One Spark Is All It Takes:

A Qualitative Analysis of the Experiences of Firewise Community Representatives in New Mexico

By Sarah Auerbach

A Professional Paper

Submitted in Partial Fulfillment

Of the Requirements for the Degree of

Master of Forestry

Northern Arizona University

May 2015

Approved:

Peter Z. Fulé, Ph.D., Co-Advisor

Andrea E. Thode, Ph.D., Co-Advisor

Alexander M. Evans, Ph.D.

ABSTRACT

One Spark Is All It Takes:

A Qualitative Analysis of the Experiences of Firewise Community Representatives in New Mexico

By Sarah Auerbach

In the past several decades, the incidents of more frequent and more destructive wildfire have been an increasing trend. This is coinciding with an increase of people moving into forested areas which are more prone to fire due to an overabundance of flammable fuels. Homes in these areas can act as an additional fuel source unless homeowners take steps to protect them by using non-flammable building materials and reducing the amount of flammable vegetation within 200 ft. of the home. The Firewise organization is one of several organizations that promotes and provides education on these protective actions. The Firewise recognition program is a voluntary certification that recognizes communities who have made a commitment to actively make their community more resilient to the damage of wildfire. For this project, the contact person for each of 16 out of 19 Firewise communities in New Mexico were interviewed to get their evaluation of the Firewise organization; their experience with the recognition process; the amount and nature of community support; and suggestions for improvement. Results show that: the application process is easily completed, often with the help of other communities; the most common mitigation activity completed in each community was vegetation management in the form of thinning and chipping; community participation was good with the majority of full-time and some part-time residents contributing; some deterrents to participation included cost, aesthetics, and absentee residents. In addition to the Firewise organization itself, a number of local organizations supported the Firewise efforts in each community and were an important part of their success. Community representatives expressed that the Firewise organization is important and a crucial component in helping communities learn to better protect themselves from wildfire.

Acknowledgements

I would like to thank all the New Mexico Firewise community representatives who took the time to let me interview them. It was wonderful getting to know them and they were so kind and helpful. Thanks to Dr. Peter Fulé and Dr. Andrea Thode who were my advisors throughout my time at NAU and who reviewed previous drafts of this paper and assisted enormously in getting it to this final product. And a special thanks to Dr. Thode for putting me in contact with Dr. Alexander Evans and giving me the opportunity to participate in this project. Thanks to Dr. Alexander Evans of the Forest Guild for a vast amount of support, direction, and encouragement in addition to comments on previous drafts and for agreeing to be a part of the committee for this final project. I would also like to thank the Forest Guild in New Mexico and the Joint Fire Science Program for their support and funding for this project. Thanks to Dr. Martha Lee who gave insight and recommendations on questions, and interview and reporting techniques. And finally, thank you to the unending support of my loving family and friends, and a special thanks to my fellow graduate student friends who would drop everything to listen and offer a helping hand whilst in the midst of their own graduate research and who had unwavering confidence in my abilities.

Introduction

In 2002, the Firewise Communities/USA recognition program was formally established. Firewise is a national program that educates communities about home fire protection and provides a frame work and recognition program that helps people take responsibility for protecting their homes and the homes of others in the community. It was started by the National Fire Protection Association (NFPA) and co-sponsored by the U.S. Forest Service, the U.S. Department of the Interior, and the National Association of State Foresters. This organization focuses on populations in the wildland-urban interface (WUI), where homes intermix or intermingle with wildland vegetation (Radeloff et al. 2005). By realizing that people are a big part of finding a solution to the problem of wildfire in the WUI, Firewise and other similar organizations are encouraging people to take responsibility for protecting their homes by uniting the community and implementing fuel reduction strategies (Daniel et al. 2007). Although wildfire has always been on the landscape burning vegetation, never before in history have we had so many people living in the same areas where these fires are occurring.

There is little research documenting the effectiveness of community based fire protection programs like Firewise, despite the need for this information. However, three recent papers (National Institute of Standards and Technology (NIST) 2013; Morrison & Wooten, 2013; Bostwick et al. 2011) investigated how the fire protection actions of individual homeowners affected a home's ignitability after wildfire. All these papers suggest that taking steps to reduce the potential for a home to ignite, such as the steps outlined by Firewise, can keep a home from igniting or can minimize damage from a wildfire. Another study interviewed 16 Incident Commanders (ICs) on their feelings toward Firewise and similar programs (Headwaters Economics, 2014). Here it was found that senior fire managers strongly believed that Firewise actions were important and effective in providing for firefighter safety and, in turn, increased the likelihood that structures will be protected.

Fire activity in the western United States has increased in the past several decades. Firewise was created out of a need to take action after a particularly devastating fire year in

1985 burned almost 1,400 homes in the U.S. (NFPA, 2013). This was an unprecedented amount of destruction that brought attention to the issue of fire in the WUI and the increasing number of damaging fires. Almost a century of fire suppression and increased temperatures have led to higher than average fuel accumulations, more fires, and a longer fire season (Westerling et al. 2006; Running, 2006; Calkin et al. 2005). Gude et al. found that an increase in summer temperatures of just 1°F could be linked to a 35% increase in area burned in CA (2013) and could account for 420 more wildfires in OR (2012). In addition, fires are larger and more severe in the Southwest (Dillon et al. 2011; Williams, 2013; Dennison et al. 2014) (Fig. 1), and more costly than ever before (Calkin et al. 2005). From 1990-2000 the cost of wildfire suppression in the U.S. was almost 6 billion and from 2001-2010 the cost increased to over 15 billion (NIFC, 2011). In a study by Gude et al. (2012), it was shown that just a 1% increase in the number of homes within six miles of a wildfire can lead to a .05% increase in suppression costs, suggesting the positive correlation between these two variables. The average number of structures lost to wildfire has increased from 861 in 2000 to 4244 in 2012 (WUI Fact Sheet, 2013) (Fig. 2).

Along with the increase of wildfire, there has also been a steady increase in the number of people who are moving to and living in the WUI. The WUI grew by 19% in the 1990s (Hammer et al. 2009; Butry & Donovan, 2008) and it seems as though the trend of rural expansion will continue into the future with a forecasted 111% growth in the WUI in the west and 93% growth in the southeast by 2030 (Hammer et al. 2009; Kyle et al. 2010). Since 1990 the conversion rate of wildlands to WUI in the U.S. has been 3 acres per minute, 4000 acres per day, and nearly 2 million acres per year (International Code Council and National Association of Resource Conservation & Development Council, 2008). As the migration of people into the WUI increases, so does the possibility of human-caused fire ignition (Poudyal et al. 2012; Hammer et al. 2007). In 2014, the number of fires started by humans in the U.S. was 55,679 compared to lightning caused fires, which was 7,933 (NIFC.gov, 2014). Additionally, of the ten fires with the biggest losses in the past 100 years, 6 of them were within the WUI (Mell et al. 2010). The need for WUI residents to take responsibility for protecting their own property against wildfire has never been more necessary as fighting fire in these areas has become much more complicated, dangerous,

and expensive, so relying completely on fire fighters to protect a home may leave homes at risk (Winter and Fried, 2001; Radeloff et al. 2005; Winter and Fried, 2000; Brenkert et al. 2006).

In the western U.S., over half of the area designated as WUI is in forested areas that have been classified as a high severity fire area which could produce fires that are difficult to control (Theobald et al., 2007; Schoennagel et al. 2009). In addition, due to the increased growth of the WUI, wildfire suppression is often directed towards the protection of people and their property and away from direct attack of the fire (Daniel et al. 2007). At one time wildland firefighters focused on protecting natural resources such as vegetation. Now, firefighters and other emergency personnel may be pulled away from direct suppression on a fire and towards defending homes in the path of the fire, allowing the fire to burn longer without being suppressed. However, if people can be empowered and given the tools to protect themselves and their property in advance of a fire, firefighters should be able to focus on suppression as opposed to home protection. With that in mind, programs such as the previously mentioned Firewise (www.Firewise.org), along with Ready! Set! Go! (www.readyforwildfire.org), Firesafe (www.firesafecouncil.org), Firefree (www.firefree.org), Firesmart (www.partnersinprotection.ab.ca), Fire Adapted Communities (www.fireadapted.org), and other state and county initiatives have begun educating their residents on how to become part of the wildfire solution in the WUI. Data have shown that fuel treatments can be effective in slowing the spread of wildfire and can decrease the damage to homes and property (Hudak et al. 2011). Research also shows that building materials and the fuel complex in the area surrounding a home are major factors in determining whether or not that home will ignite in a wildfire (Winter et al. 2000). One treatment includes thinning followed by some sort of burning or slash removal (Hudak et al. 2011; Calkin et al. 2014). However, there are a multitude of small changes a homeowner can make to increase the resiliency of their homes against wildfires. On their own, people may not have the knowledge, funding or support to take on a complex landscaping or home modification project but, with the support from a larger organization like Firewise, taking steps to protect homes from wildfire is more feasible and less overwhelming.

There are 5 steps that a community needs to complete in order to be recognized as a

Firewise community. The first is to obtain a wildfire risk assessment for the neighborhood, usually with the help of a local forester. Often times this is accomplished with the help of a Community Wildfire Protection Plan (CWPP). A CWPP is a community developed plan that identifies areas surrounding a community that would benefit from fuels reduction treatments and lays out a strategy on how that should be accomplished. It also helps identify ways that individual home ignitability can be reduced in a community at risk for wildfire and formulates an evacuation plan (What is a Community…, n.d.). Once a CWPP is created, it can be incorporated into the wildfire risk assessment necessary for Firewise recognition. Many communities have a CWPP in place and an incentive for doing this was outlined in the Healthy Forest Restoration Act of 2003 which prioritizes communities that have a CWPP in place to receive government funding for fuel reduction treatments (HFRA, 2003). Once the assessment is complete, a board or committee is formed and an action plan is created. The action plan should include at least three feasible things the community can do to protect themselves from wildfire. Next, the community needs to have a "Firewise Day" event, an event that helps gather the community together to be educated on wildfire danger and to participate in an action item that helps make the community safer. The community also needs to commit to investing a minimum of $2 per capita per year in Firewise activities that benefit the community. Finally, the board submits the application to their state Firewise liaison for final approval (A User Reference Guide…, 2009).

Firewise actions fall into 2 main categories. The first focuses on protecting a home directly by using fire resistant building and landscaping materials on roofs, exterior walls and external structures like decks and patios. A study conducted by the Stanford Research Institute found that there was an 86% survival rate of homes that had non-flammable roofs, and had also cleared vegetation from around the home (Cohen, 2000). The second category focuses on protecting a home indirectly by limiting the amount of organic and non-organic flammable material around the home. Fuel is typically reduced by thinning and then chipping or removing standing and downed vegetation, and by piling and burning debris or by prescribed burning.

Firewise puts home protection in the framework of 3 zones. These 3 zones combined cover the area between the home and 200 ft. from it. This is called the home

ignition zone. Zone 1 is the area 30 ft. or less from the home and has been called the structure ignition zone (Cohen, 2000). In wildfire scenarios, 30 ft. was the minimum distance a wooden wall could be from a large flame without igniting (Cohen, 2000). Within this zone, useful actions include clearing roofs, gutters, and the area immediately next to the house of organic material that could collect embers. Non-flammable vegetation should be used if possible. Branches that overhang the home should be trimmed and trees should be pruned 6-10 ft. up. Trees should be spaced 30 ft. apart, wood piles should be moved from this area, and vents and areas under decks and eaves should be screened in. Zone 2 is the area 30-100 ft. from the home and is also known as the fuel break zone. In this area there should be a mixture of coniferous and deciduous trees if possible. Fuel breaks like lawns, walkways, and gravel are good as well. Thirty feet should be left between clusters of trees and twenty feet between single trees, and trees should again be pruned 6-10 ft. up. Zone 3 is the area 100-200 ft. from the home and is also known as the reduced fuel zone. This area should be thinned by removing smaller trees growing between larger trees, making sure tree canopies don't touch, and removing heavy dead and downed material.

Because of the ever-increasing fire threat, there is a need for more effective and organized protection against wildfires in the WUI and these protection measures should be based on proven mitigation strategies that will decrease the likelihood of ignition of homes and surrounding vegetation. Thinning forested areas outside a neighborhood's perimeter is also important and effective as shown in a paper by Kennedy et al. (2014) after the Wallow fire (2011), Arizona's largest wildfire to date. It was found that fuel reduction treatments in the forest surrounding WUI neighborhoods reduced the intensity of the fire before it reached the homes, enough to allow firefighters time to initiate direct attack on the fire and to enter the neighborhood and protect homes. Without this extra time, the fire intensity could have been too great to allow firefighters close enough to defend homes. It was pointed out in this paper that fuel treatments in the forests surrounding a neighborhood helps lower the intensity and resultant severity of a fire but it cannot stop a fire completely. Even a low intensity fire is capable of igniting a home, which is why it is so important for homeowners to protect their own homes by employing Firewise protection measures. In addition, since the fire spreading from one structure to the next increases fire behavior, protecting an individual home and encouraging neighbors to protect their homes lowers

the chance of ignition from adjacent structures (Mell et al. 2010).

The Forest Guild of New Mexico is a non-profit organization with the mission of practicing and promoting sustainable forestry to the benefit of forest ecosystems and the human communities that depend on them (www.forestguild.org). They wanted to gather information that would help improve the implementation of the Firewise recognition program by interviewing people who initiated the recognition process for their communities in New Mexico. The goal was to evaluate the Firewise organization and its recognition program to determine if any improvements can or should be made. To do this, I developed a list of questions to solicit information from Firewise community representatives about their experience becoming a Firewise community. I also hoped to determine the importance of Firewise to risk reduction actions. And finally include this information as part of a larger report aimed at informing managers on ways to protect communities from wildfire. The objectives of this qualitative study were: (1) Administer questions covering topics related to the recognition process, the community's involvement, and satisfaction with the program; (2) Based on participant responses, develop recommendations to improve the participation in and success of the Firewise recognition program.

Methods

To gain information about the Firewise application process I conducted phone interviews and email follow-up with the individuals who initiated the Firewise recognition process in their community using contact information provided by the New Mexico Firewise Liaison. All of the phone interviews were conducted between September 16, 2014 and October 7, 2014, email correspondence continued through January of 2015. I introduced myself to each person I spoke to and they were all made aware of the project I was working on and why I wanted to speak to them. To collect data for this project, I developed a list of questions that were agreed upon by both the Forest Guild and myself. I also sought out the advice of a Professor at Northern Arizona University to ensure the questions were appropriate (see Appendix A). The qualitative nature of this project lent itself to questions that were informal in nature and open ended. The structure was that of a guided conversation which allowed for opinions and personal impressions and it also made

follow-up questions easy to communicate during the interview. Questions were geared towards getting a personal testimony regarding the experiences each person had throughout the application process and were often accompanied by anecdotes that helped illustrate the points. During the interviews and similarly with the emails I received, careful notes were taken which were transferred to an Excel spreadsheet for further review.

In New Mexico, at the time of the interviews, there were 19 Firewise communities that were currently active (Fig. 3). Of the 19 currently active Firewise communities I was able to reach 13 by phone. I emailed the entire list of questions to the remaining six communities that I was unable to reach via phone and received responses back from three of those emailed, which made for a total of 16 contacts. After several attempts, I was never able to reach the remaining three contacts. Although I sought to ask each person every question on the list, sometimes the conversation went in a different direction, making some questions redundant or inappropriate in the context of the discussion.

For questions that weren't answered during phone interviews or emails I sent a total of two personalized follow-up emails. The first email consisted of questions that hadn't been answered during the initial phone interview or email. Two weeks after that I sent out a final email to everyone. If they had answered all of the questions from the first email, I thanked them and let them know I'd be sharing the final report with them once it was complete. If they didn't answer all of the questions from the first email, if I needed clarification, or if they didn't respond to the first email, I sent a second email consisting of any questions that still needed to be answered, or anything I needed clarification on. I also asked each community representative if they would be willing to share any photos from their community, I received photos from 6 of the communities. I was grateful for everyone's willingness to communicate with me and appreciated their patience and interest in the project. At the conclusion of my correspondence with the participants, even with this follow-up, each person had some questions that they didn't answer (Fig. 4) (photos included in Appendix B).

Results

This section starts with a description of community characteristics such as terrain and vegetation followed by some demographic information. The results are organized by

the objectives stated above and include any relevant supplemental information given by representatives to help clarify or enhance the responses.

Community description

As can be seen in table 1, all 16 communities were either located in areas with mountainous terrain or surrounded by mountains and were at elevations ranging from 5,000-10,500 ft. The predominant vegetation in communities in the lower elevation ranges were grasses, pinyon pine, juniper, Gambel oak, mountain mahogany, cottonwood, and ponderosa pine. In the higher elevation ranges there was ponderosa pine, aspen, Douglas-fir, corkbark fir, Engelmann Spruce, bristlecone pine, limber pine, and white fir. Also included in Table 1 are population and income data for each community. Because the Firewise community boundaries don't always correlate with city boundaries, it is important to point out that the information given here is for the city/town that the Firewise community is closest to. Although there were a few outliers with population (Santa Fe and Ruidoso at 67,947 and 8,029 respectively, and Datil and Ute Park at 54 and 71 respectively), the majority of the populations fell between 200 and 2,000. The yearly median household income for all the communities fell between $22,000 and $73,000.

Reason for pursuing Firewise designation

It is no easy task to organize a community and educate and inspire them to make their homes and property more resistant to wildfire. All the community members I spoke to had their own personal reasons for agreeing to spearhead the project. Thirteen of the 16 Firewise community leaders answered this question. Although none of the 16 participants I communicated with had been through a fire personally, three of them were inspired to become a Firewise community because of a fire that happened close to their community, either the one they are currently living in or one they lived in previously. One community representative was told that their community was at especially high risk for wildfire. Three were inspired to become recognized because of another community that was applying for Firewise recognition, and four people applied because of their personal awareness of how overgrown the area was and the fire danger that resulted. In addition, residents of two of these communities had experience in

wildfire suppression and they helped increase awareness about the risk based on their personal involvement with fire. (Fig. 5)

CWPP status

Of the 13 Firewise representatives that answered this question, six (46%) of them had a CWPP in place prior to becoming a recognized Firewise community, one (8%) community developed a CWPP in conjunction with applying for Firewise recognition. The remaining six (46%) completed the wildfire risk assessment without a CWPP in place, but two of these six approved a CWPP after Firewise recognition was granted. The communities that completed a CWPP prior to seeking recognition mentioned that it made the wildfire risk assessment, required for Firewise recognition, much easier to prepare. And the fact that some communities had a CWPP in place prior to recognition shows that many communities were aware of the danger of wildfire prior to recognition.

Primary resource concerns

I asked the representatives what the main resource concerns were in their area in the event of a wildfire. The main concerns all communities had related to wildfire were overgrown brush, ladder fuels and access in and out of communities. In some of the communities, vegetation didn't necessarily include trees, but tumbleweeds were a problem, being very flammable and prevalent.

Firewise application process

In asking the representatives about their experience during the application process for recognition as a Firewise community, across the board, the 11 people out of 16, who answered this question felt that it was a positive and straight forward experience. Four (36%) of the communities did it from scratch with help from people within the community while the other seven (64%) had help from neighboring communities who had already gone through the process. All of the 11 communities found that it was not terribly time consuming and was easy to complete. One representative mentioned that the only thing that took longer was the wildfire risk assessment to be completed, but this was because the local foresters were very busy and it took a little time for them to schedule the assessment.

In summary, 64 % of the communities who answered this question felt that the process was made easier by following in the footsteps of previously recognized community members who had already been through the process.

Mitigation actions completed

I asked the communities what mitigation actions they completed as part of the Firewise program. All 16 people I contacted had some kind of chipper day. This entails thinning and pruning and clearing brush away from homes. Vegetation management being the most common mitigation action is a trend reflected in most of the literature on the subject (McCaffrey et al. 2011). Once vegetation had been thinned, the brush was either brought to the chipper or the chipper came to each home. The brush would then be chipped and could be used for several different things including landscaping, compost, and mulch. This seemed to be the easiest community event to organize and carry out and it often included some kind of informational and social event with food and beverages to encourage participation. It wasn't possible to ascertain the exact number of residents within each community who completed this thinning work on their own as opposed to residents who hired an outside crew to perform the work, but the conversations with participants suggested that both scenarios occurred. People who were physically capable of completing the work may have taken on the project themselves while others who weren't able to complete the work whether it be due to physical or financial limitations, or because they weren't on site, may have chosen to contract the work out. And there were also people in each community who chose not to complete the work all together.

There were some other more non-traditional activities done as well. When asked about access as one of the potential mitigation actions, 15 of the 16 communities who answered this question mentioned that access was or had been an issue. Out of the 15 communities ten, of them (67 %) expressed that access needed to be improved but found it difficult to move forward with improvement projects due to lack of funding or logistical reasons. The remaining five (33%) felt that, while not perfect, improvements had been made providing adequate access for their community for the time being. Some of the improvements included creating additional roads for ingress or egress, widening roads, and pruning branches that overhung the road.

There was also a coalition comprised of several smaller Firewise communities who built a small fire station to serve the smaller communities and donated it to the county. Another community also built a fire station for the community and put in fire hydrants so that there was one within 500 ft. of every home for easier water access in the event of a wildfire. Another community added large water tanks to be used by the firefighters and they installed signs so the neighborhood could be easily found by emergency personnel.

Community participation

Were community members supportive of becoming a Firewise community realizing that there would be some time, work, and money involved? The answers differed for almost every community but there were some common trends. Generally, there seemed to be good support and participation in all communities however, of the 13 people who answered this question, every one of them expressed some frustration with the amount of participation and maintaining motivation. The participation increased with education, as people began to understand the importance of protecting their homes and the risk level, they were more eager to help. For all 13 of the representatives I spoke to, increasing education opportunities for residents was a priority and most effective. Representatives saw an increase in participation associated with an increase in awareness of the threat of wildfire and with increased education about what could be done to mitigate it. Unfortunately, it is difficult to keep an entire community motivated. A representative mentioned that after the first year of recognition, once people had put in some initial work clearing their properties, enthusiasm died out. In another community, a chipper day that had been planned had to be cancelled because of lack of interest. Another representative mentioned that the first few years had good participation but work dwindles and people start to lose interest.

Another big issue keeping people from participating was the resistance to cutting down trees in an attempt to reduce fuel loads near the home. Of the 13 representatives that answered this question regarding community participation, seven of them (54%) stated that resident's reluctance to cut down trees was a big hurdle and I speculate that the other six communities had people who were also hesitant to cut down trees. Representatives reported that many residents in their communities explained that they had moved to that

area or bought a second home there in part because of the trees and they weren't interested in cutting any down. They also liked the tree cover as a natural fence. All 13 representatives said that although there were residents that were uncooperative in completing Firewise activities, once they became more educated on the danger they were facing and once they saw other homes that had been thinned and realized it wasn't as dramatic as they had thought, many of those opposed became more open to the idea. In other cases, there were people who didn't have the time or money to complete some of the tasks such as seasonal residents or low-income households. Of the 13 representatives, seven (54%) of them expressed issues with absentee or part-time homeowners. And sometimes homeowners were not physically capable of completing the work themselves. One representative summed it up well by saying, "participation is good overall but there are always going to be people who just don't have the time, interest, or money." Another representative said,

> "Really, the idea is to get the private citizen to take ownership – not the government, and this is a way to help communities and their members to own the problem."~Greater Eastern Jemez WUI Corridor Firewise Community Coordinator

Delving deeper into reasons behind participating in Firewise actions I asked the representatives if they thought the community members felt safer and more protected after becoming a Firewise community. This question was more speculative since I was only asking one member of each community but the seven representatives out of 16 (44%) that answered this question said yes, they thought community members felt safer. One representative stated that even if they didn't all feel that they were safer, they did feel like they had more control now that they had done something. Another representative said that many people may not reap the benefits and feel safer until a wildfire comes through and their home is saved because of the work they had done.

As a follow-up question, I asked if the community had become closer as a result of teaming up to protect the neighborhood. Ten out of the 16 community representatives answered this question and out of those ten, six representatives said that they felt Firewise brought the community closer together while three representatives felt that the

community was already close so they weren't certain if Firewise had increased this or not. One representative said that many residents didn't know that they were a Firewise community so it is unlikely that it was a factor in becoming more tightly knit.

Local support

It was impressive to hear about the support that was received from local organizations. All the communities who answered this question (15 of 16) received assistance and encouragement from local groups. Local organizations were eager to assist and the help came from the Forest Service, Bureau of Land Management (BLM), National Fire Protection Agency (NFPA), NM State Forestry Department, State Fire Departments, County Management Offices, County Fire Departments, County Fire Marshals, Volunteer Fire Departments, local Fire Stations, local businesses, neighborhood associations, and other Firewise communities. Including local organizations and businesses in making a community more fire adapted is very encouraging and helpful for a community and was spoken of very highly by respondents.

Importance of Firewise

I asked respondents how important they thought the Firewise organization was and if they felt like they would have taken steps to protect their communities and homes from wildfire without it. Thirteen of the 16 communities answered this question and all 13 of them felt that the Firewise organization was very important and valuable. A few reasons that were commonly mentioned were the importance of the educational materials and raising awareness, the importance of having a large organization to advocate for and give smaller communities a voice, and help with getting grants and making policies. In addition, all 13 communities either said that they wouldn't have taken action without Firewise or that they would have done some things but it wouldn't have been as strong an effort or as effective.

> "Firewise has been the expert voice from afar. It seems that an organization such as Firewise carries a lot of weight when making recommendations and supplying data that we can convince policy makers

that our recommendations are supported in a larger context."~ Hidden Lake Firewise Community Coordinator

"I believe that the community would have taken action without the Firewise organization because the risk to the community was so great but I don't believe that we would have been quite as successful without Firewise."~Village of Ruidoso Firewise Community Coordinator

"We would have done some of the thinning and trimming of the local wooded areas but probably would not have made as much effort without Firewise."~Fox Hills/Sandia Park Firewise Community Coordinator

"Firewise has been very generous in providing educational materials. The organization is important because people are reluctant to change but if you can talk to them in an informational way it is easier."~Santa Fe Firewise Community Coordinator

All 16 of the communities would recommend the Firewise recognition program, or something similar, to other communities. They all felt that the structure and support they received from Firewise made it easy to become recognized and the ability to get free information was very important. They felt that without the driving force of Firewise, they probably wouldn't have had the ability to organize the community or have the credibility to inspire them to participate.

"Firewise has definitely helped at all times. Their methods are successful because they are able to explain the Firewise principles in simple terms that anyone can understand. Also, they produce great brochures that provide a concise, easy to read explanation of Firewise ideas. The Firewise organization is of utmost importance to keep the idea of wildfire protection in the owner's mind at all times. Protective measures would not be as extensive or as well done if the Firewise organization was not available." ~ Taos Pines Ranch Firewise Community Coordinator

"I believe that Firewise has brought a huge awareness to community members who were not previously informed…."~El Salto Firewise Community Coordinator

When asked if they would continue to be a Firewise community into the foreseeable future, all of the representatives who answered this question, nine out of 16 (56%),

definitively said yes. One representative said that once they started it became habit and it was easy to continue (Greater Eastern Jemez WUI Corridor Firewise community representative, personal communication, September, 16, 2014), and that as long as they had people who were willing to be on the board, it would continue. Four of the respondents expressed a fear that participation is waning and felt that if they stepped down as representative, the community's participation in Firewise may not continue.

Support and Follow-up

When asked if they were happy with the amount of follow-up or support they received from the Firewise organization, the 14 out of 16 communities who answered this question said that they felt well supported by the organization and that all the information they needed was readily available to them through the Firewise website. The state Firewise liaison for New Mexico has been a great help to the communities and he has made himself very available, both remotely and by coming to various communities to help with completing Firewise projects and educational presentations. Although several of the communities expressed their appreciation that the state Firewise liaison was able to come to their community, he was unable to make it to every community. Three representatives of communities that hadn't been visited mentioned that it would be nice if Firewise could come out to some of the communities to see progress and then report on the progress.

Was cost a consideration?

Not only is there an investment associated with becoming a Firewise community ($2 per capita per year), there can also be a substantial cost accrued by the homeowner with any additional mitigation actions. There are many grants available through the government, state, and county for the express purpose of helping communities absorb the cost of protecting their homes. One of the services that Firewise provides is keeping an updated web page on their website that lists grant opportunities for the intended purpose of being used for wildfire mitigation actions (NFPA, Federal Government Grant Opportunities, 2014). The community that installed fire hydrants was provided grant funding from the water company. One community I spoke to was in a county which bought a chipper with government grant money. Another community works with the local Soil and

Water Conservation organization to get grants for thinning. Two other communities have received grants from Congress with the help of Firewise for fuels reduction. Another community received a grant from the Forest Service to clear around the highway into the community. However, these grants take a lot of work and time to apply for and can be very competitive. One representative who's community received a hazardous fuels reduction grant expressed frustration with the fact that even though there would be no out of pocket cost for the homeowner for chipping and slash removal, he still needed to "twist arms" to get people to participate. Anytime grant money is not available, it leaves the homeowner or homeowners association to pay for the work that is done, which can be sizeable, possibly $2500-$3000 per acre (Taos Pines Ranch community representative, personal communication, February 3, 2015). As I spoke to the Firewise representatives, six out of the nine people (67%) who answered this question made it clear that cost could very easily be a reason that some community members wouldn't be able to complete some of the work to thin around their homes or purchase fire resistant building materials. I also asked many people if they were aware of any insurance discounts for building with fire resistant materials or clearing brush from one's home and they all said that they weren't aware of any such incentives.

Discussion and recommendations

The impetus for this project was a desire by several organizations (US Forest Service, Forest Guild, Bureau of Land Management, with funding provided by the Joint Fire Science Program) to find the most effective ways to better protect people and property in the WUI from damage due to wildland fire. The information from the Firewise community representatives will help managers make more informed decisions as they move forward with initiatives to increase homeowner participation in property protection. In this section I focused on some key points to discuss and make recommendations on. Recommendations came mostly from representatives or the literature. There were a couple limitations for this study; in the scope of this project it was not feasible to question every resident of each Firewise community so inferences towards the entire population should not be drawn. In addition, it's important to remember that this study only included representatives from New Mexico. Similar interviews with people from different areas of the country may deliver

different results. However, the information collected can provide further insight into the actions and feelings of homeowners leading to recommendations given here to improve wildfire mitigation efforts and can give an idea of where further research may be needed.

Motivations for Becoming Recognized

I found that the biggest motivations amongst the Firewise community representatives in NM for initiating the Firewise application process were having personal knowledge of fire danger due to fuel loading, knowing of a nearby wildfire or having heard about damages to another community, and observing other communities and community members taking steps to protect their homes or becoming a Firewise community.

This shows that knowledge about wildfires and why they can occur was a big motivator for this group in deciding to initiate protection measures. For this reason, educating people about fire risk and how they can protect themselves should be a priority. Education is typically the most favored and productive strategy for increasing public support for fire safety programs (Reams et al. 2005; McCaffrey 2004). Having access to educational materials and providing educational opportunities was brought up frequently in interviews and was overwhelmingly approved of as a way to increase participation in home wildfire protection. This is corroborated by research showing that increasing education about fire management issues increases public acceptance and the more detailed and personalized the information, the better (Winter et al. 2000; Martin et al. 2007). Along these lines, the Firewise community of Taos Pines Ranch received grant money to create a Firewise education video which interviews local residents and films houses right there in the community as opposed to using a video of a community nobody has seen before. Their hope is that the personalized information will trigger a sense of connection and ownership and will inspire more participation from residents. Representatives also spoke highly of having local forest and fire managers participate in community Firewise events. Personal contact from government members and other local groups was mentioned in a paper by McCaffrey (2004) as being a key element to enhance any education effort.

For the communities in New Mexico, people liked the educational materials that the Firewise organization supplies which is mostly in the form of brochures and online resources. And while the use of pamphlets and brochures seems to be acceptable in these

communities, research by Martin et al (2007) found that brochures were a less effective motivator due to their general and impersonal nature. For Firewise and its representatives, it may be beneficial to explore alternative educational materials that is more personalized. Some additional recommendations made by respondents regarding Firewise educational materials were to continue to make them accessible and free of charge.

The importance of community is highlighted here, as it was one of the drivers that got people to initiate the recognition application process. Seeing surrounding communities take steps towards recognition was a motivating factor for several of the Firewise representatives I interviewed. I speculate that there may have been a social desire to follow-suit as neighboring communities moved in a more fire safe direction or a feeling of not wanting to get left behind but nevertheless, community influence was still a big reason people took action. A recommendation that could take advantage of this knowledge was expressed by the El Salto and Fox Hills/Sandia Park Firewise community representatives (personal communication, September 18, 2014) who mentioned that more local recognition in newspapers, radio, or television, besides just the Firewise website, might increase support and could make non-participants take a second look. This increased attention would allow neighboring communities to see what the others are accomplishing and may increase participation and inspire the creation of new Firewise communities.

Application Process

The Firewise application process was positive for people in the NM communities. I was expecting people to offer constructive criticism, but I didn't hear many negative comments. People seemed to be very satisfied with the process and didn't feel it was overly time consuming or difficult. The application process was not a deterrent and the applicants felt that they had plenty of help and felt supported, not just by the Firewise organization but by other members of the community. They appreciated the simple process and recommended keeping it that way. They also suggested having an option for people to complete the application and future renewals both online and/or via hard copy so that tech savvy and non-technical people could each be comfortable with the process. The application process can be another opportunity to increase community cohesiveness, not just between community members but also between local businesses and land

management personnel as they offer assistance in community Firewise endeavors. This added benefit was confirmed in a paper by Jakes & Sturtevant (2013) who found that relationships and communication was improved between communities and firefighting agencies as they progressed in the wildfire assessment planning process.

Community participation

Maintaining interest and participation levels was one of the biggest obstacles that many of the community representatives in New Mexico faced. While the majority of the communities felt that participation was good for the most part, it seems that there is always a need to find new ways to keep people motivated. One way mentioned by an interviewee was to publicly acknowledge the progress and accomplishments of each community. Another community member mentioned that it was all very exciting in the beginning, when they first became a Firewise community they were interviewed on the radio, television, and their accomplishments were written about in the newspaper. But, that excitement soon faded and it became harder to keep people interested. If accomplishments were being reported more often, it may inspire more commitment by homeowners to move forward with protection measures and could help sustain motivation levels. One representative commented that it would also be nice to see examples of success stories, instances where a house was protected because of the treatment. Another person mentioned that the material would relate to a broader group of people if there were a wide range of homes and properties shown. She explained that often times the homes that are shown are newer looking, more expensive, and have large manicured yards. Showing fuel treatments on less expensive and older homes may make the literature more meaningful to a larger group.

Another component of motivating people is to make them understand their risk. A tactic that was expressed by a representative as being effective was conducting a Firewise audit. An audit entails having a fire manager come and assess the homes in a community to see if they are defendable in the case of a wildfire. “Defendable” means that the home is protected enough to make it worth the risk and effort of firefighters to protect it during a wildfire. If a home was not considered defendable, the homeowner would be told that firefighters might not be able to safely protect that home if a wildfire came through and

that it would be left to fend for itself. This sometimes had a dramatic effect on people's perceptions of risk and it encouraged them to take steps to remove fuel around their homes (Fox Hills/Sandia Park Firewise community representative, personal communication, February 7, 2015). The effectiveness of this tactic falls in line with a paper by Martin et al (2007) finding that in order for people to make a connection between the risk of wildfire, the effectiveness of treatment, and their capacity to execute those treatments, people need to understand the degree to which their homes and lives are in danger. They also mentioned that a way to express these risks, especially for people who were concerned about cost and time expenditures, would be to educate people on the trade-off between taking no action and how vulnerable they were to wildfire damage. Education in schools can also be effective. One representative spoke of Firewise curriculum being incorporated into the local school, an effort that was spearheaded by two students. It was helpful in informing others because as soon as the students learned something new regarding Firewise, they wanted to come home and tell their parents and friends about it (Rancho Viejo Firewise community representative, personal communication, October 17, 2014). This same scenario was witnessed by Jakes (2012) when she studied the use of Firewise curriculum in schools. She found that after children were given lessons that taught the principles of Firewise, they would take the information that they learned back to their families who, in turn, brought it to the community.

For this project, one concern communicated by representatives regarding participation was that seasonal or absentee residents were not as willing or able to take time to protect their home as permanent residents were. In a paper by McCaffrey et al (2011) little difference was found in the desire to protect homes between seasonal and permanent residents but it was brought up often in the interviews. In many of the communities I spoke with, the property owner was not there enough to complete the work or there were no buildings on the property and the property owner was rarely on site. Managers can help inspire part-time owners to act by creating incentives or by helping to foster a stronger bond between the community and local agencies. A stronger connection to the community could inspire a stronger desire to help protect it. Additionally, in my discussions with New Mexico Firewise community representatives, they stated that some residents in their community were reluctant to cut down trees which is a big part of

mitigating for wildfire. This was also supported in some of the literature (Brenkert *et al.* 2006; McGee *et al.* 2009) which stated that many people fail to implement Firewise actions because they think that it will take away from the natural amenities of the landscape. This was also one of the biggest impediments to risk reduction in a study conducted by Martin et al. (2007). One strategy mentioned by a community representative was to incorporate the use of an "example house" to make people feel better about landscaping. If people can see the benefits aesthetically, they may be more apt to execute them. It became clear during these interviews that people were very attached to their trees, whether the property was occupied year round or seasonally. From my communication with each representative, it seems that once people saw a house that had a fuel reduction treatment, they realized that it wasn't as dramatic as they had feared and they were more compelled to allow the same treatment for their home.

In order to achieve greater adoption of Firewise activities, the amount of money, time, and labor needed to implement them needs to be reduced. This isn't surprising considering the economy and the inability of many families to spend extra money on mitigation efforts. It is unfortunate that cost can be such a limiting factor when it comes to something as important as home protection. Many of the community representatives I spoke to agreed that cost could be a major reason that some people wouldn't participate in fire mitigation activities. This concept was reiterated in a study by Hodgson (1995) who found that the cost of implementing fire protection and maintaining it was a big deterrent for many people, especially when benefits weren't immediately observable and there could be no guarantee that they would fully protect a home from fire damage. Often times, the perception that mitigation actions are an all or nothing effort can intimidate people into taking no action at all (Brenkert et al. 2006). It is important for people to understand that doing a little is better than doing nothing. People are more likely to engage in low cost efforts like moving wood piles, mowing lawns, and pruning trees (Brenkert *et al.* 2006; McGee et al. 2009). This was supported in my interviews with Firewise representatives where the most common actions taken on by homeowners were low cost activities such as clearing brush, pruning and trimming. In the future, dedicating funds to fire prone and lower income areas, educating people on low cost mitigation activities, and spreading the cost out amongst the residents may be important steps in home protection participation.

Importance of Firewise

Based on respondent feedback, the Firewise organization and the recognition program are extremely important and valuable to the communities. The vast majority of representatives expressed that without Firewise, while they still may have made small efforts to protect their neighborhood, it wouldn't have been nearly as enthusiastic or effective of an effort. Respondents also felt that they received sufficient follow-up and support from the organization ensuring that they would always have someone to contact if they had questions. This evaluation should solidify the importance of some kind of structured organization to help homeowners with the sometimes daunting task of taking on this new responsibility of home wildfire protection that, until the last couple decades, hasn't been as immediate of a concern. Fire managers should be prepared to help educate communities about the different organizations available for support and guide them as they embark on the path towards community resilience to wildfire.

After speaking with Firewise community representatives, it seems that thoughts towards Firewise actions are as varied as the people who implement (or don't implement) them. Because of the large amount of variation that exists in the public's perception of wildfire and risk, it is essential that managers prepare themselves to fully realize the specific needs of a community. The best way to do this is to get out and meet the community, understand their individual situations and challenges, and build trust by making themselves accessible and working closely with families. Managers should ensure that questions and concerns are being answered and that fire regulations are consistently enforced. It was brought up by many representatives that having the support of fire and forest managers was helpful in achieving Firewise recognition, educating the community, and maintaining motivation. Therefore, I feel like this is a major component of the continued productiveness and longevity of a community's Firewise recognition.

Conclusions

The first finding of this study is that the Firewise organization is appreciated, important, and necessary in New Mexico to help communities in the WUI protect

themselves against wildfire damage. The organization is well equipped to help support and educate the communities and they help fuel the flame and keep the momentum going for communities at risk. They are far more effective with Firewise than if a community tried to organize themselves without it. Second, I found that the representatives were friendly, approachable, and dedicated people. They cared enough about their homes, neighbors, and the community as a whole to take the time out to organize everyone and inspire them to take steps to protect their homes as well, that can sometimes be a thankless job, but as many respondents mentioned, it was a project they thought was worth taking on and they were willing to do it. All it takes is one person to be the spark that can fuel a whole community. Third, it takes a strong and cohesive community to make this program effective. With the rapid WUI population increase, it is imperative that residents help firefighters by coming together to employ some kind of protective measures. With the right information and the willingness to work with others, communities can significantly reduce the risk of fire damaging their homes. But, it is clear that acceptance and implementation of reduction measures is dependent on many variables and it isn't a clear one size fits all approach. It is important that additional research is done to further understand the complexities of the decision-making processes within the WUI.

References

A user reference guide to the Firewise Communities/USA recognition program. (2009). (Reference Guide). doi:http://www.Firewise.org/usa-recognition-program/~/media/Firewise/Files/Pdfs/Booklets%20and%20Brochures/FirewiseUserGuide.pdf. (Firewise Recognition Program)

Bostwick, P., Menakis, J., & Sexton, T. (2011). How fuel treatments saved homes from the 2011 Wallow fire. *Fuel Treatment Effectiveness Assessment, August*, *16*, 2011.

Brenkert–Smith, H., Champ, P. A., & Flores, N. (2006). Insights into wildfire mitigation decisions among wildland–urban interface residents. *Society and Natural Resources*, *19*(8), 759-768.

Bright, A. D., & Burtz, R. T. (2006). Firewise activities of full-time versus seasonal residents in the wildland-urban interface. *Journal of Forestry*, *104*(6), 307-315.

Butry, D., & Donovan, G. (2008). Protect thy neighbor: investigating the spatial externalities of community wildfire hazard mitigation. *Forest Science*, *54*(4), 417-428.

Calkin, D. E., Cohen, J. D., Finney, M. A., & Thompson, M. P. (2014). How risk management can prevent future wildfire disasters in the wildland-urban interface. *Proceedings of the National Academy of Sciences*, *111*(2), 746-751.

Calkin, D. E., Gebert, K. M., Jones, J. G., & Neilson, R. P. (2005). Forest Service large fire area burned and suppression expenditure trends, 1970–2002. *Journal of Forestry*, *103*(4), 179-183.

Cohen, J. D. (1995). Structure ignition assessment model (SIAM). In *Weise, David R.; Martin, Robert E., technical coordinators. Proceedings of the Biswell symposium: fire issues and solutions in urban interface and wildland ecosystems* (pp. 15-17).

Cohen, J. D. (1999, April). Reducing the wildland fire threat to homes: Where and how much?. In *Proceedings of the symposium on fire economics, planning, and policy: bottom lines* (pp. 189-195).

Cohen, J. D. (2000). *What is the wildland fire threat to homes?. School of Forestry, Northern Arizona University.*

Community Wildfire Protection Plan FAQ. (n.d.). Retrieved January 22, 2015, from http://www.safnet.org/lp/cwppfaq.cfm

Daniel, T., Carroll, M., Moseley, C., and Raish, C. (Ed.). (2007). *People, fire and forests: A synthesis of wildfire social science.* Corvallis: Oregon State University Press.

Dennison, P. E., Brewer, S. C., Arnold, J. D., & Moritz, M. A. (2014). Large wildfire trends in the western United States, 1984–2011. *Geophysical Research Letters*, *41*(8), 2928-2933.

Dillon, G. K., Holden, Z. A., Morgan, P., Crimmins, M. A., Heyerdahl, E. K., & Luce, C. H. (2011). Both topography and climate affected forest and woodland burn severity in two regions of the western US, 1984 to 2006. *Ecosphere*, *2*(12), art130.

Gude, P. H., Jones, K., Rasker, R., & Greenwood, M. C. (2011).The cost of protecting homes from wildfire in Oregon.

Gude, P. H., Jones, K., Rasker, R., & Greenwood, M. C. (2012).The cost of protecting homes from wildfire in the Sierra Nevada.

Gude, P. H., Jones, K., Rasker, R., & Greenwood, M. C. (2012). How much do homes contribute to wildfire suppression costs?.

Gude, P. H., Jones, K., Rasker, R., & Greenwood, M. C. (2013). Evidence for the effect of homes on wildfire suppression costs. *International journal of wildland fire*, *22*(4), 537-548.

Hammer, R. B., Radeloff, V. C., Fried, J. S., & Stewart, S. I. (2007). Wildland–urban interface housing growth during the 1990s in California, Oregon, and Washington. *International Journal of Wildland Fire*, *16*(3), 255-265.

Hammer, R. B., Stewart, S. I., & Radeloff, V. C. (2009). Demographic trends, the wildland–urban interface, and wildfire management. *Society and Natural Resources*, *22*(8), 777-782.

Healthy Forests Restoration Act of 2003, 16 USC 6511

Headwaters Economics. 2014. The Firewise Program: Perspectives of Incident Commanders. 9 pp.http://headwaterseconomics.org/wphw/wp-content/uploads/Firewise_IC_Interviews.pdf (accessed 13March 2014).

Hodgson, R. W. (1995). Strategies for and barriers to public adoption of fire safe behavior. *In: Weise, David R.; Martin, Robert E., Technical Coordinators. The Biswell Symposium: Fire Issues and Solutions in Urban Interface and Wildland Ecosystems; February 15-17, 1994; Walnut Creek, California. Gen. Tech. Rep. PSW-GTR-158. Albany, CA: Pacific,* Walnut Creek, CA.

Hudak, A. T., Jain, T. B., Morgan, P., & Clark, J. T. (2011). Remote sensing of WUI fuel treatment effectiveness following the 2007 wildfires in central Idaho. *This article was written and prepared by US Government employees on official time, and is therefore in the public domain.*

International Code Council and National Association of Resource Conservation & Development Council. (April 2008). *National Wildland Urban Interface Blue Ribbon Panel Report*. Washington, DC.

Jakes, P. J. (2012). Minnesota Firewise in the Classroom: youth working with communities to adapt to wildfire.

Jakes, P. J., & Sturtevant, V. (2013). Trial by fire: Community Wildfire Protection Plans put to the test. *International journal of wildland fire*, *22*(8), 1134-1143.

Kennedy, M. C., & Johnson, M. C. (2014). Fuel treatment prescriptions alter spatial patterns of fire severity around the wildland–urban interface during the Wallow Fire, Arizona, USA. *Forest Ecology and Management*, *318*, 122-132.

Kyle, G. T., Theodori, G. L., Absher, J. D., & Jun, J. (2010). The influence of home and community attachment on firewise behavior. *Society and Natural Resources*, *23*(11), 1075-1092.

Martin, I. M., Bender, H., & Raish, C. (2007). What motivates individuals to protect themselves from risks: the case of wildland fires. *Risk analysis*, *27*(4), 887-900.

McCaffrey, S.M. (2004). Fighting fire with education: what is the best way to reach out to homeowners? *Journal of Forestry, 102*(5), 12-19.

McCaffrey, S. M., Stidham, M., Toman, E., & Shindler, B. (2011). Outreach programs, peer pressure, and common sense: what motivates homeowners to mitigate wildfire risk?. *Environmental Management*, *48*(3), 475-488.

McGee, T. K., McFarlane, B. L., & Varghese, J. (2009). An examination of the influence of hazard experience on wildfire risk perceptions and adoption of mitigation measures. *Society & Natural Resources, 22*(4), 308-323. doi: 10.1080/08941920801910765

Mell, W. E., Manzello, S. L., Maranghides, A., Butry, D., & Rehm, R. G. (2010). The wildland–urban interface fire problem–current approaches and research needs. *International Journal of Wildland Fire*, *19*(2), 238-251.

Morrison, P.H. and G. Wooten. 2013. Analysis and comments on the Yarnell Hill fire in Arizona and the current fire situation in the United States. Pacific Biodiversity Institute, Winthrop, Washington. 34 pp

National Fire Protection Association (NFPA). 2013. Firewise Communities USA/Recognition Program. http://www.Firewise.org/usa-recognition-program.aspx (accessed March 28, 2015).

National Interagency Fire Center (NIFC). 2011. Wildland fire statistics. http://www.nifc.gov/fireInfo/fireInfo_statistics.html (accessed February 20, 2015).

National Institute of Standards and Technology (NIST). 2013. A case study of a community affected by the Witch and Guejito Fires: Report #2 – Evaluating the effects of hazard mitigation actions on structure ignitions. NIST Technical Note 1796. 107 pp.

Poudyal, N. C., Johnson-Gaither, C., Goodrick, S., Bowker, J. M., & Gan, J. (2012). Locating spatial variation in the association between wildland fire risk and social vulnerability across six southern states. *Environmental management*, *49*(3), 623-635.

Radeloff, V.C., Hammer, R.B., Stewart, S.I., Fried, J.S., Holcomb, S.S., and McKeefry. J.F. (2005). The wildland-urban interface in the United States. *Ecological Applications*, 15(3), 799-805.

Reams, M. A., Haines, T. K., Renner, C. R., Wascom, M. W., & Kingre, H. (2005). Goals, obstacles and effective strategies of wildfire mitigation programs in the Wildland–Urban interface. *Forest Policy and Economics, 7*(5), 818-826. doi:http://dx.doi.org/10.1016/j.forpol.2005.03.006

Running, S. W. (2006). Is global warming causing more, larger wildfires? *Science, 313*(5789), 927-928. doi:10.1126/science.1130370

Schoennagel, T., Nelson, C. R., Theobald, D. M., Carnwath, G. C., & Chapman, T. B. (2009). Implementation of National Fire Plan treatments near the wildland–urban interface in the western United States. *Proceedings of the National Academy of Sciences*, *106*(26), 10706-10711.

Skinner, C. N., & Chang, C. R. (1996, January). Fire regimes, past and present. In *Sierra Nevada ecosystem project: final report to Congress* (Vol. 2, pp. 1041-1069).

Theobald, D.M., & Romme, W.H. (2007). Expansion of the US wildland-urban interface. *Landscape and Urban Planning,* 83(4), 340-354.

Toman, E., Stidham, M., Shindler, B., & McCaffrey, S. (2011). Reducing fuels in the wildland–urban interface: community perceptions of agency fuels treatments. *International journal of wildland fire*, *20*(3), 340-349.

U.S. Forest Service Fire Suppression. (n.d.). Retrieved February 5, 2015, from http://www.foresthistory.org/ASPNET/Policy/Fire/Suppression/Suppression.aspx

What is a community wildfire protection plan? (2015). Retrieved March 28, 2015 from https://www.safnet.org/lp/cwppfaq.cfm

Winter, G., & Fried, J. S. (2000). Homeowner perspectives on fire hazard, responsibility, and management strategies at the wildland-urban interface. *Society & Natural Resources*, *13*(1), 33-49.

Winter, G. J., & Fried, J. S. (2001). Estimating contingent values for protection from wildland fire using a two-stage decision framework. *Forest Science*, *47*(3), 349-360.

Westerling, A. L., Hidalgo, H. G., Cayan, D. R., & Swetnam, T. W. (2006). Warming and earlier spring increase western US forest wildfire activity. *Science*, *313*(5789), 940-943.

Williams, J. (2013). Exploring the onset of high-impact mega-fires through a forest land management prism. *Forest Ecology and Management*, *294*, 4-10.

WUI Fact Sheet. (2013, August 1). Retrieved February 24, 2015, from http://www.iawfonline.org/pdf/WUI_Fact_Sheet_08012013.pdf.

Table 1: the name of each Firewise community that was contacted, the nearest city to that community, the county, the vegetation and topography of the community, and the population and median annual household income from the closest city to each community. The source for this information was the community representative except for population information which was obtained from www.census.gov and median annual household income which was obtained from www.bestplaces.net.

Firewise Community Name	City	County	Elevation	Terrain and vegetation	Total population	Median Annual Household Income
Greater Eastern Jemez WUI Corridor	Jemez Springs	Sandoval	5000-8000 ft.	Mountainous, Ponderosa, Aspen, Pinyon, Juniper, and scrub oak	250	$59,886
Village of Ruidoso	Ruidoso	Lincoln	6500-9000 ft.	Mountainous, Ponderosa, mixed conifer, Douglas-fir, Pinyon, Juniper, Gambel oak	8,029	$47,379
Hidden Lake	Ocate	Mora	9500-10500 ft.	Mountainous, Engelmann Spruce, corkbark fir, Bristlecone pine, Douglas-fir, Limber pine, Quaking Aspen, White fir	135	$43,750
Ute Park	Ute Park	Colfax	7413 ft.	Mountainous, Engelmann Spruce, Douglas and corkbark fir, bristlecone pine, quaking aspen	71	$22,821
Elk Ridge	Angel Fire	Colfax	9400 ft.	Mountainous, Engelmann Spruce, Douglas and corkbark fir, bristlecone pine, quaking aspen	1,216	$50,917
Fox Hills, Sandia Park	Sandia Park	Bernalillo	6500-7300 ft.	Mountainous, pinyon pine, juniper, mountain mahogany, scrub oak, some yucca	237	$72,566
Quemado Lake Estates	Quemado Lake	Catron	6887 ft.	Surrounded by mountains, pinyon pine, juniper, scrub oak	228	$44,779
Cimarron Ranch	Quemado	Catron	6800 ft.	Mountainous, pinyon pine, juniper, scrub oak	228	$44,779
Reserve	Reserve	Catron	5774 ft.	Surrounded by mountains in river bottom.; open grass, cottonwood,	289	$26,807

				pinyon, juniper, ponderosa pine, mixed conifer		
Taos Pines Ranch	Angel Fire	Colfax	8490-9300 ft.	Mountainous terrain	1,216	$50,917
Green Valley	Black Lake	Colfax	8579 ft.	Mountainous, Ponderosa pine, aspen, spruce, Douglas-fir	N/A	$50,917
El Salto	Arroyo Seco	Taos	7634 ft.	At the base of Lucero Peak,	1,785	$44,239
Rancho Viejo Community	Santa Fe	Santa Fe	7260 ft.	Surrounded by mountains, semi-arid desert, pinyon and sparse grass.	67,947	$50,446
Homestead	Datil	Catron	7400 ft.	Rolling mountains, pinyon, juniper, some ponderosa, sparse grass meadows	54	$26,992
Paa-Ko	Sandia Park	Bernalillo	6000-7000 ft.	East slope of Sandia mtn, pinyon, juniper, some ponderosa, scrubby grasses and tumbleweeds	237	$72,566
Taos Canyon	Taos	Taos	7500-9000 ft.	Mountainous terrain, pinyon and oak on warm side, shady side has cottonwoods, fir, ponderosa, aspen and some oak.	5,716	$29,953

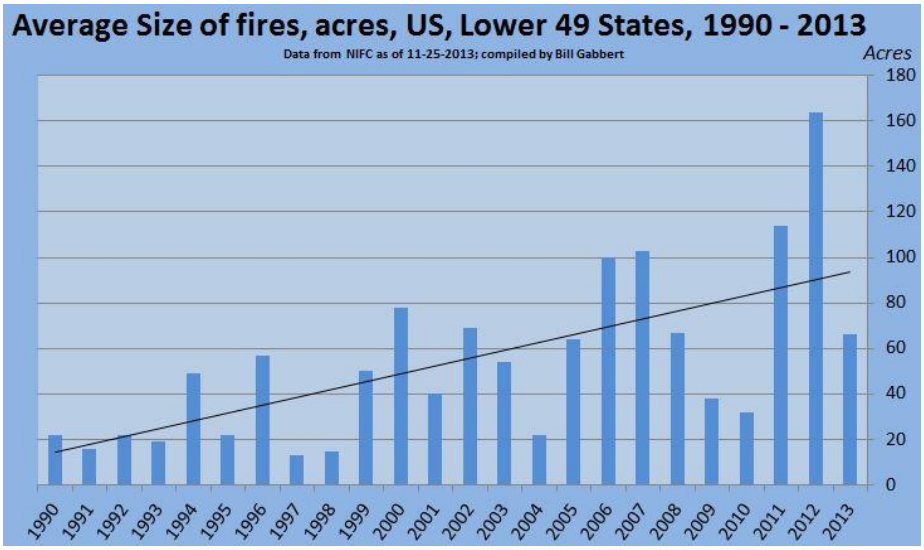


Figure 1 – The average size of fire acres in the lower 49 States from 1990-2013. This graph shows a gradual increase in the average size of wildfires and a continuing trend towards larger fires. (Data from NIFC.org as of November 25, 2013, compiled by Bill Gabbert. Retrieved March 23, 2015 from http://wildfiretoday.com/tag/statistics/

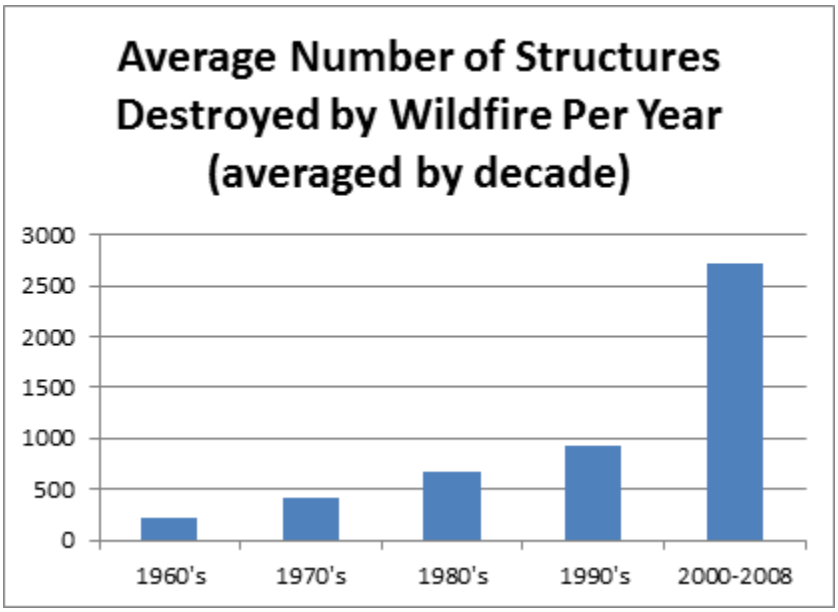


Figure 2: Average number of structures destroyed per year by wildfire, averaged by decade (except the 2000-2008 period which does not include the 2009 data). Source: The Blue Ribbon Panel Report on Wildland Urban Interface Fire, 2008. Retrieved April 3, 2015 from http://www.insurancejournal.com/blogs/corelogic/2014/05/30/330545.htm

Figure 3: Map of the 19 NM Firewise communities I communicated with for this project. Purple dots indicate the 16 communities I was able to reach. The pink dots indicate the 3 communities I was unable to reach. Firewise community locations were provided by NFPA.

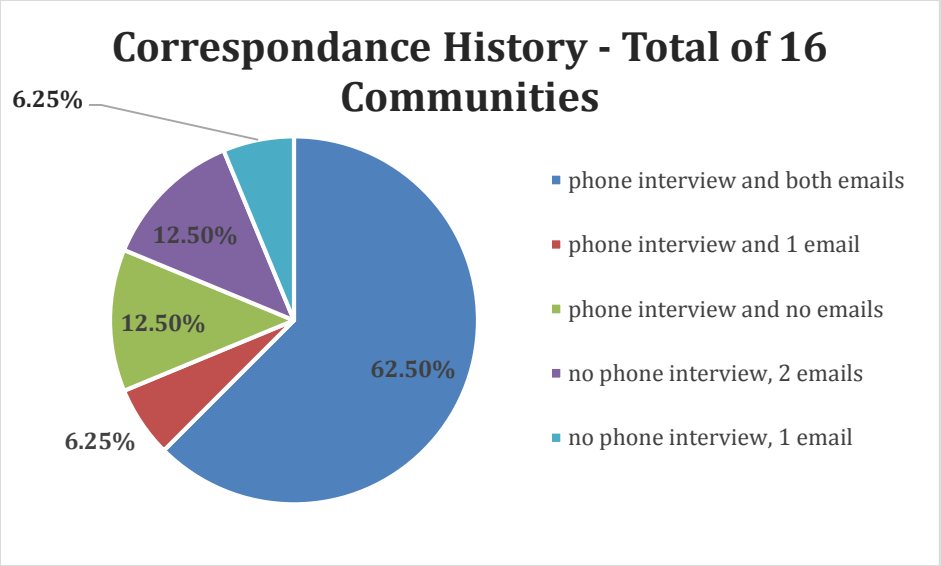


Figure 4: The percentage of people in each correspondence category with the majority of participants having conducted a phone interview and responding to two separate email attempts.

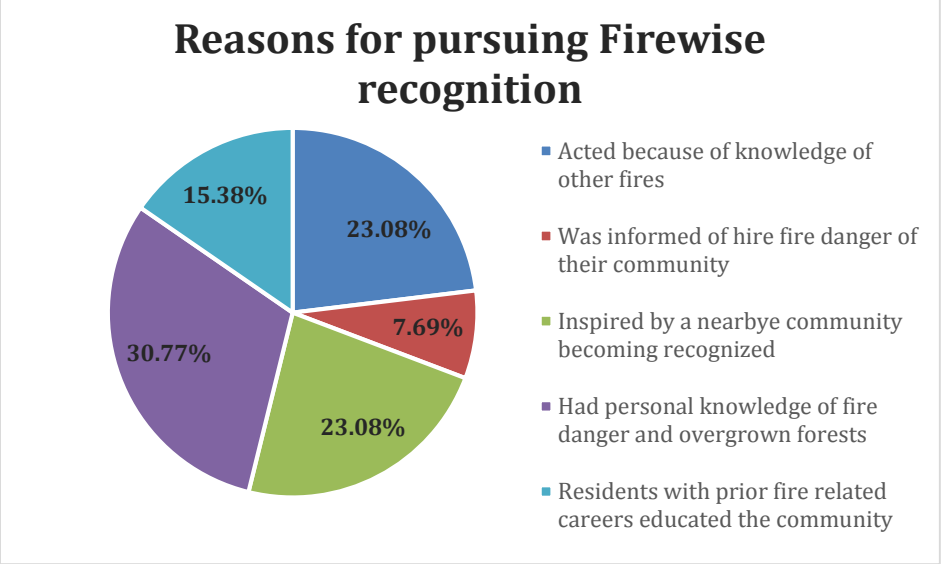


Figure 5: The percentage of the 13 people who answered this question explaining why they chose to initiate the Firewise recognition application process for their community.

Appendix A

Interview Questions

1. Why was Firewise designation pursued? Was there a particular motivating event? If so, what were they?

2. Is there a Community Wildfire Protection Plan (CWPP) that covers the neighborhood?

3. What are the primary resource concerns in the context of wildfire?

4. How was the Firewise recognition process for you?

5. What activities did the community do as part of the recognition process?

6. Do you think cost was a consideration with community members when becoming a Firewise community?

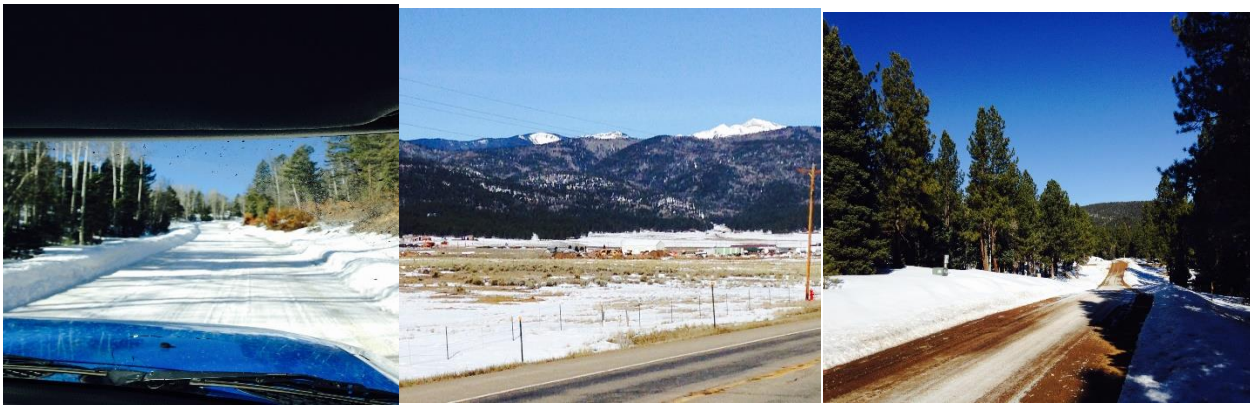
7. Did you get a lot of community participation in the Firewise recognition process?

8. How much support did you get from the fire department, city council, or other local organizations?

9. How crucial to home wildfire protection do you think the Firewise organization is? Would your community have taken protection measures without it?

10. Have you been satisfied with the amount of support and follow up from the Firewise organization?

Appendix B



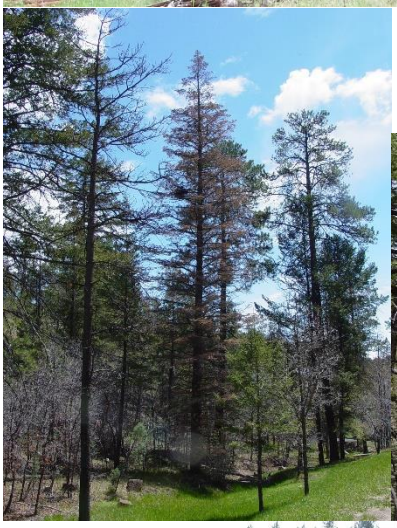
Photos courtesy of Taos Pines Ranch Firewise Community (Angel fire, NM)

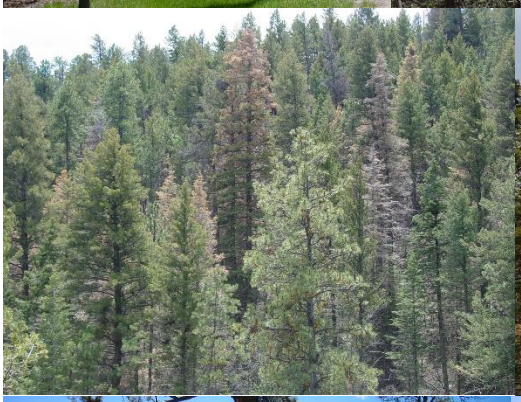
Slash pulled out prepared for chipper day

Notice turn around space for emergency vehicles

Photos courtesy of Elk Ridge Firewise Community (Angel fire, NM)








Photos courtesy of Village of Ruidoso Firewise Community (Ruidoso, NM)

Photos courtesy of Reserve Firewise Community, (Reserve, NM)

Photos courtesy of Fox Hills/Sandia Park Firewise Community (Sandia Park, NM)

Photos courtesy of Hidden Lake Firewise Community (Ocate, NM)