1/2 mile into the park and cut firewood
168	Fight a fire when they initially start rather than allowing it to become a raging inferno then panic and attempt to stop it. Ignorant way to fight a fire!
169	Elevation branches above 10', Thinning dead trees, slash removal and burn
170	We've had good educational programs, some financial assistance available. Perhaps do more of both on an ongoing basis
171	They have done well
172	They already do so
174	Removal of dead/diseased trees
175	Education
176	Not responsible for private property, homeowners responsibility
177	Education and they already do a great job
178	Very little, self sufficient sub-division
179	Encourage other homeowners to take steps like other proactive residents, maybe require it
180	Provide county help-services
181	I've been well educated by the above services and I appreciate what has been done. I leave the house surroundings as natural as possible. My wife say's burn the house save the trees (we know that is not how it can work)
182	They do a good job of explaining what should be done. They will do a survey of the property and explain what should be done
184	Inspections
185	I think home protection is responsibility of homeowner, not any agency
187	Education
188	Explain fire pro. Reasons and activities regularly
189	Pick up piles for composting at other sites
190	Fines for being a bozo, reduce carbon footprint
191	Education, responsibility of homeowner
193	They have done educational things in the past, particularly the Wilson Fire Dept and the Forest Service prior to and during the Green Knoll Fire
194	It would be great for them to help with tree removal- Especially pine bark beetle infected trees.
195	Educating homeowners regarding what is effective
196	Provide education and property evaluations

197	Provide more than one burn day per summer, harvest dead timber in forest
198	Debris pickup, more help from the town
199	Distribute information
200	N/A
201	Informing the public
202	Brochure delivered to home
203	1. Informational press releases at start of fire season. 2. Fight Fires
204	Home Surveys
206	Education
207	Seminars, fundraisers for awareness
208	Try and cover some of the activities listed in 3 & 4
210	Subsidize spraying for beetles
211	Already doing a great job
212	Education, triage of protecting homes that can be protected
214	Education, thinning trees on public land
215	Building codes, forest service can do better job of keeping fires and people from shooting guns in Mosquito Creek, be more proactive
216	More information at community centers
217	Keep educating the public
218	People are responsible for own property
219	It would be good if they would help prune trees, clear debris, and dead trees
220	Give advice in emergency situation
221	Fire inspections/guidance on fire abatement
223	Don't expect much, homeowners responsibility
224	Continuing education
226	They do a great job
227	Have enough firefighters and equipment to respond to fire
230	Reminders of what one should do to protect a home from fire

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