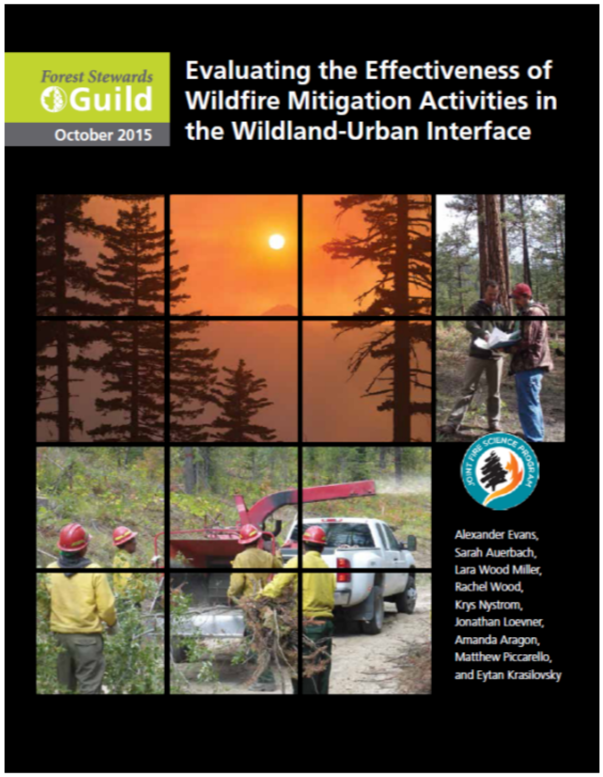
Evaluating the Effectiveness of Mitigation Activities in the Wildland-Urban Interface

Please see the full report at:
www.forestguild.org/publications/research/2015/WUI_effectiveness.pdf



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Abstract

Hundreds of millions of dollars have been spent on planning, education, and fuel reduction treatments in the WUI, yet there is little information on the effectiveness of these efforts. To address this need, we conducted an assessment of the mitigation activities in communities across New Mexico. We examined how fuel treatments change modeled wildfire behavior in 12 WUI areas, analyzed over 2,000 assessments of home wildfire hazard, studied the community hazard reduction program called Firewise, and finally integrated these different pieces of WUI mitigation efforts by studying the implementation of nine Community Wildfire Protection Plans (CWPPs). CWPPs are a key focal point because they facilitate the public's participation in wildfire threat reduction, set priorities for fuel treatments, and are required to access certain funding sources. Over 17,000 CWPPs have been written to guide wildfire mitigation in the WUI. Each CWPP is unique because of local decisions about scale, approach, areas of emphasis, and depth. While fire can never be completely eliminated from fire-adapted ecosystems, building fire-adapted communities links the wide range of WUI mitigation approaches in a way that can significantly reduce the impacts of wildfires on communities.

Background

Estimates of the total number of WUI acres in the U.S. are driven in part by the method used to map WUI (Haas et al. 2013). The most recent assessment estimated 190 million acres (771,066 km^2) of WUI in the U.S., 44 million houses in the WUI, and 99 million WUI residents or 32 percent of the U.S. population (Martinuzzi et al. 2015). Another panel put the estimate at close to 600 million acres of WUI for the entire U.S. with 100 million full-time WUI residents (ICC 2008). A recent risk-based analysis combined maps of population density with models of wildfire probability to estimate that about 40 million people or 13 percent of the U.S. population was at risk from wildland fire (Haas et al. 2013). The population density mapping by Haas and colleagues found 16 million acres of populated places at the highest wildland fire risk with another 33 million acres at medium risk (Haas et al. 2013). An analysis of properties at risk from wildfire for the western U.S. estimated 1.1 million homes, with a reconstruction value of $268 billion dollars, in the highest risk category with another 1.2 million properties in the next highest risk category (Botts et al. 2015). Not only is the WUI in the U.S. extensive, but it is growing rapidly. The WUI area in the conterminous U.S. grew by nearly 20 percent during the 1990s (Hammer et al. 2009). Two estimates from a similar methodology suggest a 7 percent increase in the WUI area of the U.S. between 2000 and 2010 (Radeloff et al. 2005, Martinuzzi et al. 2015). Even wildfire does not necessarily reduce WUI growth; new WUI development often occurs inside fire perimeters within five years of a fire (Alexandre et al. 2015).

Even as the WUI has expanded, large wildfires are burning more acres and becoming more severe. An examination of wildfires in the western U.S. between 1984 and 2011 showed both the number of large fires and the acreage burned increased significantly (Dennison et al. 2014). Regional studies have documented an increase in burn severity in both California and the southwestern U.S. (Dillon et al. 2011, Miller and Safford 2012). The increase in severity and acres burned by wildfires is likely to continue because of changes in the climate, particularly in the western U.S. On average, the western U.S. is likely to be warmer and drier by the end of the 21st century than it was during the 20th century, with warmer spring and summer temperatures, reduced snowpack and earlier snowmelts, and longer, drier summer fire seasons (Westerling et al. 2006, IPCC 2007, Dominguez et al. 2010). The Quadrennial Fire Review documents the lengthening of the fire season in the western U.S. and the evolution toward a typical fire season of more than 300 days per year (Booz Allen Hamilton 2015). Three lines of evidence predict that warming and drying conditions are likely to cause increased fire activity: reconstructions of fire and climate in the past (Swetnam 1993, Frechette and Meyer 2009), trends over the last few decades (Westerling et al. 2006), and predictive models (Westerling and Bryant 2008). Increased drought and heat are already beginning to cause an increase in tree mortality (Allen et al. 2010). A warming and drying climate is also amplifying the risk of extreme fire behaviors such as longer flame lengths, torching, crowning, erratic changes, rapid runs, and blowups (Brown et al. 2004, Booz Allen Hamilton 2015).

The Healthy Forest Restoration Act of 2003 (HFRA) introduced CWPPs as one of the key elements in planning wildfire mitigation activities in the WUI. HFRA's Title 1 included a provision for the creation of CWPPs to facilitate the public's participation in wildfire threat reduction. The goal was to have communities initiate a planning process to make themselves safer from wildfire threat. The HFRA guided federal agencies to collaborate with citizens on CWPPs and to prioritize treatment areas based on CWPPs (U.S. Congress 2003, Communities

Committee et al. 2004). CWPPs can delineate the WUI, identify fuel reduction opportunities, and set priorities for implementation. CWPPs can recommend where and how treatment should be implemented on both federal and non-federal lands. Specifically, a CWPP is defined as a plan for an at-risk community that:

1. is developed within the context of the collaborative agreements and the guidance established by the Wildland Fire Leadership Council and agreed to by the applicable local government, local fire department, and State agency responsible for forest management, in consultation with interested parties and the federal land management agencies managing land in the vicinity of the at-risk community;
2. identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment on federal and non-federal land that will protect one or more at-risk communities and essential infrastructure; and
3. recommends measures to reduce structural ignitability throughout the at-risk community (U.S. Congress 2003).

State fire assistance via the National Fire Plan helped to fund the initial round of CWPPs (McCarthy 2004), though the need for CWPPs remains greater than available funding (CWSF 2006). Since 2003, thousands of communities have developed and implemented community wildfire protection plans (NASF 2014).

Study description and location

The main report provides an analysis of fuel reduction treatments, Firewise programs, and home mitigations in New Mexico. These four elements, in combination with detailed case studies and lessons learned from CWPPs, provide the most complete view to date of the effectiveness of mitigation activities in New Mexico's WUI.

In order to model the effect of fuel treatments on fire behavior, we compared standard fire modeling results from before and after treatments for 12 different CWPPs. CWPP boundaries were available as part of the CWPPs posted online by New Mexico State Forestry (NMSF). For the home mitigations, we conducted assessments with the form developed by the Santa Fe County Fire Department's wildland fire division (see Appendix I – Home Wildfire Hazard Assessment Form). The assessment uses 28 questions about accessibility, surrounding trees, ladder fuels, fuel connection, ground cover, slope, debris, flammable materials, and structure hazard to arrive at a general hazard rating for the property. Many of these variables have been assessed in other studies of residents' wildfire mitigation efforts (e.g., Bright and Burtz 2006). The Santa Fe County form is similar to other home assessment forms (e.g., NFPA 2002). Assessments were collected by trained fire and forestry personnel from the road or driveway. This analysis includes assessments conducted by the Santa Fe County Fire Department and reassessments conducted specifically for this report.

In order to better understand the motivations and impacts of the Firewise program in New Mexico, we interviewed central figures at 16 of the 27 Firewise communities now recognized in the state. We developed open-ended questions aimed at soliciting information from Firewise community representatives about their experience and satisfaction with the Firewise organization. To create CWPP case studies, we first collected the CWPPs for each area. In some cases, multiple CWPPs covered the same communities, often smaller community-level CWPPs are within large county CWPPs. We analyzed each CWPP to identify as many of the questions from the 2008 evaluation guide as possible (Resource Innovations 2008). Then we searched for contact information for the CWPP Core Team. In some cases, CWPP Core Team members had moved on to other positions or could not be found. In total we interviewed 76 people who represented homeowners, non-governmental organizations, federal, state, tribal, county, and municipal governments. Lessons learned for each case study were identified by the interviewer or come directly from the interviewees.

Key Findings

Our analysis indicated that successful CWPPs usually include active community participation, engaged federal agency staff, clear prioritization, planning at an effective scale, and avoiding formulaic CWPPs written just to access funding.

People are the key

If there is one element that seems to make the difference between a living CWPP that helps drive real wildfire mitigations and an unused CWPP, it is an actively engaged planning team (often called a CWPP Core Team) that meets regularly and has strong personal relationships. In one case, the paper version of the CWPP is brief and unimpressive, but the Core Team has achieved impressive results. The Core Team remained engaged, meeting before, during, and after the development of the CWPP. As a result they were able to implement a range of treatments and drive a reduction in home hazard throughout the community. Interviews from CWPPs also point to a paid WUI coordinator as one way to promote an engaged Core Team.

CWPP planning processes that are inclusive and build trust are linked to successful outcomes. In contrast, CWPPs developed through processes that omit affected parties and disregard local relationships do little good. Consultants with little connection to local community often use boilerplate CWPPs and undervalue public involvement. Engaging agency support during the CWPP process is important because agency staff bring resources and expertise, as well as instill confidence that the plan will drive treatments on public land.

Prioritizing treatments

Clear prioritization of implementable projects makes a CWPP useful for managers and can speed implementation. The importance of prioritization is clear: it focuses resources and attention on the most at-risk areas and the most important projects. Prioritization facilitates implementation by streamlining planning and helping match funding to projects.

Planning scales

While county-level plans fit well with many administrative boundaries and provide a synoptic view of the wildfire hazard, the community scale is better suited to identifying individual projects. Managers and residents can develop new plans at the community scale that build off of the many existing county CWPPs and avoid duplicating time consuming efforts such as mapping wildfire risk. Vulnerable populations, such as the poor, the elderly, and people with disabilities, are at particularly high risk from wildfire; future plans should consider the needs, which may be best accomplished at the community rather than the county scale.

Ensuring that CWPP plans work

Effective WUI mitigation work requires a plan that will not just sit on the shelf. One way to avoid paying for plans that are never used is for funding agencies to require concrete evidence of engagement such as regular Core Team meetings. A related issue is the lack of integration between CWPPs and other plans, which contributes to duplication and wasted effort. However, all-hazard, zoning, and other planning efforts are likely to involve many of the same agency staff and engaged residents as CWPPs, so relationships built within CWPP Core Teams could be advantageous to other planning efforts.

Fuel reduction treatments

Our fire behavior modeling for CWPPs in New Mexico demonstrates that where communities and land managers have made a concerted effort, treatments can change wildfire behavior enough to give firefighters the opportunity to protect lives and properties. Modeling showed a reduction in active crown fire and some reductions in flame length. This modeling fits well with the growing body of research that shows fuel treatments can change fire behavior, particularly when thinning is combined with removal of surface fuels. Prescribed fire is often the most efficient way to remove surface fuel over large areas. However, fuel reduction treatments are not occurring fast enough or across enough of the landscape to stop all wildfires.

Home hazard mitigation

Even with effective fuel reduction in the forest, wildfires are part of fire-adapted ecosystems, so residents need to reduce home ignitibility as a complement to forest fuel reduction. Our analysis of home hazard assessments indicates that two-thirds of homes lack key elements of defensible space. However, nearly 20 percent of the average home hazard could be reduced by undertaking the easiest mitigation steps. The community hazard reduction program, Firewise, is one tool that can build on the power of neighbors encouraging neighbors to undertake mitigation efforts. Our interviews indicate residents like the Firewise program and feel it has made a difference in their communities.

Documenting success and weathering transitions

Where mitigation efforts like Firewise have been successful, it is important to document and trumpet successes. The spread of Firewise to nearby communities underscores the positive impact of sharing successes. The same is true for fuel treatments. Mapping where treatments have occurred can build momentum and communication across land management agencies. This sharing of information allows managers from different agencies to talk and be able to see the spatial connections between their efforts on a map. Data tracking and sharing can also help protect against the negative impact of staff transition. Keeping an accessible record of projects and successes reduces the risk that the departure of an individual will mean loss of important information and momentum.

Maintaining treatments and momentum

One of the biggest challenges facing WUI communities is the maintenance of treatments and home mitigation efforts. Wildfire hazard reduction is not a onetime task. Forest fuel reduction treatments only affect fire behavior until trees and vegetation grow back, often in 10 years or less. Similarly, campaigns to promote home mitigation can lose momentum, particularly because of the importance of one or two individuals as community catalysts. Future wildfires may reinvigorate mitigation programs just as wildfires helped motivate some communities to begin mitigation programs. Communities and managers should be ready to channel the concern and attention nearby wildfires generate into productive mitigation efforts.

Planning for post-fire

Even the most effective wildfire mitigation cannot eliminate wildfire from fire-adapted ecosystems, so communities need to plan for their post-wildfire response and recovery even as they reduce wildfire hazard. Some CWPPs already include recommendations to develop post-fire Burned Area Emergency Rehabilitation protocols for each local watershed. Preplanning can significantly reduce the impact of wildfires on communities and enhance their recovery after wildfire.

Conclusion

The challenge of wildfires in the WUI will continue to grow. More houses will be built and wildfires will likely grow in size and severity. Our review of past studies and in-depth look at WUI mitigation in New Mexico shows there is no perfect solution, no silver bullet, to protect lives and properties within fire-adapted ecosystems. Creating fire-adapted communities requires a combination of fuel treatments and home hazard mitigations. Effective treatments are guided by a strategic CWPP and include both thinning and surface fuel reduction. Neighbors and community catalysts are crucial for expanding and deepening the adoption of home mitigation measures.

While fire can never be completely eliminated from fire-adapted ecosystems, building fire-adapted communities links the wide range of WUI mitigation approaches in a way that can significantly reduce the impacts of wildfires on communities.

Management implications

Management implications from this work have been integrated into the update guidance from New Mexico State Forestry for CWPPs. This guidance is online at http://allaboutwatersheds.org/library/inbox/2015-community-wildfire-protection-plan-cwpp-update-guidelines/view

2015 Community Wildfire Protection Plan (CWPP) Update Guidelines (excerpt)

The State of New Mexico and collaborative stakeholders have made a concerted effort over the past fifteen years to identify areas throughout the state that are at risk for wildland fires. Community Wildfire Protection Plans (CWPP) have become the primary mechanism for evaluating risk due to their emphasis on community involvement and assessment of local resources. CWPPs are also an important planning document used by emergency responders and citizens to plan for and respond to wildfire emergencies. Local leaders and governmental entities find CWPPs valuable for the purposes of identifying critical needs and prioritizing funding. The New Mexico State Forestry Division has used CWPPs to rank risk communities for the annual Communities At Risk Report that is provided to the Governor and New Mexico legislature by December 15 of each year.

Most of the wildfire risk areas in New Mexico are now included in a CWPP, but the work does not stop there. Resources and landscapes change over time and CWPPs must be revisited and refreshed regularly. Changes in risk ratings should be reflected upon completion of priority projects and new initiatives developed for the CWPP to remain viable. In addition, effective new strategies and wildland programs should be incorporated into CWPP planning efforts. For example, across the country, natural resources and fire managers are increasingly operating under the National Cohesive Wildland Fire Management Strategy which has these goals:

a. Restore and maintain resilient landscapes,
b. Create and sustain Fire Adapted Communities, and
c. Respond safely, effectively and efficiently to wildfire.

CWPPs should be updated every five years to be most useful. These guidelines are designed to enhance a CWPP's effectiveness and were generated from actual experiences with mitigation and large wildfires, as well as community planning processes.

Process for Updating Your CWPP

1. Review existing CWPP.
2. Host collaborative meetings.
3. Update maps.
4. Reflect changes in risk ratings due to completed projects or changes in landscape.
5. Develop updated priorities.
6. Distribute CWPP update drafts to key stakeholders (including local, state, tribal and federal partners) for review and input before the final approval.
7. Submit the final document to your local government body, local fire department(s) and State Forestry for required signatures and endorsement.
8. Once signed and endorsed by your local governing parties, submit all documentation to NM State Forestry no later than September 1st for final approval by the New Mexico Fire Planning Task Force.

Requirements for updating a Community Wildfire Protection Plan (CWPP) in New Mexico

All CWPPs and CWPP updates must be reviewed and approved by the New Mexico Fire Planning Task Force (FPTF). The FPTF recommends that communities update their CWPP every five years. Minimum requirements for all new CWPPs and updates must address the following items:

1. Collaboration: A CWPP must be collaboratively developed by local and state government representatives, in consultation with federal agencies and other interested parties.
2. Prioritized fuel reduction: A CWPP must identify and prioritize areas for hazardous fuel reduction treatments and recommend the types and methods of treatment that will protect one or more at-risk communities and essential infrastructure.
3. Reduce structural ignitability: A CWPP must recommend measures that homeowners and communities can take to reduce the ignitability of structures throughout the area addressed by the plan.
4. Secure signature:
    a. The applicable local government (i.e., counties or cities);
    b. The local fire department(s); and
    c. The state entity responsible for forest management.

In addition, in New Mexico all CWPPs – including updates – must include the following criteria:

1. Describe progress made and list accomplishments since the CWPP was adopted.
2. Identify any new risks that have developed.
3. List any changes in a community's hazard risk rating. Risk must be rated as either high, medium, or low.
4. Appropriate signatures (local government, local fire department(s), and State Forestry)

5. List of communities-at-risk and each individual community hazard risk rating
6. Map the Wildland Urban Interface (WUI) areas within the CWPP boundaries with either a high, medium, or low risk rating. Deliver paper, PDF, and digital WUI boundary files to New Mexico State Forestry's Resource Protection Bureau. Digital files must be shapefiles. WUI boundary files must have the high, medium, or low risk rating delineated.
7. Include a list of new prioritized projects. The list must reflect state, tribal and federal priorities. Narrative should capture collaborative efforts and best practices within your landscape.
8. State Forestry accepts CWPP updates either as a preface to a previously approved plan, or as a new document with the updates integrated into the existing approved plan.

Relationship to other recent findings and ongoing work on this topic

Most plans include creation of defensible space, creation of fuel breaks, and thinning of forest stands (over 85 percent of plans reviewed by Abrams and colleagues (2015)). This is driven by HFRA's requirement that CWPPs recommend the types and methods for fuel reduction treatment. In addition, the scientific consensus on the ability of fuel reduction treatments to change fire behavior has solidified. Modeling provides one avenue for testing the effectiveness of fuel treatments (Stephens and Moghaddas 2005, Finney et al. 2007, Mason et al. 2007, Mitchell et al. 2009, Vaillant et al. 2009, Moghaddas et al. 2010, Johnson et al. 2011, Loudermilk et al. 2014). Fuel treatments have also been tested by wildfire and proved to reduce severity (Pollet and Omi 2002, Dailey et al. 2008, Wimberly et al. 2009, Prichard et al. 2010, Cochrane et al. 2012, Safford et al. 2012, Stevens-Rumann et al. 2013), even under extreme conditions (Prichard and Kennedy 2013). Fuel breaks, as opposed to thinning, have been shown to be effective when they facilitate access for firefighting (Syphard et al. 2011). Thinning without treating the slash produced by the thinning can result in fire behavior that is more extreme than in untreated areas (Stephens 1998, Innes et al. 2006). Prescribed fire, particularly multiple burns, can reduce the threat of high severity wildfire (Stephens and Moghaddas 2005, Collins and Stephens 2007). In general, treatments that include both thinning and surface fuel reduction are the most effective at moderating wildfire behavior (Evans et al. 2011, Collins et al. 2013, Martinson and Omi 2013). Prescribed fire is usually the most cost effective tool to reduce surface fuels, particularly over large areas (Cleaves et al. 2000, Hartsough et al. 2008).

Research has also begun to focus on the ability of fuel reduction treatments to help protect the WUI (Graham et al. 2004). Modeled fires show the efficacy of thinning (Ager et al. 2010) and fuel breaks (Bar Massada et al. 2011) in the WUI environment. The Angora Fire of 2007 tested fuel treatments implemented before the wildfire. Detailed analysis showed that these treatments were able to modify fire behavior and protect homes (Safford et al. 2009). Similarly, fuel treatments implemented before the 2011 Wallow Fire were able to reduce fire severity (Waltz et al. 2014). Importantly, fuel treatments in the Wallow Fire area gave firefighters opportunities to protect residences during the fire (Bostwick et al. 2011, Kennedy and Johnson 2014). Another example from Idaho showed that where slash was removed, fuel treatments were effective in the WUI (Hudak et al. 2011).

While existing research makes a strong case for the effectiveness of fuel treatments, residents of the WUI are not necessarily supportive of these treatments (Brunson and Shindler 2004) (Rodriguez et al. 2003). Individuals and communities do not always perceive treatments as effective and hence may not support thinning or prescribed burning to reduce wildfire hazard (Ascher et al. 2013). Support for fuel treatments is often linked to past experience with wildfire and the assets at risk (Fischer et al. 2014). Ascher and colleagues (2013) found communication efforts should focus on the benefits to forest health and future wildfire hazard reduction in order to build support for fuel treatments. Wilson and colleagues (2012) found that framing the conversation about the cost of recovering from wildfire losses is a particularly effective way to build support for forest fuel reduction. WUI treatments are more likely to garner support than more remote projects. USFS fuel reduction projects in 2001-2002 were 10 percent less likely to be litigated if they occurred in the WUI (Laband et al. 2006). Projects within a CWPP are less likely to be canceled or postponed than projects in areas without a CWPP (Evans and McKinley 2007) .

Public trust is particularly important when prescribed fire is one of the fuel treatments employed (e.g., Winter et al. 2002, Vogt et al. 2005). To build support for controlled burns, Ascher and colleagues recommend highlighting managers' ability to control prescribed fire to counteract negative opinions and perceived risk (Ascher et al. 2013). However, in any controlled burn, there is some element of risk and fire professionals cannot give the full guarantee of safety some members of the public desire. Smoke from prescribed fire is a growing concern in many areas of the country (Shindler and Toman 2003). However, because prescribed fire is often the lowest-cost treatment per acre, in can be an important tool to reduce wildfire hazard at a meaningful scale.

Research has provided some important insights into the effectiveness of CWPPs, the most important planning tool for WUI hazard reduction. Lachapelle and McCool (2011) found the two CWPPs they assessed were effective in getting local equipment certified and improving communications among local officials, but the potential for future cooperative action was less certain. Another assessment of three CWPPs documented social learning but did not assess efficacy of CWPP implementation (Brummel et al. 2010). Williams and colleagues (2012) evaluated the planning process for 13 CWPPs but did not specifically study the implementation or sustainability of hazard reduction efforts. Three best management practices came out of the study including paying attention to problem framing, choosing a scale at which participants can make things happen, and taking steps to facilitate implementation and ensure long-term success (Williams et al. 2012). A recent case study of three CWPPs found that the direct benefits of a CWPP could be obscured when wildfire mitigation had been occurring prior to the CWPP's existence (Jakes and Sturtevant 2013). Less formal assessments of CWPPs have occurred as well. One survey of 11 state-level managers of wildfire hazard reduction programs indicated that many share the opinion that CWPPs were the most effective element in a wildfire mitigation program (Renner et al. 2010). However, the opinion survey provided little concrete evidence of the benefits CWPPs provide. The Council of Western State Foresters also suggested the process itself of writing CWPPs was a success in an early review (2006). Much of the CWPP evaluation to date is best summed up by McCaffery's 2015 review:

> *Efforts that facilitate development of relationships, within communities and between community members and fire personnel, can contribute to increased preparedness at the individual and community level by facilitating information exchange and helping to build a sense of community.*

Successful planning processes are determined by how CWPPs are created and the people involved. Processes that are inclusive and build trust are linked to successful outcomes (Fleeger and Becker 2010, Toman et al. 2013). In Catron County, partnership between federal agencies, county staff, and other partners resulted in an effective risk mapping process and then to thousands of acres of fuel treatment. Trust-building helped convince hesitant landowners in McKinley County to create defensible space. In contrast, CWPPs developed through processes that omit affected parties and disregard local relationships do little good. In Taos County, the first consultant-written CWPP failed to pass muster and was rewritten. In McKinley County, a formulaic plan called for sprinkler systems without recognizing that they were a poor fit for the infrastructure and water resources of the county. Consultants with little connection to local community often use boilerplate CWPPs and undervalue public engagement. Engaging agency support for the CWPP process is important because agency staff can bring resources and expertise, as well as instill confidence that the plan will drive treatment on public land (Jakes et al. 2007, Fleeger 2008, Toman et al. 2013). The Claunch-Pinto CWPP shows an example of an agency staff person who led an effective CWPP process. Flagstaff, Arizona, is another community which demonstrates that a collaboration between forest managers and the community can help ensure the success of wildfire mitigation activities (Farnsworth et al. 2003).

Future work needed

The challenge of wildfires in the WUI will continue to grow. More houses will be built and wildfires will likely grow in size and severity. Our review of past studies and in depth look at WUI mitigation in New Mexico shows there is no perfect solution, no silver bullet, to protect lives and properties in fire-adapted ecosystems. Creating fire-adapted communities requires a combination of fuel treatments and home hazard mitigations. The fire-adapted communities concept provides a framework for linking the wide range of WUI mitigation approaches while acknowledging that fire cannot be eliminated from fire adapted ecosystems.

This assessment adds to past research by emphasizing the importance of engaged people to make WUI mitigations happen. Communities, and managers who work with them, may be able to expand and improve fuel treatments by continuing to focus on communication, particularly by sharing documentation of where treatments have been implemented. Our modeling adds to the research showing that fuel treatments can change wildfire behavior in the WUI and provide opportunities for suppression. Effective WUI mitigation requires treatments that include both thinning and surface fuel reduction. Prescribed fire is an efficient tool for fuel reduction and may be especially useful as communities move toward maintenance of initial treatments.

Neighbors and community catalysts are crucial for expanding and deepening the adoption of home mitigation measures. Any program to expand the adaptation of defensible space should take advantage of the power neighbors have to encourage neighbors to undertake mitigation efforts. Assessing home hazards may help motivate residents to make changes, but more work needs to be done to ensure reassessments can document improvements accurately. Currently, most homes in the areas we assessed lacked key elements of defensible space, but residents could substantially reduce their home hazard by undertaking some of the easy-to-implement mitigation measures. The strong support for the Firewise program indicates that building home mitigation efforts around this program is worthwhile, especially if a there is a local resident, a catalyst, willing to take the lead. Maintaining momentum is a looming challenge for both home mitigation programs and forest fuel reduction efforts.

Fire is inevitable in fire-adapted ecosystems, but communication, planning, and preparedness can protect communities. Together neighbors, homeowners, land managers, planners, and leaders have the power to build fire-adapted communities and mitigate the threat of wildfire.

Deliverables

Deliverable Type	Description
Website	http://www.forestguild.org/WUI
Training session	McKinley County Community Wildfire Protection Plan; spring 2014 Black Lake / Angel Fire training in conjunction with prescribed burns in 2013 and 2014
Webinars	Jan 2014 https://www.frames.gov/rcs/16000/16481.html Nov 2014 https://www.frames.gov/rcs/18000/18856.html Final webinar Jan 2016
Conference/symposia/ workshop	presented at the 2013 New Mexico Wildland-Urban Interface Summit. Taos, NM presented at the Fostering resilience in Southwestern ecosystems workshop. 2014 Southwest Fire Science Consortium presented at the 2014 New Mexico Wildland-Urban Interface Summit. Taos, NM
Non-referred publication	http://facnetwork.org/learning-in-taos-new-mexico-part-1-a-passionate-and-motivated-cwpp-core-team/ http://facnetwork.org/learning-in-taos-new-mexico-part-2-cwpp-updates-and-leveraging-resources/
Non-referred publication	http://allaboutwatersheds.org/library/inbox/2015-community-wildfire-protection-plan-cwpp-update-guidelines/view
Annual Report	Completed
Non-referred publication	*Evaluating the Effectiveness of Wildfire Mitigation Activities in the Wildland-Urban Interface* Uploaded to JFSP
Refereed publication	*Spatial analysis of community wildfire protect plan fuel treatment effectiveness* – In submission at *Forest Ecology and Management*
Final Report	Uploaded to JFSP

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