



The role of community policies in defensible space compliance[☆]

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ABSTRACT

Recently enacted federal and state policies provide incentives, including financial assistance, for local jurisdictions to manage risks associated with wildland fire. This has led to an array of local-level policies designed to encourage homeowners to create fire-safe landscapes. This qualitative study collected data from focus group interviews with homeowners in three diverse communities and used the theory of reasoned action to interpret dimensions of local-level wildland fire policies that are associated with homeowner acceptance of or compliance with defensible space guidelines or regulations. Common factors emerged in two policy evaluation categories: acceptance and compliance. WUI homeowners are more accepting of policies that are seen as fair and part of a more comprehensive risk reduction strategy. Topics that shaped acceptance of voluntary versus mandatory approaches included perceived risk severity, views about the proper roles of government, and beliefs about alternatives to regulatory approaches (e.g. private insurance, education, ignition source reduction). Program characteristics that were found to be related to beliefs about defensible space and acceptance included provision of one-on-one expert consultation, direct mail communication modes, needs-based financial assistance, and enhanced yard waste disposal options. Homeowner compliance is related to the feasibility in terms of household costs and yard waste disposal options, neighborhood norms, competing land use objectives, insurance considerations, and whether or not the policy is mandatory. These findings led to a proposed conceptual model of vegetation management policy acceptance and compliance that local governments can use to develop or amend defensible space vegetation management policies to increase policy acceptance and compliance.

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1. Introduction

Effective wildland urban interface (WUI) fire risk management requires action by local communities and individual property owners. However, societal response to a natural hazard at the local level, where the greatest control over mitigation can be exercised, is often difficult to motivate (Burby and May, 1998). Recently enacted federal and state policies provide some significant incentives for local jurisdictions to manage the risks associated with wildland fire (US Dept. of Agriculture and US Dept. of Interior, 2000; Western Governors Association, 2001). For example, several grant opportunities are available through the National Fire Plan's (NFP) Community Assistance program, including through the State Fire Assistance, Volunteer and Rural Fire Assistance, and Private Land Assistance programs (Steelman et al., 2004). The need for greater local action has led to an

array of local policies, laws, and programs targeted at communities and their residents. These local policy responses are nearly as varied as the communities that have established them. Useful case studies and anecdotal descriptions of successful and unsuccessful local WUI initiatives have begun to appear in the literature (e.g., Jakes, 2003; Steelman et al., 2004; USDA, 2004).

As WUI risk mitigation responsibilities continue to devolve to the local government level, more attention is needed to understand how these various policies are understood and accepted by constituents, including local governments and residents. Such an assessment will help communities better evaluate, support, and choose among policy responses and can help local managers understand their approaches to reduce wildfire risks and gain public acceptance of the new policies and compliance with local initiatives (Renner et al., 2005). This study examined attributes of local defensible space vegetation management incentives and policies, voluntary and involuntary, and their association with homeowner acceptance and compliance in diverse WUI communities. The findings can be used as a general guide for communities that are designing new or modifying existing defensible space vegetation management policies in an effort to reduce wildfire risks to local communities, including residents and businesses.

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2. Review of existing science

Government policy analysis and a review of the literature suggest several emerging topics worthy of research consideration. These topics include local government solutions, engagement of homeowners, barriers to defensible space compliance, and local program costs and regulatory structure.

2.1. A new focus on local government solutions

Recent federal policies to increase wildfire mitigation effectiveness and reduce federal costs are increasingly focused on local government solutions, particularly community-based efforts to address the wildfire problem in the West (USDA and USDI, 2000; WGA, 2001). The policies are designed to encourage a more integrated and sustainable solution to the wildland fire problems that affect communities and ecosystems. The focus on local response has only grown in recent years as wildfire suppression costs have risen dramatically from \$213 million in 1995 to \$1.5 billion in 2006 (Rey and Hatfield, 2007; Strategic Issues Panel, 2004). Forest Service managers estimate that 50% to 95% of these costs are directly related to protecting private property in the WUI (Young, 2006). In response to the resultant state and federal assistance programs, local jurisdictions have developed a wide variety of programs to manage fuels, restore forests, create defensible space around homes and communities, educate the public about wildfire, and develop markets for fuels management and forest restoration by-products (Steelman et al., 2004; USDA, 2004).

2.2. Engaging homeowners in defensible space compliance

Recent research based on social psychological theories of behavior suggests that homeowners' choice to practice fire-safe vegetation management is influenced by several cognitive factors. Using the theory of planned behavior (Ajzen, 1991), Bright and Burtz (2006) found that homeowner intentions to practice defensible space was predicted by attitudes toward the vegetation management activities, perceived behavior control (barriers to practicing vegetation management), and subjective norm (the degree to which a homeowner thinks it is important to comply with the desire of important referent groups – neighbors, family, the local fire department – as it relates to vegetation management).

A study based on the theory of reasoned action (Ajzen and Fishbein, 1980) examined homeowners' approval of mandatory, local defensible space ordinances (Vogt et al., 2005). Attitude toward acceptance of the ordinance and beliefs about the positive and negative outcomes predicted approval of the ordinance. Additional predictive factors included level of trust in the agency administering the ordinance and the degree to which defensible space was personally important to them.

In addition to individual homeowner cognitive factors and personal motivations, state and local governments and, more recently, insurance companies, can offer a combination of incentives and regulations to encourage fire-safe behavior by property owners (Weatherspoon and Skinner, 1996; Plevel, 1997; Davis, 2001). To the extent that proposed local WUI policies involve action on the part of individual residents (i.e. homeowners, voters, taxpayers), local planners and policy makers will find it useful to assess the likelihood that they can build constituency interest in, and demand for their objectives. In their study of local planning efforts to mitigate natural hazards in Florida and New South Wales, Australia, Burby and May (1998) found that higher levels of commitment by local jurisdictions to hazard mitigation planning were predicted strongly by the extent of constituency demand for mitigation objectives.

Absent mandatory regulation, many communities find it challenging to engage property owners in firesafe landscaping, building, and retrofitting. Carroll and Daniels (2003) classified this problem as

“social dilemmas,” or voluntary actions that make sense, but for which there is insufficient incentive to motivate particular individuals. Amacher, Malik and Haight (2006) also raised and analyzed this dilemma in the context of private, woodlot owners. Research on social dilemmas concludes that socialized sanctions can be more effective than mandatory regulation in compelling individuals to engage in the appropriate behavior (Carroll and Daniels, 2003). For example, a neighborhood association could shame homeowners into compliance by publicizing the names of the noncompliant.

2.3. Defensible space compliance barriers, costs and incentives

Research of homeowners' perceptions and practices related to living in high-risk WUI environments reveals the existence of many factors that can deter individuals from taking protective actions. Smith and Rebori (2001) identified 15 such factors in their review of four studies about defensible space practices in the WUI. They categorized them into a three-dimensional typology consisting of *motive*, *means*, and *opportunity* factors. Nelson et al. (2005) found that concerns about privacy, naturalness, and wildlife and recreational values shaped the willingness of Florida and Minnesota homeowners to modify their vegetation. Resource availability can also affect willingness. Homeowners in a WUI area of Michigan's northern Lower Peninsula expressed a median annual willingness to pay either 31 hours of work around their property or \$500 to hire contractors to undertake defensible space improvements to reduce their risk of home loss due to wildland fire (Fried, Winter and Gilless, 1999).

Local communities, often working in partnership with state or federal agencies, have implemented programs to add incentives or reduce barriers to private risk averting behavior. For example, in some places, providing free chipping and hauling services for removed vegetation has been quite successful in increasing vegetation management by homeowners (McCaffrey, 2004). Using innovative experimental economics methods, McKee et al. (2004) found evidence that adding cost-share components to programs designed to encourage private investment in risk averting increases expenditures significantly. Such public-private partnerships make sense from the perspectives of individuals and local governments charged with public life and safety responsibilities.

2.4. Local program costs and regulatory structure

A key dilemma that officials face with voluntary efforts is that individual fire mitigation is generally not solely a private good (individual risk reduction) but also a public good as actions taken on one property can reduce risk to nearby property owners. A few studies suggest that in some locales WUI homeowners are willing to accept tax-financed public expenditures or regulatory actions that result in local risk reduction. Using contingent valuation methods, Winter and Fried (2000) estimated that 75% of Michigan WUI homeowners in a high risk fire hazard region were willing to pay for public investments in mitigation measures that would result in a 50% reduction in the risk of home loss. Homeowners in a California community, where vegetation management for defensible space is an enforced local ordinance, were twice as likely as homeowners in Michigan and Florida communities (91% versus 44% and 42%) to have engaged in defensible space actions on their properties (Vogt, Winter and Fried, 2005).

Regulator policy is exemplified by California. In 1992, following the Oakland Hills firestorm, the California legislature passed laws¹ requiring the California Department of Forestry to identify, and local agencies to subsequently adopt, “very high fire hazard severity zones” in Local Responsibility Areas (LRA's) for the purpose of requiring

¹ Via Assembly Bill 337 (popularly known as “the Bates bill”), the legislature enacts Government Code, Sections 51175–51188 and amends Health and Safety Code Section 13108.5.

vegetation clearance and other fire hazard mitigation measures around structures. This kind of state level land-use mandate makes it easier for local public officials to take action in the face of property-rights advocates who would otherwise present more of a political risk (Davis, 2001).

Some local regulatory interface policies in California that pre-date this 1992 state law have been quite effective. According to Rossomando (1991), the Los Angeles City Fire Department (LAFD) achieved a high level of compliance with brush clearance regulations through a system that gives a reasonable time for compliance, and then has the property cleared if the owner fails to do so, and then recovers the cost from the noncompliant owner. The program achieved 94% compliance.

Outside California, mandatory defensible space regulations have been more sporadic. Although Oregon has a Forestland–Urban Interface Protection Act, in 1997, the state Legislature weakened provisions that would have required high-risk WUI homeowners to take action (Davis, 2002). A notable exception is the Village of Ruidoso, New Mexico, where the local government has implemented a comprehensive interface protection program that includes mandatory vegetation management on high-risk properties (Emerson, 2004). Other communities have required firesafe planning and measures for new developments, but the rules don't apply to existing homes.

Whether mandatory or voluntary, incentives or none, risk managers in many local communities are investing significant resources in programs (laws and policies) to mitigate wildland urban interface fire hazards. In-depth and systematic evaluation of these costly efforts is warranted. A meaningful assessment requires both qualitative and quantitative social science methods to reveal both the meaning of community and individual responses to wildland fire and the distribution of those meanings within community populations (Carroll and Daniels, 2003).

3. Research problem and study objectives

This research study was designed to reveal policy acceptance and compliance factors that WUI residents associate with local government vegetation management strategies for wildfire risk reduction. Qualitative research methods were employed to explore the motives and meanings of WUI residents' intentions to accept and comply with existing and proposed local government policies. Broadly, the theory of reasoned action (or TRA) (Ajzen and Fishbein, 1980) guided inquiry into the identification of beliefs held by individuals, attitudes held toward policy approaches, and implementation and compliance to policies. Findings were used to construct a conceptual model of the factors that influence individuals' decisions to support and practice (or not) local wildland fire management policy. The authors intend these findings to be useful to local government stakeholders in developing or improving their own local vegetation management policies to maximize constituent acceptance and compliance.

4. Study sites

Based on publicly available information (e.g., USDA 2004) and the literature (e.g., Steelman and Kunkel, 2004), we identified WUI communities that represented a range of local policies and incentives to mitigate the wildland fire hazard. Key informant interviews by phone and e-mail helped determine the suitability of a site for inclusion in the project.

Three research sites were purposively chosen to represent the mandatory to voluntary spectrum of policies and the use of incentives. Oakland, California has long-standing mandatory defensible space ordinance enhanced in 2003 by a voter-approved property tax assessment proposition that created and funds a wildfire Prevention District covering more than 22,000 homes/parcels in the Oakland Hills area.

The District has full-time staff who inspect each property in the District at least once per year. The inspections are meant to determine property owner compliance with state and local hazard mitigation laws. The District also has an education/outreach program, enhanced yard waste disposal services, and a program to offset the costs of complying with mitigation requirements for city-owned land (e.g., right-of-ways, etc).

Ruidoso, New Mexico is a small village in southeastern New Mexico of about 9000 permanent residents with a large seasonal population. It was listed by New Mexico State Forestry as one of the "Twenty Most Vulnerable Areas" facing a high level of wildfire risk (Steelman and Kunkel, 2004). In 2002, the Ruidoso Village Council passed a mandatory fuels management ordinance in the highest risk areas of the city. The ordinance is actively enforced and includes incentives such as enhanced yard waste disposal and cost-share options for property owners who are willing to thin vegetation beyond the minimum standards.

Grand Haven, Michigan has no mandatory regulations, but township fire department officials recently partnered with Michigan Cooperative Extension to develop defensible space guidelines and education materials specifically for WUI area homeowners along the fire-prone shoreline of Lake Michigan. Primary concerns of residents and fire officials are the limited ingress and egress of the older lakeshore subdivisions and the highly combustible dunegrass that is often the initial target of ignition sources, sometimes related to human recreational activities.

5. Methods

Qualitative methods were used to explore beliefs and behaviors related to vegetation management and local wildfire policies. The researchers used a method that would capture words, meanings and ways of framing topics for future quantitative research on the same scientific problem (Strauss and Corbin, 1998). Focus groups (Krueger, 1994) were selected as the appropriate approach for soliciting thoughts and ideas from members of a selected population. Two focus groups were held in each location. Participants were recruited at random from a sample frame of resident homeowners extracted from each county's tax assessor database. While residents self-selected to participate, the sample was not a convenience or snowball sample that often produces less valid results. Researchers used advance letters with return postcards (to indicate level of interest in participating) and follow-up phone calls to recruit volunteer participants. Focus group size ranged from 6 to 12 participants, averaging 7.5 participants per group. Because previous research (see Vogt et al., 2005) had not found socio-demographic variables to be meaningful in predicting view of fuel reduction techniques we did not collect socio-demographic data from participants.

Focus group data consists of the moderated group discussions, each of which followed a standard interview guide that was designed to elicit discussion of the local wildland fire risk, homeowner mitigation actions, and knowledge and perspectives on the local community's wildland fire risk mitigation programs (Krueger, 1994). Participants were also asked to share their perspectives on risk mitigation programs that exist in other communities. Focus group discussions were audio-recorded and transcribed. Transcribed focus group discussion remarks by individual participants were coded according to a hierarchical framework that emerged during several open and axial coding iterations (Strauss and Corbin, 1998).

6. Findings on vegetation management policy acceptance factors

The essence of the focus group discussions was distilled into two broad themes: vegetation management policy *acceptance* factors and *compliance* factors. Acceptance factors were based on statements related to policy attributes, values, and beliefs reflecting

a homeowner's attitude toward the policy. Within each theme, specific sub-themes and individual elements of those sub-themes revealed by participants are summarized. Focus group transcript excerpts illustrating these key findings are included. They are coded to indicate their particular focus group origin (GH1,2 = Grand Haven; OK1,2 = Oakland; RU1,2 = Ruidoso).

Homeowners commented about WUI vegetation management policies on a wide range of factors which can be segmented into two general categories: attitudes toward attributes of the policy's specific rules and guidelines; and how beliefs about policy implementation are formed and influenced (Table 1).

6.1. Attitudes toward policy attributes

WUI homeowners expressed acceptance of policies that they perceive as being fair and part of a comprehensive approach. Acceptance is also related to whether a vegetation management policy is voluntary or mandatory, with focus group participants expressing mixed feelings about this attribute.

6.1.1. Fairness: division of responsibilities

Homeowners readily recognized that WUI hazard mitigation and response is a shared responsibility between property owners and local government (and other agencies) where each group (and subgroups) has specific roles and duties. Commonly, participants described this shared responsibility as a kind of “deal” that is only fair if each participant (homeowner, government) does their part.

Participants felt that a homeowner's primary responsibility is to manage the vegetation on their property.

When we had the fire chief come to talk to the homeowners association, we sent out things to the homeowners about what to

have within six feet of the house, what to have within 30 feet of the house and we tried to take the best advice that we could get and make sure that our people know about it. (GH2)

I think people in Oakland – if you own a house, you're aware that you have to leave a defensible space. (OK1)

[H]omeowners themselves should take a lot on their hands too. Whether they clear it and put it in a pile and let the forestry come in and grind it up, something. (RU1)

Participants felt local government was responsible for: 1) supporting private property owners' efforts, 2) managing vegetation on government land, and 3) being prepared to protect homes. Local government needs to inform property owners about local WUI policies and assistance programs and provide information on how to comply with vegetation management rules or guidelines.

Local government was also seen as responsible for ensuring compliance with WUI defensible space rules or guidelines.

Fire department educators should do audits of homeowner compliance. (GH1)

The fire inspector comes around and inspects the property and gives you a pass-fail. (OK1)

Why can't [the Village] follow up every six months, let's say, to each neighborhood, the following lots are in compliance, the following lots are not in compliance. So when we look across the street, we know and we can go to the City and say why are you not enforcing this? (RU2)

As part of the “deal” participants felt that if they were being asked to manage vegetation on their property then government agencies had a responsibility to manage their land under the same rules.

I think homeowners, or even individuals, can do a lot to – I noticed, after the firestorm, that neither the City nor the state were adequately maintaining their properties. (OK1)

Let's say the Village of Ruidoso [has] every single one of us with the most beautiful perfect lots in the world, but the Forest Service doesn't get their act together, what's the point? (RU1)

In Grand Haven, some participants also felt that part of the deal was that their property would be protected if they had defensible space and indicated that if that protection wasn't available they would make a “deal” with a different entity – their insurance company.

If [the township] were to require these things, I guess I would expect that, in return for requiring me to keep my piece of property safe, that there would be some involvement to make sure they can get the equipment needed to fight a fire into my place...So, don't ask me to spend a lot of time and money to make my place fireproof, because they can't get to it to fight it. (GH2)

Sure, I have concerns about a fire damaging my property. But, by the same token, I also think that, if a fire came up the hill, there's no way that fire department could put it out. So, I might as well buy good insurance and rebuild. That's just what you have to face. Because I don't think there's any way that, if a fire got started in

Table 1
Key policy acceptance factors evident by WUI study site.

| Vegetation management policy acceptance factor | Voluntary vegetation management Grand Haven, MI | Recently enacted mandatory vegetation management (not fully implemented) Ruidoso, NM | Long-term, fully implemented mandatory vegetation management Oakland, CA |
|--|---|--|--|
| <i>Attitudes toward policy attributes</i> | | | |
| Fair; recognizes shared responsibility | ✓ | ✓ | ✓ |
| Anticipative and comprehensive | ✓ | ✓ | ✓ |
| Voluntary, not mandatory | ✓ | ✓ | ✓ |
| Infringes on property rights | ✓ | ✓ | ✓ |
| Enforce/use other policies first | ✓ | | |
| Private insurance | ✓ | | |
| Mandatory, not voluntary | ✓ | ✓ | ✓ |
| Perceived risk severity | ✓ | ✓ | ✓ |
| Public safety function of government | ✓ | ✓ | ✓ |
| Noncompliance affects on neighbors | | ✓ | ✓ |
| <i>Influences on beliefs about policy implementation</i> | | | |
| Consultative with expert availability | ✓ | ✓ | ✓ |
| Direct mail communication | ✓ | ✓ | ✓ |
| Financial assistance for the needy | ✓ | ✓ | ✓ |
| Yard waste disposal | ✓ | ✓ | ✓ |
| Enforcement fairness | | ✓ | ✓ |

✓ indicates that a factor was discussed by at least one focus group at that WUI study site.

our dune, that we'd escape it... I don't want my residential structure destroyed or damaged, but insurance will take care of that. (GH2)

6.1.2. Anticipative and comprehensive

Some participants thought that local government should anticipate the wildfire risks in long-range planning processes and in other departments besides forestry and fire. For example, more attention to zoning and building ordinances that address the fire risk was suggested – either as an alternative to mandatory vegetation management or as supplemental policies.

There's another broader policy issue and that is that our planning department allows ... people to build on very steep property that heretofore would not be considered buildable ... So, I don't think that our planning and zoning is dealing with the issue ... So, it's not just the fire department vegetation management. But it's some of the policy issues that the City needs to really take a harder stand on. (OK1)

6.1.3. Other types of policies are generally preferred to mandatory vegetation management regulations

Participants at all three sites noted that mandatory vegetation management regulations are at odds with some conceptions of property rights and personal liberties.

Legislating morality, legislating behavior, legislating individual rights, I think is a hot button in today's environment. And...then the willingness to pay additional taxes to perform that legislation, I don't know if there's anyone who would be willing to quickly raise their right hand right here to enforce that. (GH2)

The village came out and said, well, this is what we're going to do, we all dug our feet in saying you can't tell me to do that to my property. (RU2)

The government is supposed to protect us, but, as we were discussing earlier ... anytime the government is saying, "We're going to do this to protect you", you have a huge number of people saying, "We don't want you to do that. You're infringing on our rights." (OK2)

Some participants believed that mandatory regulation should be a last alternative, used only if other policies were tried and failed. These views were most prevalent in Grand Haven, the one site without mandatory regulations. Suggested alternatives to mandatory regulation fell into three main categories. First, local authorities should better enforce existing laws to control ignition sources instead of making new regulations. These suggestions often targeted "others" who were seen as careless and irresponsible (e.g. renters, tourists, youth, and seasonal homeowners).

[T]here's a lot of kids that come in, and nobody controls them. They do whatever they want, and it seems like people are turning and look the other way... I have seen neighbors' kids light a fire on a piece of string and twirl it, you know, throwing cigarettes out, and nothing's ever been done. (RU1)

What is not needed is more legislation, but enforcement of existing laws, because you just look around and you see fires all the time. I see people that couldn't have gotten a permit [for those fires]. (GH1)

Another big problem is, although Michigan has a very good fireworks law, it's not enforced. (GH1)

It is widely perceived by WUI residents that "others" (e.g. seasonal homeowners, vacation renters) are disproportionately responsible for wildfire ignition risks or noncompliance with vegetation management practices. These perceptions may not be accurate, nevertheless, these are strongly held beliefs that prompt requests for targeting communication messages heavily toward these potential "violators."

Second, education and example should be improved to get the messages out to those who live in WUI areas and to the aforementioned "others" who are perceived to be responsible for causing fires in the first place.

[Neighborhood associations] are very important to the education process, to actually implementing the pressures on individuals to do the right thing. It can't be done because someone wrote a law. (GH2)

Finally, some Grand Haven participants thought that private homeowners insurance could encourage vegetation management practices via requirements and inspections among policy holders who live in high-risk areas. Often participants who did not agree that local government should be allowed to require compliance saw this as a legitimate role for private insurance companies.

That's [the insurance company's] option...and that is accomplished without having to add more government employees and we're already paying for it. (GH2)

Create incentives. One is the insurance industry. If you do certain things, it's reflected in your insurance rates. (GH2)

6.1.4. In some circumstances, mandatory may be preferable to voluntary

Despite concerns about regulation in all three sites, participants recognized that regulations might be justified given certain conditions. First, when the underlying wildfire risk is high.

When I look at the fires out West, that's one situation. Much higher risk level there in terms of wildfires and their impact than I would suggest really exist in our area...So to start imposing a lot of rules and regulations...What does that achieve other than make government employees? (GH2)

Well, how great is the risk in those communities that don't have rules? How great is the risk? The risk isn't as high as it is here, and so everybody doesn't react. We didn't either until we had enough fires all around the perimeter of the village, and after that is when we got the ordinance. (RU1)

Second, when there is an acknowledged public safety role for local government.

The purpose of government, particularly local governments, is two-fold. One is, with its police powers, to protect the people. But, you can extend that, then, two, to safety. And that is the main purpose of government, as far as I'm concerned. And, as a result of having those two roles, which this is typical governmental roles on the nonfederal levels, so everything else down. They have a duty to protect us. By the same token, government doesn't just happen. We have, then, the responsibility to fund this, so that this protection can proceed. (OK2)

I don't have a problem with regulations as long as they're for the common good, and public safety is for the common good. (GH1)

Third, when individual noncompliance puts others (neighbors) at risk. Participants at two sites recognized that social pressure to take action would not work with everyone.

6.2. Influences on beliefs about policy implementation

WUI homeowners discussed how their beliefs have been formed or could be influenced in the future, primarily by two particular outreach methods.

6.2.1. Consultation programs with experts

Participants felt that agencies responsible for developing vegetation management rules or guidelines should make their staff available to consult one-on-one with homeowners to show them exactly how they can create defensible space on their property.

The other thing that's critical – and this is probably an offshoot of education – is the availability, in this case of [our fire chief], his willingness to sit down, take an hour or half an hour and sit down with you and say, "Okay, for your house consider this." And, I'm not sure all fire chiefs would have the time to do that. I mean, obviously, it makes their job easier if they can prevent fires. But, still, that was something that was very important: availability. (GH2)

We're seeing progress in the wildfire prevention district in terms of yearly inspections, with the firefighters going out and meeting with the homeowners. (OK1)

The village was very, very positive in saying we will come to your homeowner's association, we will come and visit with different people, make an appointment. We will tell you what needs to be done and what trees you can keep. You don't have to cut down everything. And that was a very good thing that eased our neighbors in that instance. (RU2)

6.2.2. Direct mail communication

Participants expressed a strong preference for, and most readily acknowledge receiving, information about WUI policies via written communication from the agency responsible for WUI policy and enforcement. While they acknowledge many other appropriate forms of communication (e.g., media advertisements, internet, signage), direct communication via letters to homeowners ensures that the message is delivered.

The Township should send letters to homeowners each summer to discuss the wildfire threat. (GH1)

[Upon learning from another focus group participant that there are several free yard waste disposal services offered by the City]: Send a flier to everybody. I'm just learning about this now. I just learned the other day that you could put more than one green bin. I never knew that. (OK2)

I got a letter that requires so much of the debris and everything to be cleared. And I called somebody and they came and cleaned it, and I got the confirmation from the City that it was an approval. (RU1)

7. Vegetation management policy compliance factors

The second main theme of the focus group inquiry was on factors that affect homeowner compliance with local programs. Compliance

factors were determined by statements related to policy attributes or individual household considerations associated with a homeowner's decision to comply or actual compliance with the policy. Four major themes that influence compliance emerge from the qualitative data analysis of the focus group sessions: conflicts with other homeowner land use objectives, neighborhood norms, feasibility of compliance, and whether or not the policies are mandatory (Table 2).

7.1. Competing land use objectives

Fire safety was a landscape objective for most homeowners. However, not all of them felt it was important enough to preclude consideration of other objectives. Many homeowners expressed a variety of objectives for their landscaping and yard maintenance efforts such as desire for native plants, well-manicured outdoor space, views, and privacy. These concerns parallel the findings by Nelson et al. (2005) of factors that shaped Florida and Minnesota homeowners willingness to modify their landscaping.

I want the leaves falling on the ground within three feet of my home and I want the trees closed in. That's why I'm here. If it wasn't for that, I wouldn't be here. So I don't want to be assessed. I don't think that would necessarily motivate me to change what I have. (GH2)

There's going to be some give and take. We're all going to have to compromise at some point. My neighbors may be looking directly into my house at some point, because I have to cut something down. And, who's going to agree with that? (OK2)

An additional competing objective commonly expressed was concern about erosion control, a result of both homeowner concern and legal requirements.

The other thing is we're having an erosion problem. We're watching the mountain kind of slide down because it's very steep. (RU1)

I clear my yard, but on the other hand, I have the other problem now when the rains come, I'm afraid the hillside is going to wash away. So it becomes this thing where you have to kind of balance the fact that the fire with the water – and they're still concentrating on the fire –

Table 2 Key compliance factors evident by WUI study site.

| Vegetation management compliance factor | Voluntary vegetation management Grand Haven, MI | Recently enacted mandatory vegetation management (not fully implemented) Ruidoso, NM | Long-term, fully implemented mandatory vegetation management Oakland, CA |
|---|---|--|--|
| Competing land use objectives | | | |
| Desired vegetation | ✓ | ✓ | ✓ |
| Erosion control | ✓ | ✓ | ✓ |
| Neighborhood norms | ✓ | ✓ | ✓ |
| Compliance feasibility | | | |
| Yard waste disposal options | ✓ | ✓ | ✓ |
| Compliance costs | ✓ | ✓ | ✓ |
| Mandatory, not voluntary | ✓ | ✓ | ✓ |
| Private insurance | ✓ | | |

✓ indicates that a factor was discussed by at least one focus group at that WUI study site.

that they're not concerned about the other factors that go into it. And I'm worried about those as well. (OK1)

We could remove dunegrass, but that is in conflict with the need to prevent erosion and in conflict with MDEQ rules. (GH1)

Competing land use objectives may not just derive from homeowner landscape preferences but also from external requirements such as the Michigan Department of Environmental Quality regulations (as expressed in the quote above), or from homeowner associations that restrict the removal of trees or other vegetation that is over a certain size (as expressed by a Ruidoso resident).

7.2. Neighborhood norms

It was also widely recognized that the shared responsibility was not just between individual homeowners and local government, but between neighbors as vegetation management would be less effective in decreasing fire risk if undertaken by only a few property owners. In this light, participants felt that homeowners should monitor their neighbor's efforts and help set norms to encourage their neighbor's compliance.

I'd offer to help my neighbor if I could see that they hadn't done anything about their vegetation. And they don't do anything and I call them again and call them again. And, if they don't do anything, I'll may call the fire inspector to have them deal with the issue, or offer to go out and work with the neighbor on the problem. (OK1)

Now, you're usually nice the first time, but you also go by and say, "Do you know, we could help you find somebody to help clean up your lot, but this has got to be done." (RU2)

Even if your space is fairly cleared, it's not necessarily safe... you know ... if your neighbor's property is in bad shape, or other properties in the neighborhood. (OK1)

While some are willing to confront their neighbors with these concerns, even they acknowledge that, in some cases, it is necessary to have a government official emphasize the seriousness of the situation. Participants at each site recognized the need to sometimes have a third party, such as a local government or fire department official to intervene when a neighbor is not complying with WUI defensible space or safety policies.

The fire department can talk to neighbors who don't comply rather than having neighbors telling on neighbors. (GH1)

I couldn't go to my neighbor's and say, "Now, listen, this is a goddamn mess over here and you gotta do something." They'd say, "Get out of here!" Or they'll ostracize me. But if somebody from the fire department who's the third party government says something...Look, it's a whole other animal. (OK2)

[W]hen the neighbor comes and you can actually say, look, even the City says you're not in compliance and you're putting the neighborhood at risk. (RU2)

7.3. Compliance feasibility

Two factors were associated with feasibility of firesafe landscaping: *yard waste disposal* and *compliance costs*. In Grand Haven,

residents cited the lack of any community yard waste disposal programs as an obstacle to complying with defensible space guidelines. On the other hand, both Oakland and Ruidoso offer frequent curbside pickup of yard waste: these efforts were cited as key elements of the local programs that facilitated firesafe landscaping.

I live next to a park and there is tons of undergrowth in the area. What are you supposed to do with it? You can't dispose of it in this area. (GH1)

When they've got the [yard waste disposal service] and you didn't have to haul your pine needles, that was a huge improvement, because you've actually got something you can do with [the waste]. (RU1)

Some WUI homeowners were concerned about potential costs of compliance with mandatory programs. This cost was primarily financial, especially for doing any more work than the minimum required, but was also discussed in terms of sufficient time or physical ability.

Every year [the fire department inspectors come] and they assess our house and tell us what we need to get rid of. So, I expect that this is a minimum amount of prevention, that it's a very likely thing to happen, that if a fire starts, our house can go up... If it wasn't so expensive, I'd cut them down already. They'd be gone. But we've had a couple of estimates. It's pretty pricey. (OK2)

If there were a program based on financial status...You know, if you can afford it, great, pay for it; but make an application to where it's like, you know, here are my funds, to where there is 100% upfront or maybe the village has a crew that could do it for them. What if it's an elderly person that can't rake, can't get out there and do that and they're on a fixed income? (RU1)

7.4. Mandatory policy enforced

The primary difference between sites rested on whether the site had mandatory or voluntary regulations. Grand Haven participants simply did not see the risk as high enough to merit mandatory efforts. As many of the quotes presented earlier demonstrate, Grand Haven participants placed more emphasis than their Oakland and Ruidoso counterparts on the need for focusing on policies and outreach programs other than mandatory regulations for accomplishing vegetation management including more emphasis on controlling human ignition sources, education, and private insurance as alternative means of risk reduction or as a non-government incentive to manage vegetation for defensible space.

7.5. The role of private insurance in home replacement

In Grand Haven, focus group participant indicated that private insurance can be a substitute for defensible space practices as a risk reduction mechanism. In this case, the homeowner's preference for insurance is tied to beliefs about the efficacy of fire suppression and, presumably, of defensible space to protect structures in his neighborhood.

8. Discussion

These findings on acceptance and compliance comprise the basic elements of a conceptual model of vegetation management policy that utilizes attitude-behavior framing following the theory of reasoned action (Tables 1 and 2). Acceptance factors are related to beliefs held

and attitudes toward the rules and/or guidelines that comprise the vegetation management policy and how it is implemented. Compliance factors are related to homeowners' perceptions of the potential impacts (costs, benefits, tradeoffs) a policy will have on his/her own household and their own intent to comply.

8.1. *Acceptance of policies*

Acceptance was shaped primarily by attributes of the actual policies or programs. Fairness is a key policy characteristic determining acceptance of vegetation management policies. Questions that arose about fairness from the focus groups include: Do the policies reflect the shared nature of the burden by both homeowners and other property owners, including government agencies, to comply? Do they acknowledge a division of responsibilities by both the policy target (e.g. homeowners) and the policy implementer (e.g. local government or fire department)? All are questions worthy of further investigation in the literature and future empirical studies.

Some homeowners were more accepting of vegetation management policies that are part of a larger, comprehensive strategy that may include zoning and planning policies that discourage development in high-risk areas and that include fire-safe building codes. When considering the acceptability of mandatory policies, participants generally relied on three concepts to form their beliefs and opinions: (A) perceptions about risk severity, (B) beliefs about the appropriate roles of government, including balancing public safety concerns with private property rights, and (C) and beliefs about the degree to which non-complying neighbors pose a risk to the neighborhood. Residents of the relatively low-risk site – Grand Haven, MI – expressed theoretical arguments to support regulation, but rejected that policy option for their area primarily because the risk was not severe enough to warrant an intrusion on property rights. Conversely, Oakland and Ruidoso residents, with few exceptions, saw regulation as necessary and a legitimate use of police power due to the high risk.

In terms of a local policy being implemented, participants were more accepting of a policy where local government actively assisted homeowners in understanding and in complying with policy guidelines or requirements. Specifically, most want communication by direct mail instead of having to seek it out via the internet or by other mass media. Given the perceived technical nature of the vegetation management guidelines, participants also expressed a strong preference for one-on-one consultation with a local expert who can show them precisely what they should do on their own property to comply. Finally, recognizing that some homeowners might be limited by financial or physical constraints, participants felt that provision of needs-based financial assistance and enhanced yard waste disposal services were key components in any vegetation management policy.

8.2. *Compliance with policies*

Compliance was more directly related to individual household response to vegetation management policies. Key factors fall generally into five categories: feasibility, competing land use objectives, neighborhood norms, whether or not the policy is mandatory, and private insurance as a substitute hazard adjustment. Any local policy should consider each of these factors and their component elements to maximize compliance.

Depending on a number of elements, such as household economics, disability status, and landscape characteristics, compliance may be more burdensome for some homeowners. As such, focus group participants acknowledged that some homeowners will have difficulty complying even if they are accepting of the policies. Ease of yard waste disposal was universally recognized as an important compliance factor. Without deliberate programs to manage this waste, some homeowners pointed out the potential hazardous nature of compliance (e.g., being forced to burn the debris, resulting in an

added source of wildfire ignition). Of the three research sites, Ruidoso has the most aggressive yard waste disposal program. Residents there can put to the curb any amount of yard waste for weekly pick-up by grapple trucks.

Homeowner compliance is also affected by how well actions fit with competing land use objectives, either the homeowner's preference for property uses, or regulatory land use requirements. Compliance is also associated with neighborhood norms, especially where there is an active homeowners' association. Such groups or individual neighbors may be able to apply forms of social sanction that can increase compliance among less pro-active residents.

Where regulatory policies are in force, their mandatory nature appears to be the overriding element in compliance. The other compliance factors may come into consideration primarily with whether a homeowner chooses to just do the minimum amount required or engage in more extensive vegetation management. Where voluntary policies prevail, or to achieve higher levels of vegetation management, the other factors play a more important role. In the location where regulatory policies are not in force, there also was anecdotal evidence that some homeowners would rely on insurance as a hazard adjustment strategy instead of compromising on land use objectives or spending time or money altering a yard or landscaping. Ironically, insurance companies in western states increasingly are requiring policy holders in certain high-risk areas to comply with specified vegetation management guidelines to maintain coverage. Although essentially an indirect type of regulation, participants appear to find this both an acceptable and effective risk mitigation strategy.

9. **Conclusions**

Our research shows there is a general acceptance of the need for vegetation management programs to reduce wildfire risk and highlights a number of factors that shape acceptance and compliance. Notably, mandatory regulations as a form of community forestry policy are not the inherent anathema that many might think. However, much depends on the level of risk, recognition of the shared nature of that risk, and sense that government has a role to play in minimizing that risk. One notable concept that was expressed at all three sites was the recognition that noncompliance by even one neighbor provides a potential fuel path for a wildfire, running the risk of exposing others to the hazard. This argument was used by some to suggest the justification of regulatory sanctions that could compel otherwise recalcitrant landowners and homeowners to comply. Whether programs are mandatory or voluntary, a sense of fairness is critical in acceptance. While homeowners clearly recognize their responsibility for managing vegetation on their property, there is a strong sense that their efforts need to be matched by those who are asking or requiring them to make such an effort. This takes the forms of leading by example by managing vegetation on government land and by actively providing the guidance and resource assistance needed to facilitate action on private property.

Although our findings point to some possible relationships between acceptance and compliance, the limited sample means that further quantitative testing is needed to assess statistically relevant relationships in population estimates. This work is being undertaken as the second portion of this study. While sampling techniques to recruit focus group participants were very broad in their efforts to recruit homeowners, residents who do not own a home or seasonal homeowners who may not have resided in the study site during the research time period, are most likely underrepresented. Future research should expand the study sites to enable further testing of principles and practices of diverse mandatory or voluntary policies. Moreover, different types of incentive programs should also be further explored and tested. Possible quasi-experimental designs manipulating incentives (benefits in the form of free consultation, free or low cost fuels disposal) are worthy of further scientific inquiry.

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