

Individual Response to Voluntary and Involuntary Incentives to Mitigate Fire Hazard: What Works and What Doesn't?



Final Survey Data Report

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Overview of Study and Findings

A survey of homeowners who live in the wildland urban interface (WUI) in four distinctive areas of the United States reveals that local ordinances requiring vegetation management for the reduction of risks associated with wildfires produce more positive attitudes toward defensible space management and higher levels of compliance on many defensible space practices compared to communities without vegetation management policies. Overall, higher levels of social acceptability occurred where ordinances were in place (mandatory policy). While high levels of acceptance were found in mandatory areas, not every one fully accepts all aspects of local ordinances pertaining to defensible space. This report highlights where awareness, knowledge, attitudes and behaviors of homeowners fall short of desired levels by fire protection and natural resource managers in WUI areas.

Regression analysis on the factors which best predict acceptability of mandatory vegetation management for fire safety found one independent variable had a positive significant influence on acceptance across all four sites – the belief that “local government has the responsibility to require property owners to manage their property in a way that does not endanger their neighbors or the community.” In three of the four sites, including the two mandatory policy sites, a positive significant relationship between the influence of “a local ordinance that requires a homeowner to take vegetation management actions” and acceptance was found. Another regression analysis on the factors which best predict a homeowner’s evaluation of their own efforts to maintain vegetation for fire safety found two independent variables had a significant influence on self-evaluation of vegetation management across all four sites– the personal importance that “for community wildfire protection, it is important that one’s own household manage vegetation” (positive relationship with self-evaluation) and the belief that “I don’t know how to go about managing my yard for fire safety” (negative relationship with self-evaluation). Other significant relationships were found in these two regression models, but not across all four sites.

Study sites were chosen largely for their wildland fire policy diversity: Oakland, California has a long-standing mandatory defensible space ordinance recently enhanced by a voter approved tax assessment district that provides added inspection, enforcement, and homeowner services (e.g yard waste disposal). Ruidoso, New Mexico has recently established a mandatory defensible space ordinance city-wide. Larimer County, Colorado requires that new construction in the County’s wildfire hazard area comply with wildfire hazard mitigation regulations and the county offers free disposal and chipping services to residents. Grand Haven Township, Michigan has no mandatory regulations, but recently partnered with Michigan State University Extension to develop defensible space guidelines and education materials specifically for WUI area homeowners along the fire-prone shoreline of Lake Michigan. These four research sites were purposively chosen primarily for their wildland fire policy diversity and presence of WUI flammable vegetation (fuels), significant residential housing (density, high value of real estate), and significant population levels (permanent, vacation, tourists). The voluntary policy sites were Larimer and Grand Haven; and the mandatory policy sites were Ruidoso and Oakland. The use of incentives in each area is noted, but the study design did not allow for control of or testing the impact of incentives. In spring 2008 after obtaining OMB

clearance, 5,000 surveys were sent to homeowners (permanent and seasonal) in high risk areas with just short of 1,800 survey returned for a 37% response rate. A homeowner could have received up to three mailings. A nonresponse study was also conducted to understand any response bias (no extensive biases were noted).

Additional selected results from the homeowner's survey include:

- Wildfire threat was the greatest concern in Larimer County and Ruidoso, compared to other issues. In Grand Haven, wildfire threat was rated as the lowest concern; and in Oakland, some other issues were rated of greater concern such as crime, schools, and the economy.
- Knowledge of local ordinances about building code or vegetation management was weak in all four study sites. For construction materials, landscape and vegetation, and fire department inspections it was not uncommon for most respondents at all four sites to answer “not sure.” In Oakland, nearly all respondents (94%) said correctly annual inspections of landscaping for fire safety is required. Respondents from the mandatory sites were most correct about curbside or neighborhood pickup of vegetation; while respondents from the voluntary sites were most correct about free or pay drop off sites available in their community. Few respondents at all study sites know about on-site consultations (often free) with local fire departments to learn and implement fire-safe landscaping or other fire protection advice. A “show me” approach to vegetation management with supportive services (like pick-up or drop-off) was rated more positively than “tell me” or “selective enforcement” approaches.
- Residents living in the voluntary policy sites held higher levels of agreement (than residents in mandatory policy sites) that they did not know how to manage their property for vegetation control and fire safety.
- Motives to implement defensible space were largely for wildfire safety reasons for Larimer County, Ruidoso and Oakland homeowners. High levels of vegetation maintenance and replacement of building materials (i.e., roof) were noted in these sites. Grand Haven Township residents appeared to perform vegetation management for reasons other than wildfire safety. Vegetation management beyond keeping the roof and gutters free of debris were on many homeowner's “to-do” list, particularly converting nonroof building materials and landscaping to fire-resistant materials and enclosing porches. Homeowners in the mandatory policy study areas were more likely to be motivated by laws. In Oakland 42% were partly motivated by local vegetation management programs and 29% in Ruidoso. One in ten homeowners in Ruidoso was motivated by insurance companies, which is partly explained by increased efforts by insurance companies (e.g., State Farm) in that area. In Larimer County and Grand Haven Township very few were motivated by laws (which more than likely didn't exist unless the home was new and some building codes required fire-resistant materials). Almost half of the Grand Haven Township homeowners took no defensible space actions, whereas almost nine out of ten homeowners in the other three study site areas took action in at least one of the eleven practices.
- Homeowners, particularly in the mandatory policy study sites, place high levels of importance on many stakeholders (e.g., county government, businesses, park managers, utility companies) being involved in defensible space and making a community safe(r) from wildfire. Homeowners agreed that the most important stakeholder is their own household and they rated themselves just short of “excellent” in their efforts. Owners of vacant lots received the lowest performance rating by homeowners.

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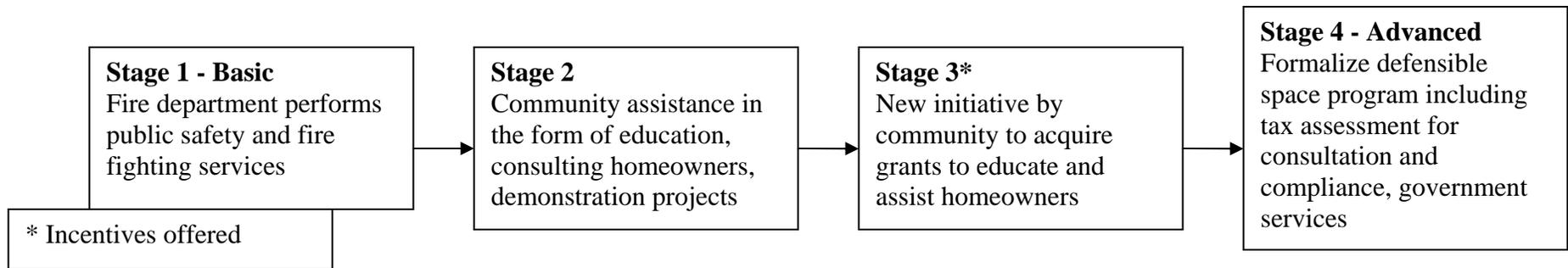
Individual Response to Voluntary and Involuntary Incentives to Mitigate Fire Hazard: What Works and What Doesn't?

Introduction and Purpose of Study

Many components of wildland urban interface (WUI) risk management programs require action by local communities and individual property owners. According to some observers, the focus on federal and state policies to motivate local jurisdictions to act is disproportionate to the attention that should be paid to what is actually happening in the local community (Steelman and Kunkel, 2004) by fire officials, government resource agencies, homeowners, neighborhood associations, and other parties such as insurance firms. Natural hazards researchers have shown societal response at the local level, where the greatest control over mitigation can be exercised, is difficult to motivate (Burby and May, 1998). Others argue there are few local political incentives to respond to the WUI fire problem given current patterns that shift post-disaster recovery burden or pre-disaster mitigation measures to state and national taxpayers (Davis 2001; Plevel 1997). Recently enacted federal and state policies provide some strong incentives for local jurisdictions to manage the risks associated with wildland fire (USDA and USDI 2000, WGA 2001). This has led to an array of local policies, laws, and programs.

Our research was aimed at identifying WUI areas where innovative approaches developed to reduce the risks and losses that wildland fire can bring to homeowners and more broadly the community. Our intent was to identify programs of different approaches but similar goals and outcomes. A significant characteristic of programs across the United States is whether defensible space is mandatory (meaning the community adopted a homeowner program and/or a local ordinance was in place) or voluntary (meaning a community may or may not have administered a program; and homeowners could practice defensible space on their own volition). Attempts were made to study another variable – the use of incentives (or disincentives in terms of taxes, fines). Figure 1 illustrates a sequence of wildfire management approaches that represent policy changes starting with voluntary programs and developing into mandatory programs that have been institutionalized by local or state public services. The goals and outcomes of defensible space programs are to prevent the loss of homes, businesses, and other built structures; prevent lives lost or injuries (residents, firefighters, animals); return dense vegetation levels to a healthier ecological condition; reduce the overall costs of firefighting; and create a partnership of agencies, homeowners, and other stakeholders to share in the prevention of wildfire and maintenance of appropriate fuel levels.

Figure 1. Evolution of Defensible Space Policy and Practices



Resource managers are learning through experience and research that the built and nonbuilt environment frequently intermix in all parts of the United States, including urban areas with high housing density and areas with no or little federally or state managed land resources. Resource managers recognize zoning, building permitting, infrastructure and government services, and building design and construction materials are just part of the complexity of the matter. Social systems and dynamics greatly influence the built and natural environment. Values, demographics, mobility and migration, and place attachment are topics gaining interest and applications in resource management, particularly in the WUI. Case studies have begun to highlight approaches taken by federal, state, county and local units of governments across the United States. Environmental policy and practices by these units over the past twenty years or so have placed elevated concern over the risks associated with heavy fuel levels throughout forests and other native ecosystems. Several years of record level fires, acres burned, homes lost, lives lost and billions of dollars spent on fighting fires has drawn attention to approaches and responsibilities.

Our research helps identify similarities and differences in homeowners’ attitudes toward local defensible space policies in communities where voluntary defensible space initiatives or mandatory defensible space ordinances exist (table 1) and various levels of incentives or costs are also present (table 2). In a questionnaire, homeowners were asked to consider: 1) the type of property and house they purchased (in some cases constructed or remodeled), 2) the characteristics of landscape in their yard and the surrounding area, 3) the routine maintenance they perform, and 4) their attitudes towards these efforts. These four factors have shown to be relevant in fires igniting or passing by structures.

Table 1. Local Wildfire Safety Law (Requirements)

Coded per local policy at time of study: M=Mandatory P=Partially Mandatory N=No local, state or federal requirements	Voluntary Policies (VP)		Mandatory Policies (MP)	
	Larimer Cty, CO	Grand Haven Twp, MI	Ruidoso, NM	Oakland, CA
Fire-resistant construction materials for all new homes	M	M	M	M
Fire-resistant landscaping and vegetation for all new homes	M	N	M	M
Fire-resistant landscaping and vegetation for existing homes	N	N	M	M
Annual fire department inspection of landscaping for fire safety	N	N	P ¹	M

¹ Re-inspections are required every five years, not annually.

Table 2. Incentives Offered

Coded per local policy at time of study: I=Incentive offered O=Offered at a cost -- = no incentive offered	Voluntary Policies (VP)		Mandatory Policies (MP)	
	Larimer Cty, CO	Grand Haven Twp, MI	Ruidoso, NM	Oakland, CA
Monthly or more frequent curbside pick-up of <u>un</u> limited yard waste (trimmings, branches, leaves, needles, etc.)	--	--	I	I
Monthly or more frequent curbside pick-up of <u>limited</u> yard waste	--	--	--	--
Less frequent curbside pickup of yard waste	--	--	--	--
A free drop-off site where I can take my yard waste	I	--	--	--
A pay drop-off site where I can take my yard waste	O	O	--	--
Home visits by the County employee or fire department official to offer free advice about fire-resistant landscaping options	I	I	I	I
Financial assistance to property owners to help with costs of fire-resistant landscaping	--	--	I	I

Overall, this research study was designed to reveal policy acceptance and compliance factors associated with local government vegetation management strategies for WUI wildfire risk reduction. Research questions in which the study was designed to answer include (stated as #5 and #6 in the proposal):

1. What is the social acceptability of the laws, policies and incentives?
2. To what extent are WUI residents motivated to comply with voluntary versus involuntary policies? And to what extent are incentives necessary to ensure compliance?

Project objectives as stated in the proposal included:

1. Develop and test individual measures (survey questions and scales) to develop a set of reliable and valid indicators of attitudes, understanding, beliefs and motivations, and other compliance factors related to local laws, policies and incentives that comprise the conceptual model variables.
2. Construct and employ a quantitative survey instrument to test and refine the conceptual model of the causal factors and processes by which individuals adjust to the wildland fire hazard in response to the local laws, policies and incentives.
3. Test and refine the conceptual model to construct a matrix of policy options and associated success factors based on public perceptions explored qualitatively and measured quantitatively.
4. Transfer findings to researchers and federal, state and local risk managers via a range of publications and presentations (this objective is ongoing).

Methods

This research used two phases of research to study defensible space programs. The first phase employed a qualitative approach of using focus group interviews with homeowners in three diverse communities to explore which attributes of local-level wildland fire policies are associated with homeowner support for and compliance with defensible space guidelines or regulations. Study sites were chosen largely for their wildland fire policy diversity: Oakland, California has a long-standing mandatory defensible space ordinance recently enhanced by a voter approved tax assessment district that provides added inspection, enforcement, and homeowner services (e.g yard waste disposal). Ruidoso, New Mexico is in the process of establishing a mandatory defensible space ordinance city-wide. Grand Haven Township, Michigan has no mandatory regulations, but recently partnered with Michigan State University Extension to develop defensible space guidelines and education materials specifically for WUI area homeowners along the fire-prone shoreline of Lake Michigan.

Phase two of the research employed a survey research approach using mail surveys with samples developed from the three mentioned sites, plus one additional site (Larimer County, Colorado). Larimer County, Colorado requires that new construction in the County's wildfire hazard area comply with wildfire hazard mitigation regulations and the county offers free disposal and chipping services to

residents. The survey was intended to empirically test the conceptual model from Phase 1 and assess the reliability and validity of existing and newly constructed measurement scales in a quantitative survey scientifically administered to households. Deliverables from this research are individual questions and the entire survey. The survey and its elements will be marketed for use by other researchers and at other WUI sites. The survey data allowed for testing of the outcomes of scenario specific factors (policy, mandatory/voluntary, incentives), as well as the determination of the influence of social characteristics (e.g., demographics, social trust, general beliefs about policy outcomes, and humans' roles in ecosystem management) on attitudes, understanding, and acceptance, and individuals' practices toward wildland fire hazard abatement efforts.

Four research sites (table 3) were purposively chosen, primarily for their wildland fire policy diversity and presence of WUI whereby flammable vegetation (fuels), significant residential housing (density, high value of real estate), and significant population levels (permanent, vacation, tourists):

Larimer County-Front Range, Colorado requires that new construction in the County's wildfire hazard area comply with wildfire hazard mitigation regulations. These include provisions for fire-resistive construction and vegetation management to create a defensible space around the new buildings. The County also operates a grant-funded yard waste facility that offers free disposal and chipping services to County residents. A full-time wildfire specialist offers on-site consultation to builders to recommend vegetation management actions that will comply with the County's defensible space guidelines.

Grand Haven Township and nearby area, Michigan has no mandatory regulations, but township fire department officials recently partnered with Michigan State University 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.

City of Ruidoso, New Mexico is a small village in southeastern New Mexico of about 9,000 permanent residents with a large seasonal population. Ruidoso 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.

City of 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 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).

Table 3. WUI Sample Site Scheme

	Voluntary policies	Mandatory policies
With incentives	<p><i>Larimer County – Front Range, Colorado</i></p> <p>New home building focus</p> <p>Insurance incentives – selective</p> <p>Home risk assessments</p> <p>Wildfire risk - high</p>	<p><i>City of Ruidoso, New Mexico</i></p> <p>Mandatory vegetation mgmt. regulations</p> <p>Cost share arrangements</p> <p>Wildfire risk - high</p>
Without incentives	<p><i>Grand Haven Township, Michigan</i></p> <p>Firewise education by MSU Extension in partnership with township fire department and state forestry</p> <p>Wildfire risk – low to moderate</p>	<p><i>City of Oakland, California</i></p> <p>Mandatory vegetation mgmt. regulations</p> <p>Tax assessment</p> <p>Wildfire risk - high</p>

The questionnaire was a product of both the focus groups and qualitative analysis, as well as reviews of other questionnaires created by social science researchers such as Bruce Schindler, Oregon State University, and Alan Bright, Colorado State University. Additional efforts were made to review the literature for concepts and scales pertaining to opinions and judgments about policies and incentives. We had also completed several general population surveys in recent years and those experiences and scales were also adapted for this study. The questionnaire also was submitted to OMB review process. This effort started around March 2007 and was finally approved on February 2008. The final questionnaire is available in appendix a.

The samples were obtained from local or county tax assessors. A list of specific WUI areas, criteria for selection (included: occupied homes, permanent residents, seasonal residents; excluded; businesses, vacant land, land with hunting sheds only, apartments) and data field needs (name, mailing address, situs address, home value) was provided to a staff person in the assessor’s offices who selected the sample. Upon receiving these population files, 50 households were randomly selected for a pre-test of the survey. Two hundred households were sent a survey packet (questionnaire, personalized letter, business reply envelope) in March 2008. With one mailing a total of 38 surveys were returned and analyzed for

any last minute question or direction suggestions (of which none were noted). Based on the pre-test response rates, a sample size of 1,500 was deemed appropriate for Larimer County, Colorado and Ruidoso, New Mexico given the size of the communities and WUI area. Also, past research in Colorado had shown response rates to be lower than California or Michigan sites. A sample of 1,000 was requested for Grant Haven, Michigan and Oakland, California.

The questionnaires were mailed on April 10, 2008 with a personalized cover letter and a business reply envelope. Reminder postcards followed about a week later. A second mailing to nonrespondents occurred on May 9, 2008. Copies of these letters and postcard are found in appendix b. This multi-staged mailing effort was designed by Don Dillman and is widely practiced to provide for the highest possible level of response rates. Press releases were also sent to local newspaper media in April and May to time with the receipt of the survey (appendic c).

Table 4 shows response rates for the four study sites and overall. Almost 1,800 completed surveys were returned from a possible 4,802 (sample size less bad addresses) for a 37% response rate. Fifty respondents contacted the principal investigator stating they were not interested in participating. Larimer County held the highest response rate (42.2%) and Oakland the lowest rate (27.5%).

Table 4. Response Rates to Mail Survey

County where WUI is located	Sample size	Bad addresses	Refused	Returned	Response rate
Larimer Cty, CO	1,500	96	10	591	42.2%
Grand Haven Twp, MI	1,000	19	16	391	39.9%
Ruidoso, NM	1,495	32	12	548	37.5%
Oakland, CA	1,000	46	12	262	27.5%
Total	4,995	193	50	1792	37.4%

In June, 2008 a nonresponse study was completed. Surveys were mailed to a smaller sample of nonrespondents in Colorado, New Mexico and California. A copy of the letter, short survey, and table of results is found in appendix d. Phone calls rather than another mailed survey were used to survey Oakland residents per advisement by OMB to use multi-methods to test for nonresponse bias. A phone survey firm was hired to make the calls and followed a script and coded questions. In addition to a nonresponse study, efforts were made to use the original population database provided by assessors and compare estimates to sample statistics.

The nonresponse survey and analysis revealed the following potential biases that may exist in the data (table 23 in appendix d). For Larimer County, a comparison of population and sample estimates reveal that seasonal homeowners responded at a higher participation rate than permanent homeowners; and high property value households were more likely to respond than lower property values. For the other sites, only a comparison of

permanent and seasonal homeowner's level of response (to nonresponse levels) could be completed because of availability of data, revealing no significant differences. Using the nonresponse mail or phone survey, the following biases were revealed: 1. In Oakland and Larimer County, nonrespondents to the main survey held significantly higher ratings of the likelihood of wildfire occurring than respondents to the main study. 2. In Oakland, nonrespondents to the main survey held significantly more positive attitudes toward two measures (i.e., visit by an official to show how to manage vegetation, ordinance that requires vegetation management). All other differences across the four study sites were not statistically significant. Overall, these nonresponse biases were not judged to be systematic or warranting an adjustment of the main study results, but should be considered in interpretation of the results. Particularly in Oakland County, attitude results presented in this report regarding ordinances may be less positive than an estimate of everyone if that was possible.

Completed surveys were keyed and analyzed using SPSS 16.0. Tables were created to display descriptive statistics (frequencies, means, standard deviations). Means scores on interval and ratio data were calculated for voluntary policy (estimating a composite mean for CO and MI sites) and mandatory policy (estimating a composite mean for NM and CA) and an independent sample t-test was applied. In some cases the two sites within each policy are significantly different from each other. ANOVA tests with post-hoc testing (site differences are documented with superscripts on each mean) were used to test for similarities and differences across attitudinal and behavioral measures. Regression models were also estimated for each site on two key variables: attitude toward mandatory ordinances and self-rating on management of vegetation for fire safety. The overall aim of the research was to determine whether mandatory policies yielded greater compliance and greater acceptance than voluntary policies.

Findings

The findings of the research are organized into the following sections: description of respondents; assessment of county issues and services; knowledge about wildfire laws, services and incentive programs; behavioral compliance and motives; implications of defensible space practices; and stakeholders involved with defensible space management. The final section provides analysis for two key dependent variables – acceptance of mandatory vegetation management and homeowner's self-perception of their compliance to vegetation management.

Description of Respondents

A mix of male and female respondents was obtained across the four study sites (table 5). Men were more likely to be respondents than females, with the exception of the Oakland study site. On age, few respondents were likely to be 19 to 39 years old, unsurprising given the nature of the sample being homeowners. In all study sites, over half of the respondents were 60 year or older. Related to age is the finding that respondents were more likely to be retired than employed full-time or part-time, with the exception of Oakland. In Grand Haven, MI and Oakland, the majority of homeowners had household incomes greater than \$100,000. In Larimer County and Ruidoso, approximately one-third of the respondents had these high levels of income with an equal distribution over lower household income categories.

Residential status and type of home varied across the four study sites (table 6). In three of the four study sites, permanent or full-time homeowners were most common. In Ruidoso, seasonal or part-time residents were most common. In Oakland, very few respondents used their property for seasonal or vacation use. Length of residency was the greatest in Grand Haven with over three-quarters (79.0%) of the household living in their home for over 10 years, followed by Oakland households (73.5%). In all four study sites, single-family homes were most common. Ruidoso respondents were most likely to live in a condominium (11.3%) or a manufactured or mobile home (7.4%). Multi-family units were most common in Oakland (4.2%).

Table 5. Demographic Description of Respondents

	<u>Voluntary Policies (VP)</u>		<u>Mandatory Policies (MP)</u>	
	Larimer Cty, CO	Grand Haven Twp, MI	Ruidoso, NM	Oakland, CA
Gender				
Male	62.4%	57.2%	59.6%	47.8%
Female	37.6	42.8	40.4	52.2
Age				
0-18	0.2	0.0	0.0	0.0
19-39	5.9	2.2	4.0	2.9
40-49	15.1	10.2	7.0	18.0
50-59	27.8	25.9	25.0	27.3
60-69	30.1	29.2	35.0	31.4
Over 70	21.0	32.5	29.0	20.4
Employment				
Employed, full-time	37.9	29.2	30.8	46.1
Employed, part-time	5.0	6.6	5.6	7.8
Retired	41.8	50.9	46.0	31.8
Self-employed	13.5	8.2	13.3	10.9
Unemployed	0.2	0.0	0.2	0
Homemaker	0.7	4.5	3.4	2.3
Student	0.2	0.0	0.2	0.4
Other	0.7	0.5	0.6	0.8
Household Income				
Less than \$20,000	3.5	1.2	4.6	1.7
\$20,000 - \$39,999	15.5	8.8	12.5	5.4
\$40,000 - \$59,999	19.8	12.2	17.5	7.1
\$60,000 - \$79,999	16.4	14.1	13.7	9.2
\$80,000 - \$99,999	12.3	10.0	12.1	13.8
\$100,000 or more	32.5	53.8	39.7	62.9

Table 6. Residential Status and Types of Home

	<u>Voluntary Policies (VP)</u>		<u>Mandatory Policies (MP)</u>	
	Larimer Cty, CO	Grand Haven Twp, MI	Ruidoso, NM	Oakland, CA
Residential Status				
Full time (homeowner)	52.6%	62.1%	33.5%	96.6%
Full time (renter)	0.3	0.3	0.4	1.1
Seasonal (vacation home)	43.6	33.9	63.3	0.0
None of above (e.g., weekend cabin, other family lives there)	3.4	3.7	2.8	0.0
Length of Residency				
0-10 years	43.3	21.0	51.4	26.5
Over 10 years	56.7	79.0	48.6	73.5
Types of Home				
Single-family house	89.4	97.1	77.7	92.0
Condominium	0.3	0.5	11.3	1.9
Other multi-family unit (e.g. duplex, triplex)	0.0	0.0	1.5	4.2
Manufactured or mobile home	3.5	0.5	7.4	0.0
Other type of house	6.7	1.8	2.0	1.9

Assessment of County Issues and Services

To understand the importance of wildfire concerns in comparison to other community issues, respondents were asked to rate their level of concern on eight community services, including two items related to wildfires. On six of the eight issues, the composite mean for the mandatory policy sites was significantly greater (higher level of concern) than the composite mean for the voluntary policy sites (table 7). Both wildfire items (threat of wildfire in local area, wildfire could change your quality of life) were significantly different. Wildfire threat was the greatest concern in Larimer County and Ruidoso compared to other issues. In Grand Haven, wildfire threat was rated as the lowest concern; and in Oakland, some other issues were rated of greater concern such as crime, schools, and the economy.

Table 7. Homeowner Concerns about County Issues

	<u>Voluntary Policies (VP)</u>					<u>Mandatory Policies (MP)</u>					<u>Overall</u> (MP vs. VP)	<u>Overall</u> (4 states)
	Larimer Cty, CO		Grand Haven Twp, MI			Ruidoso, NM		Oakland, CA			T-test	ANOVA df=3
	Mean ^a	SD	Mean	SD	<i>Mean (Total)</i>	Mean	SD	Mean	SD	<i>Mean (Total)</i>		
Crime in local area	3.1 ^{2,3}	1.12	3.1 ^{2,3}	1.07	3.1	3.5 ^{1,3,4}	1.17	4.4 ^{1,2,4}	0.83	3.8	13.23***	F=100.26***
County budget	3.2 ^{2,3}	1.09	3.1 ^{2,3}	1.23	3.2	3.4 ^{1,3,4}	1.18	4.2 ^{1,2,4}	0.89	3.7	9.76***	F=62.69***
Threat of wildfires in local area	3.8 ^{1,3}	1.07	2.6 ^{2,3,4}	1.14	3.3	3.8 ^{1,3}	1.07	3.4 ^{1,2,4}	1.13	3.7	6.86***	F=121.86***
Quality of local public schools	2.9 ^{1,2,3}	1.31	3.1 ^{2,3,4}	1.28	3.0	2.6 ^{1,3,4}	1.26	4.4 ^{1,2,4}	0.90	3.2	4.00***	F=128.79***
Access to health care	3.1	1.25	2.9 ²	1.32	3.0	3.3 ¹	1.26	3.1	1.35	3.2	3.24**	F=7.21***
Wildfire could change your quality of life	3.5 ^{1,3}	1.23	2.7 ^{2,3,4}	1.32	3.2	3.4 ¹	1.30	3.2 ^{1,4}	1.26	3.4	2.23*	F=31.24***
Health of the local environment	3.6	1.17	3.5	1.21	3.5	3.5	1.13	3.7	1.14	3.6	0.69	F=1.60***
Local economy	3.3 ^{1,3}	1.20	3.8 ^{2,4}	1.20	3.5	3.2 ³	1.19	4.0 ^{2,4}	1.01	3.5	-0.05	F=40.90***

a: scale where “1” is not concerned; “3” neutral; “5” very concerned.

¹ Statistically different than Michigan; ² Statistically different than New Mexico; ³ Statistically different than California; ⁴ Statistically different than Colorado

* $p < .05$, ** $p < .01$, and *** $p < .001$.

Additionally, respondents were asked to rate the quality of selected county or local services. Three of the five items related specifically to wildfire: wildfire education, prevention and protection, and local fire department services (table 8). In the sites with mandatory policies (Ruidoso, Oakland), education and protection services for wildfire were rated at a higher level than the two voluntary policy sites. The county’s financial management and government services, however, were rated significantly lower at the two mandatory policy sites.

Table 8. Quality of Public Services

	Voluntary Policies (VP)					Mandatory Policies (MP)					Overall (MP vs. VP)	Overall (4 states)
	Larimer Cty, CO		Grand Haven Twp, MI			Ruidoso, NM		Oakland, CA				
	Mean ^a	SD	Mean	SD	Mean (Total)	Mean	SD	Mean	SD	Mean (Total)	T-test	ANOVA df=3
The County’s financial management	3.0 ^{1,2,3}	0.77	3.5 ^{2,3,4}	0.75	3.2	2.8 ^{1,3,4}	0.91	2.2 ^{1,2,4}	0.86	2.6	-14.18***	F=123.11****
Overall County government services	3.1 ^{1,2,3}	0.81	3.5 ^{2,3,4}	0.74	3.3	3.0 ^{1,3,4}	0.84	2.5 ^{1,2,4}	0.83	2.8	-11.07***	F=82.84***
Local services to educate homeowners about wildfire protection and prevention	3.4 ¹	1.04	2.5 ^{2,3,4}	1.04	3.1	3.5 ¹	1.08	3.4 ¹	1.00	3.4	6.82***	F=77.41***
Local services to prevent and protect the community from wildfires	3.5 ^{1,2}	1.00	3.0 ^{2,3,4}	1.02	3.3	3.7 ^{1,4}	0.93	3.5 ¹	0.89	3.6	6.52***	F=31.11***
Local fire department services	3.9	0.97	3.8	0.87	3.8	3.9	0.82	3.8	0.83	3.8	0.07	F=0.98

a: scale where “1” is poor; “3” neutral; “5” excellent.

¹ Statistically different than Michigan; ² Statistically different than New Mexico; ³ Statistically different than California; ⁴ Statistically different than Colorado

* $p < .05$, ** $p < .01$, and *** $p < .001$.

Knowledge about Wildfire Laws, Services and Incentive Programs

If we consider each of the four research sites existing along a continuum of wildland fire defensible space policies from completely voluntary to completely mandatory (as shown in Figure 1), Grand Haven Township, Michigan would occupy the voluntary end of the continuum and Oakland, CA would occupy the mandatory end. All sites require new homes to be constructed of fire-resistant materials, but only the Michigan site does not also require new homes to ensure that the landscaping and vegetation are consistent with defensible space guidelines (as shown in Table 1). Toward the mandatory end of the continuum, only the New Mexico and California sites require that even existing homes be compliant with vegetation and

landscaping defensible space guidelines. And only the California site requires annual inspections to ensure compliance. Ruidoso, New Mexico requires regular re-inspections; however, these occur every five years.

When asked whether or not local laws require these actions, it was not uncommon for most respondents at all four sites to answer “not sure” (table 9). Respondents in Oakland were the least likely to be unsure of the correct response. However, even here, 41% were unsure of the requirement for construction materials of new homes and 47% were unsure of vegetation and landscaping requirements for new homes. Interestingly, in Oakland, only 30% correctly stated that fire-resistant landscaping and vegetation was required for existing homes, yet nearly all respondents (94%) said, correctly, that annual inspections of landscaping for fire safety is required.

Collectively, respondents at the Colorado and Michigan site were more sure of whether or not existing homes are required to comply with defensible space guidelines. About half answered these questions correctly and very few answered incorrectly. Still, at these sites, about half or more answered “not sure.”

Table 9. Local Wildfire Safety Law (Requirements – also see Table 1)

	<u>Voluntary Policies (VP)</u>						<u>Mandatory Policies (MP)</u>					
	Larimer Cty, CO ^a			Grand Haven Twp, MI ^b			Ruidoso, NM ^c			Oakland, CA ^d		
Are these required?	Yes	No	Not Sure	Yes	No	Not Sure	Yes	No	Not Sure	Yes	No	Not Sure
Fire-resistant construction materials for all new homes	23.5%	21.6%	54.9%	21.1%	15.6%	63.3%	19.3%	14.3%	66.4%	54.4%	4.8%	40.9%
Fire-resistant landscaping and vegetation for new homes	21.3	23.8	54.8	4.1	29.9	65.9	28.1	13.9	58.0	45.0	8.4	46.6
Fire-resistant landscaping and vegetation for existing homes	7.5	44.4	48.0	1.1	42.5	56.4	27.8	25.0	47.2	29.5	34.7	35.9
Annual fire department inspection of landscaping for fire safety	4.3	56.0	39.7	2.2	48.6	49.2	20.5	25.0	54.5	94.0	1.6	4.4

(a): Larimer County, CO does require fire-resistant construction and landscaping of new homes, but not existing homes. Nor are annual inspections required. (b) Grand Haven TWP, MI only requires fire-safe building construction on new homes. (c) Ruidoso, NM requires all listed items with the caveat that re-inspections are required every five years, not annually. (d) All listed items are requirements in Oakland, CA’s Wildfire Prevention Assessment District.

Generally, respondents at all sites were most sure about whether or not some type of curbside yard waste pickup was offered to them (table 10). Respondents were least sure about the availability of financial assistance to help pay for the cost of fire-resistant landscaping. A plurality of Colorado site respondents (42%) knew about the existence of a free drop-off site for yard waste to encourage defensible space vegetation management. More Colorado respondents knew of a place they could pay to drop off their yard waste. At the Michigan site, few respondents believed that any of these services were offered; however, many were “not sure.” In Ruidoso, NM, most respondents knew that their city offers at least monthly, unlimited curbside pickup of yard waste, and just over half (51%) believed that curbside yard waste pickup is available, but for only a limited amount of waste. At the California site, 75% of respondents knew that the city offers curbside pickup of a limited amount of yard waste. Only about half (47%) thought they could dispose of an unlimited amount of waste through this program. Few respondents at all sites know about the availability of free, on-site consultations with local officials about fire-safe landscaping and vegetation management.

Table 10. Services and Incentives Offered

	<u>Voluntary Policies (VP)</u>						<u>Mandatory Policies (MP)</u>					
	Larimer Cty, CO ^a			Grand Haven Twp, MI ^b			Ruidoso, NM ^c			Oakland, CA ^d		
Are these offered?	Yes	No	Not Sure	Yes	No	Not Sure	Yes	No	Not Sure	Yes	No	Not Sure
Monthly or more frequent curbside pick-up of <u>unlimited</u> yard waste (trimmings, branches, leaves, needles, etc.)	6.6%	67.7%	25.7%	9.3%	67.0%	23.7%	61.9%	16.2%	21.9%	47.0%	39.4%	13.7%
Monthly or more frequent curbside pick-up of <u>limited</u> yard waste	11.4	63.0	25.5	13.5	59.9	26.6	51.3	18.8	30.0	75.5	14.1	10.4
Less frequent curbside pickup of yard waste	10.6	59.2	30.2	14.6	51.8	33.6	31.1	22.4	46.5	28.9	43.6	27.5
A free drop-off site where I can take my yard waste	42.0	32.0	25.9	37.5	23.0	39.5	24.9	20.8	54.4	18.4	33.9	47.7
A pay drop-off site where I can take my yard waste	55.3	16.8	27.9	16.5	24.2	59.2	25.7	14.2	60.0	46.6	8.0	45.4
Home visits by the County employee or fire department official to offer free advice about fire-resistant landscaping options	24.3	29.9	45.8	6.8	38.6	54.5	23.3	25.0	51.6	31.1	22.7	46.2
Financial assistance to property owners to help with costs of fire-resistant landscaping	3.0	45.4	51.5	1.1	43.6	55.3	13.1	31.0	55.8	2.0	41.8	56.2

(a) Larimer County, CO has a grant-funded, free drop-off site residents can take yard waste for disposal or chipping and offers free, on-site consultations with the County’s wildfire specialist. (b) Residents of Ottawa County, MI can take yard waste to a pay site or obtain a burn permit for on-site burning, and the Fire Dept. offers free, onsite consultations about defensible space guidelines. (c) Residents of Ruidoso, NM have access to unlimited, curbside pickup of yard waste, home visits and financial assistance for landscaping and vegetation management above the minimum standards. (d) Oakland, CA’s Wildfire Prevention Assessment District offers the same incentives as Ruidoso, NM.

Risk Perception and Attitudes Towards Personal Property Vegetation Management

Homeowners were asked about the likelihood of a wildfire occurring near their neighborhood in the next five years, as well as the likelihood that their home would incur damage during the wildfire. Larimer County homeowners rated the likelihood of fire the highest, but still an overall mean of “somewhat likely” (table 11). In all four study sites the likelihood of a home being damaged was rated lower. In the two mandatory policy areas, the likelihood of a wildfire causing home damage was significantly higher than the voluntary policy sites, but overall still low.

Table 11. Perceived Wildfire Occurrence and Damage

	<u>Voluntary Policies (VP)</u>					<u>Mandatory Policies (MP)</u>					<u>Overall</u>	<u>Overall</u>
	Larimer Cty, CO		Grand Haven Twp, MI			Ruidoso, NM		Oakland, CA			(MP vs. VP)	(4 states)
	Mean ^a	SD	Mean	SD	Mean (Total)	Mean	SD	Mean	SD	Mean (Total)	T-test	ANOVA df=3
A wildfire will damage your home in the next 5 years	2.3 ^{1,3}	0.88	1.9 ^{2,3,4}	0.86	2.1	2.4 ^{1,3}	0.93	2.1 ^{1,2,4}	0.84	2.3	3.36**	F=33.06***
A wildfire will occur near your neighborhood in the next 5 years	3.2 ^{1,2,3}	1.11	2.3 ^{2,3,4}	0.99	2.9	2.9 ^{1,4}	1.02	2.7 ^{1,4}	1.05	2.8	-0.41	F=66.46***

a: scale where “1” is not likely at all; “3” somewhat likely; “5” very likely.

¹ Statistically different than Michigan; ² Statistically different than New Mexico; ³ Statistically different than California; ⁴ Statistically different than Colorado

* $p < .05$, ** $p < .01$, and *** $p < .001$.

Respondents were in high levels of agreement (table 12) that defensible space practices “improves the way my yard looks,” “make sense to do because insurance can’t replace everything,” and “a good way to protect my home in case of a wildfire.” Mandatory policy sites had a slight (statistical) edge over voluntary policies. The two mandatory policy sites also yielded significantly less uncertainty about what to do with yard waste or how to make a yard more fire safe. Homeowners in the two voluntary policy sites, on average, rated that defensible space practices interfere with other things they wanted to do with their yard at a higher level than mandatory policy homeowners. Homeowners across the voluntary and mandatory comparison were similar on slightly disagreeing that defensible space management cost too much, agreeing that the initial effort was more work than subsequent maintenance, and having neutral views about its effect on the attractiveness of a yard for wildlife.

Table 12. Managing Vegetation on Homeowner’s Property for Wildfire Protection (Attitudes about Benefits, Costs, and Uncertainties)

Vegetation Management	Voluntary Policies (VP)					Mandatory Policies (MP)					Overall (MP vs. VP) T-test	Overall (4 states) ANOVA df=3
	Larimer Cty, CO		Grand Haven Twp, MI			Ruidoso, NM		Oakland, CA				
	Mean ^a	SD	Mean	SD	Mean (Total)	Mean	SD	Mean	SD	Mean (Total)		
I don’t know what to do with all the yard waste it creates	2.5 ^{1,2,3}	1.35	3.0 ^{2,3,4}	1.19	2.7	2.2 ^{1,3,4}	1.27	1.9 ^{1,2,4}	1.05	2.1	-9.80***	F=50.18***
I don’t really know how to go about managing my yard for fire safety	2.3 ¹	1.16	3.4 ^{2,3,4}	1.20	2.7	2.4 ^{1,3}	1.23	2.1 ^{1,2}	1.12	2.3	-7.23***	F=89.21***
Improves the way my yard looks	3.8 ^{2,3}	1.05	3.8 ^{2,3}	1.03	3.8	4.0 ^{1,4}	1.04	4.1 ^{1,4}	0.93	4.0	4.61***	F=7.50***
Interferes with other things I want from my yard	2.3 ^{2,3}	1.00	2.6 ^{2,3,4}	0.92	2.5	2.3 ¹	1.04	2.1 ^{1,4}	1.00	2.3	-3.91***	F=12.10***
Makes sense to do because insurance can’t replace everything	4.1 ¹	0.96	3.6 ^{2,3,4}	0.98	3.9	4.1 ¹	0.95	4.0 ¹	1.09	4.0	3.04**	F=19.66***
A good way to protect my home in case of a wildfire	4.5 ^{2,3}	0.77	3.9 ^{2,3,4}	1.00	4.3	4.3 ^{1,3,4}	0.90	4.5 ^{1,2}	0.77	4.4	2.74**	F=36.30***
Costs too much to do it right	2.6 ^{1,3}	1.11	2.8 ^{3,4}	0.90	2.7	2.8 ³	1.15	2.2 ^{1,2,4}	1.04	2.6	-1.80	F=18.18***
Hard to do the first time, but easy every year after	3.6 ^{1,3}	0.93	3.4 ^{2,4}	0.76	3.6	3.6 ^{1,3}	0.97	3.3 ^{2,4}	0.98	3.5	-1.02	F=10.88***
Makes my yard more attractive to wildlife	3.0 ¹	1.06	3.2 ^{3,4}	0.94	3.1	3.2	1.06	3.0 ¹	1.03	3.1	-0.18	F=4.72***

a: scale where “1” is strongly disagree; “3” neutral; “5” strongly agree.

¹ Statistically different than Michigan; ² Statistically different than New Mexico; ³ Statistically different than California; ⁴ Statistically different than Colorado

* $p < .05$, ** $p < .01$, and *** $p < .001$.

In nine attitude statements about fire protection approaches ranging from ordinances, vegetation removal, insurance requirement, and specialized programs, homeowners living in the mandatory policy sites rated eight out of nine statements more positively than those living in the voluntary policy sites (table 13). Two of the eight items held a one-point scale difference, an unusually large difference in social science research. They were particularly positive about curbside pickup of any yard waste that resulted from defensible space efforts that they or a contractor might have done. They were also positive about the existence of local ordinances that require vegetation management (and compliance) and special taxing districts for particularly high risk areas. A positive mean, but closer to neutral, was found for other efforts such as programs that helped homeowners go beyond minimum vegetation efforts, were targeted at lower-income households, or consisted of a visit or inspection by a local official to show

how to manage vegetation. Also receiving more neutral ratings were insurance policies requiring defensible space management. Education materials and presentations to neighborhoods about defensible space received moderately positive ratings from homeowners in all four study sites.

Table 13. Attitudes toward Fire Protection Approaches

	Voluntary Policies (VP)					Mandatory Policies (MP)					Overall	Overall
	Larimer Cty, CO		Grand Haven Twp, MI			Ruidoso, NM		Oakland, CA			(MP vs. VP)	(4 states)
	Mean ^a	SD	Mean	SD	Mean (Total)	Mean	SD	Mean	SD	Mean (Total)	T-test	ANOVA df=3
Curbside pickup of any yard waste that results from managing vegetation for fire safety	3.6 ^{2,3}	1.3	3.7 ^{2,3}	1.18	3.6	4.4 ^{1,4}	0.83	4.6 ^{1,4}	0.69	4.5	16.87***	F=89.82***
Local ordinances that require homeowners to manage their vegetation for fire safety	2.9 ^{1,2,3}	1.26	2.7 ^{2,3,4}	1.21	2.8	3.7 ^{1,3,4}	1.16	4.0 ^{1,2,4}	0.97	3.8	16.34***	F=95.00***
A special taxing district in high wildfire risk areas to pay for enforcement of a local ordinance that requires homeowners to manage their vegetation for fire safety	2.2 ^{2,3}	1.16	2.0 ^{2,3}	1.11	2.1	2.5 ^{1,3,4}	1.27	3.0 ^{1,2,4}	1.34	2.7	9.32***	F=42.85***
Programs that will help homeowners with the cost of maintaining vegetation for fire safety if the homeowner will manage vegetation beyond the minimum standards	3.4 ^{1,2,3}	1.3	2.9 ^{2,3,4}	1.30	3.2	3.7 ^{1,4}	1.21	3.7 ^{1,4}	1.17	3.7	8.17***	F=33.89***
Programs that will help lower-income households with the cost of maintaining vegetation for fire safety	3.2 ^{2,3}	1.35	3.0 ^{2,3}	1.3	3.1	3.5 ^{1,3,4}	1.25	3.8 ^{1,2,4}	1.20	3.6	7.28***	F=21.24***
Homeowners insurance policies that require homeowners to maintain their vegetation for fire safety	2.9 ^{1,2,3}	1.23	2.6 ^{2,3,4}	1.21	2.8	3.1 ^{1,4}	1.2	3.3 ^{1,4}	1.20	3.2	7.10***	F=19.87***
A visit to my home by a local government official to show me how to manage the vegetation on my property for fire safety	3.3 ¹	1.3	2.9 ^{2,3,4}	1.3	3.1	3.3 ¹	1.19	3.4 ¹	1.13	3.4	3.88***	F=11.90***
Local government distributing educational materials to homeowners to encourage them to maintain their vegetation for fire safety	3.9 ³	0.95	3.8 ³	0.99	3.9	3.9 ³	0.99	4.1 ^{1,2,4}	0.86	4.0	2.25*	F=6.46***
A presentation by local government officials to my neighborhood or homeowners association about maintaining vegetation for fire safety	3.8 ^{1,2}	1.02	3.4 ^{3,4}	1.10	3.6	3.5 ⁴	1.06	3.7 ¹	0.98	3.6	-0.78	F=10.92***

a: scale where "1" is extremely negative; "3" neutral; "5" extremely positive.

¹ Statistically different than Michigan; ² Statistically different than New Mexico; ³ Statistically different than California; ⁴ Statistically different than Colorado

* $p < .05$, ** $p < .01$, and *** $p < .001$.

Similar to other attitudes items presented thus far, homeowners in the mandatory policy study areas were also more positive in their attitudes toward a variety of local government policies and actions to mitigate the fire risk compared to the voluntary policy site homeowners (table 14). The highest level of agreement was with the view that found local government should promote community health and safety. This was followed by local government requiring property owners to manage their property in certain ways if the rules are enforced fairly and consistently. Homeowners, particularly at the mandatory policy sites, moderately agreed that local government does not have the right to tell property owners how to manage their property. This finding suggests that homeowners are more supportive of “show me” approaches, then “tell me.”

Table 14. Attitudes Toward the Role of Local Government in Defensible Space Management

	<u>Voluntary Policies (VP)</u>					<u>Mandatory Policies (MP)</u>					<u>Overall</u>	<u>Overall</u>
	Larimer Cty, CO		Grand Haven Twp, MI			Ruidoso, NM		Oakland, CA			(MP vs. VP)	(4 states)
	Mean ^a	SD	Mean	SD	Mean (Total)	Mean	SD	Mean	SD	Mean (Total)	T-test	ANOVA df=3
Local government has the responsibility to require property owners to manage their property in a way that does not endanger their neighbors or the community.	3.3 ^{2,3}	1.20	3.3 ^{2,3}	1.19	3.3	3.9 ^{1,3,4}	1.08	4.4 ^{1,2,4}	0.82	3.6	14.00***	F=74.41***
Local government has the right to require property owners to manage their property in certain ways if the rules are enforced fairly and consistently.	3.2 ^{2,3}	1.17	3.2 ^{2,3}	1.17	3.2	3.8 ^{1,3,4}	1.11	4.2 ^{1,2,4}	0.97	3.9	13.25***	F=64.91***
Local government does not have the right to tell property owners how to manage their property.	2.7 ^{2,3}	1.23	2.8 ^{2,3}	1.25	3.2	2.5 ^{1,3,4}	1.25	1.9 ^{1,2,4}	1.06	3.7	8.03***	F=34.67***
Generally speaking, local government should promote community health and safety.	4.0 ^{2,3}	0.96	4.0 ^{2,3}	0.96	4.0	4.2 ^{1,3,4}	0.83	4.5 ^{1,2,4}	0.79	4.1	6.24***	F=18.43***
Local government may require property owners to manage their property in a certain way, but only if the risk to neighbors is very high.	3.3 ²	1.14	3.4	1.14	3.4	3.6 ⁴	1.13	3.5	1.18	3.6	3.92***	F=7.75***

a: scale where “1” is strongly disagree; “3” neutral; “5” strongly agree.

¹ Statistically different than Michigan; ² Statistically different than New Mexico; ³ Statistically different than California; ⁴ Statistically different than Colorado

* $p < .05$, ** $p < .01$, and *** $p < .001$.

Behavioral Compliance and Motives and Implications of Defensible Space Practices

Homeowners were asked to share with us which defensible space practices they instituted at their property. A list of eleven items pertaining to vegetation and house features, including building materials, was provided. Respondents were offered an option of that feature not pertaining to their house, the feature already existing when they purchased, action has been taken for wildfire safety or other reasons, or no action has been taken. Table 15 provides much data on both practices and compliances. Few respondents across the four study sites indicated that vegetation or home features were not applicable to their property. Overall, firewood stacked near a building was less common, particularly in Oakland, CA. Approximately one-quarter of respondents indicated that fire-resistant house construction materials or landscaping were features of their homes or that decks were enclosed to keep debris from collecting underneath. In the columns marked “action not necessary because already existed when purchased” most practices yielded a single digit percent suggesting few homeowners found themselves in that situation or that vegetation management requires ongoing or frequent effort. The exception was fire-resistant roofs with 31% of Ruidoso homeowners having appropriate roof materials to 17% of Grand Haven Township homeowners. The column marked “my household took this action primarily for wildfire safe reasons” shows the magnitude of effort taken by Larimer County, Ruidoso and Oakland homeowners. High levels of vegetation maintenance and replacement of building materials (i.e., roof) were noted. Grand Haven Township residents appeared to perform vegetation management for reasons other than wildfire safety. Finally, vegetation management beyond keeping the roof and gutters free of debris were on many homeowner’s “to-do” list, particularly converting non-roof building materials and landscaping to fire-resistant materials and enclosing porches.

Table 16 provides insight into the reasons why homeowners took the actions (or lack of action). Homeowners living in the mandatory policy study areas were more likely to be motivated by laws. In Oakland 42% were partly motivated by local vegetation management programs and 29% in Ruidoso. One in ten homeowners in Ruidoso was motivated by insurance companies, which is partly explained by increased efforts by insurance companies (e.g., State Farm) in that area. In Larimer County and Grand Haven Township very few were motivated by laws (which more than likely didn’t exist unless the home was new and some building codes required fire-resistant materials). Almost half of the Grand Haven Township homeowners took no actions or practiced defensible space, whereas almost nine out of ten homeowners in the other three study site areas took action in at least one of the eleven practices.

Table 15. Features of Home and Actions to Protect Home from Wildfires

	1. Not a feature of my home or property				2. Action not necessary, as already existed when purchased home				3. My household took this action primarily for wildfire safety reasons				4. My household took this action primarily for other reasons				5. Have not done this to my home or property			
	VP ^a		MP ^b		VP ^a		MP ^b		VP ^a		MP ^b		VP ^a		MP ^b		VP ^a		MP ^b	
	CO	MI	NM	CA	CO	MI	NM	CA	CO	MI	NM	CA	CO	MI	NM	CA	CO	MI	NM	CA
Roof and rain gutters kept free of leaves/needles./twigs	20.5%	28.3%	11.9%	3.6%	4.9%	3.7%	5.8%	3.6%	24.0%	3.4%	29.6%	22.8%	45.4%	61.9%	49.2%	65.6%	5.3%	2.6%	3.5%	4.4%
Overhanging/dead branches removed w/in 10' of roof	11.4	8.5	6.8	8.9	7.6	2.7	7.8	6.1	49.1	8.8	52.7	60.7	15.8	59.8	21.7	19.0	16.0	20.2	11.0	5.3
Firewood/lumber stacked at least 30' from all buildings	12.2	27.1	22.2	42.3	3.0	2.4	4.4	2.8	52.4	7.7	38.9	27.0	10.4	34.8	12.9	5.2	22.0	27.9	21.6	22.6
Green veg. area maintained at least 30' around house	14.4	15.2	24.1	10.8	6.7	9.1	7.8	12.4	41.8	5.9	29.0	42.2	12.8	43.3	16.2	23.3	24.3	26.5	22.9	11.2
Trees and shrubs are thinned w/in 30-50' of house	6.7	10.7	8.3	7.5	7.9	3.7	9.2	6.3	50.8	6.7	53.7	52.2	9.3	42.2	13.6	20.2	25.4	36.6	15.2	13.8
Shrubs and lower tree branches could carry flames from ground into crown of trees are removed	4.4	10.1	8.6	6.7	5.2	3.2	7.3	5.1	51.6	7.7	58.0	51.8	8.6	32.4	14.4	14.6	30.2	46.7	11.7	21.7
House has a fire-resistant roof (asphalt shingles, metal)	5.1	7.5	3.8	8.3	24.3	16.7	30.9	25.7	43.2	11.6	34.9	42.3	19.2	54.4	24.2	16.6	8.2	9.7	6.1	7.1
Dead vegetation, leaves, and needles are cleared at least 30' from home	3.1	4.5	2.1	4.4	3.5	1.3	4.4	2.8	56.8	11.2	64.6	58.2	15.8	57.5	19.6	27.9	20.8	25.4	9.2	6.8
House construction materials (siding, porches and decks) are fire-resistant	22.7	20.3	22.7	17.2	7.6	8.4	16.4	17.6	14.3	5.7	13.4	22.0	5.8	26.8	6.8	8.0	49.6	38.8	40.2	35.2
Underside of deck enclosed to keep debris from collecting below	29.1	29.7	27.2	38.3	6.8	5.6	13.1	10.1	11.0	3.7	15.1	8.9	7.3	26.3	10.8	12.5	45.7	34.7	33.8	30.2
Yard is landscaped with fire-resistant vegetation	28.5	25.8	28.2	14.1	5.8	2.2	7.7	8.4	11.3	3.5	14.1	23.3	5.5	14.8	8.1	17.7	48.8	53.8	41.8	36.5

a: VP indicates "Voluntary Policies." b: MP indicates "Mandatory Policies."

Table 16. Motives for Defensible Space Practices

Variables	Voluntary Policies (VP)		Mandatory Policies (MP)	
	Larimer Cty, CO	Grand Haven Twp, MI	Ruidoso, NM	Oakland, CA
My household did not take any of the actions and I did not check any item in column 3 (table 15)	11.7%	46.2%	8.5%	8.3%
Voluntarily took one or more of these actions	81.1	39.0	64.2	72.3
Took one or more actions because it was required by law	7.4	0.9	29.0	42.1
My insurance company requires one or more of these actions	5.4	1.4	10.3	5.4
None of the above	4.3	15.3	7.4	4.1

Homeowners were asked to rate the effectiveness of fire safety actions in reducing the risk of severe damage to their house if a wildfire were to occur in their neighborhood. The data in table 17 does not take into account those who practiced these management applications compared to those who didn't. Similar to earlier attitudinal results, homeowners living in the mandatory policy study sites held higher ratings of the effectiveness of most of these actions. Both site means and overall means suggest that homeowners perceive actions to be fairly effective at reducing the risk of severe damage.

Table 17. Effectiveness of Fire Safety Actions for Risk Reduction of Severe Damage to Home by Wildfire

	Voluntary Policies (VP)					Mandatory Policies (MP)					Overall (MP vs. VP) T-test	Overall (4 states) ANOVA df=3
	Larimer Cty, CO		Grand Haven Twp, MI			Ruidoso, NM		Oakland, CA				
	Mean ^a	SD	Mean	SD	Mean (Total)	Mean	SD	Mean	SD	Mean (Total)		
Roof and rain gutters are kept free of leaves needles and twigs	3.8 ^{1,2,3}	1.09	3.5 ^{2,3,4}	1.11	3.7	4.0 ^{1,4}	0.97	4.0 ^{1,4}	1.03	4.0	6.61***	F=43.65***
Yard is landscaped with fire-resistant vegetation	3.6 ³	1.10	3.5 ³	1.06	3.6	3.7 ³	1.13	4.0 ^{1,2,4}	0.92	3.8	4.17***	F=12.49***
Dead vegetation, leaves, and needles are cleared at least 30 feet from house	4.4 ¹	0.77	4.0 ^{2,3,4}	0.89	4.3	4.4 ¹	0.77	4.5 ¹	0.76	4.4	4.04***	F=20.54***
Overhanging and dead branches are removed within 10 feet of roof	4.4 ^{1,2}	0.78	4.0 ^{2,3,4}	0.94	4.2	4.3 ^{1,3}	0.81	4.5 ^{1,2}	0.76	4.4	3.70***	F=14.77***
Shrubs and lower tree branches that could carry flames from the ground into the crown of the trees are removed	4.3 ¹	0.84	3.8 ^{2,3,4}	0.93	4.1	4.3 ¹	0.83	4.3 ¹	0.92	4.3	3.50***	F=12.94***
Underside of deck is enclosed to keep debris from collecting underneath	3.6 ³	1.14	3.6 ³	1.04	3.6	3.7 ³	1.15	4.0 ^{1,2,4}	1.02	3.8	3.53***	F=8.05***
Trees and shrubs are thinned out within 30-50 ft. of house	4.3 ¹	0.86	3.7 ^{2,3,4}	0.96	4.0	4.2 ¹	0.91	4.2 ¹	0.90	4.2	3.00**	F=9.62***
Removed shrubs and lower tree branches that could, carry flames from the ground into the crown of the trees	4.4 ¹	0.80	3.8 ^{2,3,4}	0.92	4.1	4.3 ¹	0.80	4.3 ¹	0.91	4.3	2.92**	F=5.77***
House has a fire-resistant roof (e.g. asphalt shingles or metal)	4.6 ¹	0.70	4.3 ^{2,3,4}	0.83	4.4	4.5 ¹	0.75	4.6 ¹	0.68	4.5	2.41*	F=5.77***
Firewood and lumber are stacked at least 30 feet from all buildings	4.3 ^{1,2}	0.84	3.9 ^{2,3,4}	1.00	4.1	4.2 ^{1,4}	0.92	4.2 ¹	0.97	4.2	0.60	F=0.49***
House construction materials (e.g. siding, porches and decks) are fire-resistant	4.1 ³	0.95	4.0 ³	0.94	4.1	4.0 ³	1.02	4.4 ^{1,2,4}	0.81	4.1	0.48	F=8.15***
A green vegetation area is maintained at least 30 feet around house	4.1 ^{1,2}	0.93	3.8 ^{2,3,4}	0.97	4.0	3.9 ^{1,3,4}	1.00	4.2 ^{1,2}	0.89	4.0	0.91	F=1.08***

a: scale where “1” is not effective; “3” neutral; “5” very effective.

¹ Statistically different than Michigan; ² Statistically different than New Mexico; ³ Statistically different than California; ⁴ Statistically different than Colorado

* $p < .05$, ** $p < .01$, and *** $p < .001$.

Stakeholders Involved with Defensible Space Management

Respondents were also asked to indicate how important it was to them that different land owners managed for wildfire safety on their property. Homeowners living in the mandatory policy study sites rated all stakeholders at higher levels of importance compared to homeowners living in the voluntary policy areas (table 18). In all locations homeowners themselves were most important but all were deemed important.

Table 18. Importance of Managing Vegetation for Wildfire Safety by a Variety of Community Stakeholders

	Voluntary Policies (VP)					Mandatory Policies (MP)					Overall (MP vs. VP) T-test	Overall (4 states) ANOVA df=3
	Larimer Cty, CO		Grand Haven Twp, MI		Mean	SD	Mean	SD	Mean	SD		
County government	3.9 ^{1,2,3}	1.19	3.4 ^{2,3,4}	1.26	3.7	4.4 ^{1,4}	0.89	4.6 ^{1,4}	0.76	4.5	14.77***	F=82.19***
Businesses	3.5 ^{2,3}	1.45	3.3 ^{2,3}	1.31	3.4	4.3 ^{1,4}	0.95	4.2 ^{1,4}	1.15	4.3	14.06***	F=64.34***
Local parks	3.6 ^{2,3}	1.37	3.5 ^{2,3}	1.25	3.6	4.3 ^{1,4}	0.96	4.5 ^{1,4}	0.85	4.4	13.86***	F=63.43***
Utility companies	3.9 ^{2,3}	1.21	3.7 ^{2,3}	1.24	3.8	4.3 ^{1,3,4}	0.96	4.6 ^{1,2,4}	0.72	4.4	11.71***	F=48.69***
Federal or state agencies	3.8 ^{1,2,3}	1.22	3.3 ^{2,3,4}	1.33	3.6	4.3	0.99	4.2 ^{1,4}	1.15	4.3	11.24***	F=58.72***
Owners of vacant lots in my neighborhood	4.0 ^{1,2,3}	1.16	3.5 ^{2,3,4}	1.28	3.8	4.3 ^{1,4}	0.94	4.5 ^{1,4}	0.90	4.4	11.12***	F=60.38***
Immediate neighbors	4.1 ^{1,2,3}	1.09	3.6 ^{2,3,4}	1.23	3.9	4.3 ^{1,3,4}	0.87	4.5 ^{1,2,4}	0.80	4.4	10.14***	F=52.33***
Own household	4.3 ^{1,3}	0.96	3.8 ^{2,3,4}	1.21	4.1	4.5 ^{1,3}	0.90	4.7 ^{1,2,4}	0.63	4.5	9.04***	F=59.42***
Seasonal or vacation homeowners	4.1 ^{1,2,3}	1.12	3.6 ^{2,4}	1.26	3.9	4.3 ^{1,3,4}	0.90	3.8 ^{2,4}	1.58	4.2	4.46***	F=30.24***

a: scale where “1” is not important; “3” neutral; “5” very important.

¹ Statistically different than Michigan; ² Statistically different than New Mexico; ³ Statistically different than California; ⁴ Statistically different than Colorado

* $p < .05$, ** $p < .01$, and *** $p < .001$.

Applying the same items in table 18, but using a difference scale, homeowners were asked to rate the performance or quality of stakeholder’s actions. Homeowners in mandatory policy study sites rated all stakeholders doing a “better job” than homeowners in voluntary policy sites (table 19). Homeowners in both Ruidoso and Oakland gave the highest marks to themselves. Owners of vacant lots received the lowest ratings.

Table 19. Performance Quality of Vegetation for Fire Safety by a Variety of Community Stakeholders

	Voluntary Policies (VP)					Mandatory Policies (MP)					Overall	Overall
	Larimer Cty, CO		Grand Haven Twp, MI			Ruidoso, NM		Oakland, CA			(MP vs. VP)	(4 states)
	Mean ^a	SD	Mean	SD	Mean (Total)	Mean	SD	Mean	SD	Mean (Total)	T-test	ANOVA df=3
Own household	3.7 ^{1,2,3}	0.97	3.4 ^{2,3,4}	1.05	3.6	4.1 ^{1,3,4}	0.81	4.4 ^{1,2,4}	0.75	4.2	13.27***	F=72.43***
Immediate neighbors	3.1 ^{2,3}	1.15	3.1 ^{2,3}	1.15	3.1	3.4 ^{1,3,4}	1.18	3.7 ^{1,2,4}	1.12	3.5	6.33***	F=18.11***
Businesses	2.8 ^{1,2,3}	1.08	3.0 ^{2,3,4}	0.97	2.9	3.5 ^{1,3,4}	0.92	3.2 ^{1,2,4}	0.90	3.4	11.05***	F=49.30***
Federal or state agencies	2.6 ^{2,3}	1.06	2.7 ²	1.02	2.7	3.4 ^{1,3,4}	1.06	2.9 ^{2,4}	1.01	3.3	10.99***	F=50.58***
Local parks	3.0 ^{1,2,3}	1.11	3.2 ^{2,3,4}	1.01	3.1	3.7 ^{1,3,4}	0.91	3.4 ^{1,2,4}	0.93	3.6	10.18***	F=41.23***
County government	2.8 ^{2,3}	1.03	2.8 ^{2,3}	0.99	2.8	3.4 ^{1,3,4}	1.04	3.1 ^{1,2,4}	1.00	3.3	10.25***	F=41.26***
Utility companies	2.9 ²	1.05	3.0 ²	1.02	3.0	3.4 ^{1,3,4}	1.02	3.1 ²	0.96	3.3	6.70***	F=19.39***
Owners of vacant lots in my neighborhood	2.3 ^{1,2,3}	1.06	2.5 ^{3,4}	1.11	2.4	2.6 ⁴	1.21	2.8 ^{1,4}	1.09	2.7	5.83***	F=17.47***
Seasonal or vacation homeowners	2.7 ^{1,2,3}	1.02	2.9 ⁴	1.08	2.8	3.0 ⁴	1.09	3.1 ⁴	0.96	3.0	4.48***	F=9.15***

a: scale where “1” is poor; “3” neutral; “5” excellent.

¹ Statistically different than Michigan; ² Statistically different than New Mexico; ³ Statistically different than California; ⁴ Statistically different than Colorado

* $p < .05$, ** $p < .01$, and *** $p < .001$.

A final question tested perceived influence of ordinances, communication efforts, and different stakeholders on defensible space management. Overall, homeowners rated most as having “neutral” to little influence (table 20). Several items received significantly higher influence scores by homeowners in the mandatory policy study sites. These included: local vegetation ordinance, written communication about vegetation management requirements or suggestions, or a government official, particularly a fire or forestry official. Homeowners living in the voluntary policy areas rated the neighborhood or homeowner’s associations, as well as a university Extension professional as having significantly greater (but still low levels of) influence on their household’s actions to protect their home from wildfires using vegetation management techniques. Insurance companies were slightly more likely to have perceived influence on homeowners in mandatory versus voluntary areas.

Table 20. Level of Influence of Various Actions to Protect Home from Wildfires Using Vegetation Management Techniques

Influence	Voluntary Policies (VP)					Mandatory Policies (MP)					Overall	Overall
	Larimer Cty, CO		Grand Haven Twp, MI			Ruidoso, NM		Oakland, CA			(MP vs. VP)	(4 states)
	Mean ^a	SD	Mean	SD	Mean (Total)	Mean	SD	Mean	SD	Mean (Total)	T-test	ANOVA df=3
Local ordinance that requires I take vegetation management actions	1.8 ^{1,2,3}	1.11	1.5 ^{2,3,4}	0.94	1.7	3.1 ^{1,3,4}	1.46	3.4 ^{1,2,4}	1.43	3.2	24.69***	F=224.69***
Letter my household received telling us what to do	2.1 ^{1,2,3}	1.25	1.7 ^{2,3,4}	1.16	1.8	2.9 ^{1,4}	1.53	3.1 ^{1,4}	1.47	2.9	14.62***	F=83.39***
City, town, or county government	2.3 ^{1,2,3}	1.21	1.5 ^{2,3,4}	0.89	2.0	3.2 ^{1,3,4}	1.32	2.9 ^{1,2,4}	1.29	3.1	17.84*	F=152.42***
Fire or forestry department official visiting with me at my home	2.1 ^{1,2,3}	1.37	1.4 ^{2,3,4}	0.79	1.8	2.6 ^{1,4}	1.55	2.5 ^{1,4}	1.52	2.6	11.39***	F=69.24***
Fire department	3.0 ^{1,2,3}	1.37	1.7 ^{2,3,4}	1.12	2.5	2.7 ^{1,3,4}	37	3.9 ^{1,2,4}	1.15	3.1	8.80**	F=160.52***
Newspaper ads/announcement	2.0 ^{1,2}	1.09	1.7 ^{2,3,4}	0.98	1.9	2.5 ^{1,3,4}	1.28	2.0 ^{1,4}	1.09	2.3	7.83***	F=40.02***
Neighborhood or homeowner's association	2.9 ^{1,2,3}	1.42	1.8 ^{3,4}	1.16	2.5	1.9 ^{3,4}	1.26	2.3 ^{1,2,4}	1.35	2.0	-6.62***	F=81.26***
University or cooperative extension	2.0 ^{1,2,3}	1.14	1.7 ⁴	1.09	1.9	1.7 ⁴	0.98	1.6 ⁴	0.90	1.6	-4.50***	F=13.94***
Insurance company (possibility of losing home coverage)	2.3 ^{1,3}	1.10	1.6 ^{2,3,4}	1.10	2.0	2.3 ¹	1.41	2.0 ^{1,4}	1.33	2.2	2.49*	F=24.30***
Insurance company (educational materials)	2.2 ¹	1.23	1.6 ^{2,3,4}	0.92	2.0	2.2 ¹	1.28	2.0 ¹	1.14	2.1	2.49*	F=26.64***
Insurance company (discounts for fire-resistant landscaping/vegetation)	1.6 ¹	1.17	1.6 ^{2,4}	1.05	1.8	2.0 ^{1,3}	1.28	1.8 ²	1.10	2.0	2.42**	F=11.73***
A realtor	1.6	0.88	1.4 ²	0.81	1.5	1.6 ¹	0.97	1.5	0.92	1.6	1.44**	F=3.43***
Insurance company (cost of coverage)	2.3 ¹	1.31	1.7 ^{2,3,4}	1.20	2.1	2.4 ^{1,3}	1.36	2.1 ^{1,2}	1.26	2.3	2.90	F=23.31***
Observing neighbors' actions	2.4 ¹	1.22	1.9 ^{2,3,4}	1.21	2.2	2.3 ¹	1.28	2.3 ¹	1.21	2.3	1.68	F=16.92***
Talking to an individual neighbor	2.5 ^{1,2}	1.28	1.9 ^{2,3,4}	1.20	2.3	2.3 ^{1,4}	1.29	2.4 ¹	1.27	2.3	1.09	F=17.14***
A home builder or developer	1.6 ³	0.97	1.5	0.97	1.6	1.6	0.99	1.4 ⁴	0.88	1.5	-0.79	F=3.22***
A member of my family	2.2 ¹	1.30	1.8 ^{2,4}	1.20	2.0	2.0 ¹	1.28	2.0	1.27	2.0	0.29	F=7.80***

a: scale where "1" is no influence; "3" neutral; "5" much influence.

¹ Statistically different than Michigan; ² Statistically different than New Mexico; ³ Statistically different than California; ⁴ Statistically different than Colorado

* $p < .05$, ** $p < .01$, and *** $p < .001$.

Model of Acceptance of Mandatory Vegetation Management and Homeowner’s Self-perception of their Compliance to Vegetation Management

In an effort to understand factors which influence acceptance of and one’s own compliance to voluntary or mandatory vegetation management two regression models were estimated using demographic factors and other cognitive factors found to be important in the wildfire acceptance literature (see Vogt, Winter and Fried, 2004). Table 21 provides the results of the acceptance model where a single attitudinal variable is regressed on risk perceptions, beliefs about vegetation management as a strategy, beliefs about the role of government in defensible space, the influence of outside sources, personal importance, and selected demographics. At three sites, the adjusted R-square reached over 30% explained variance. A generous $p < .10$ alpha level was applied given the exploratory nature of this research. Only one independent variables had a positive significant influence on acceptance of mandatory vegetation management across all four sites – “local government has the responsibly to require property owners to manage their property in a way that does not endanger their neighbors or the community.” In three of the four sites, including the two mandatory policy sites, a positive significant relationship between the influence of “a local ordinance that requires a homeowner to take vegetation management actions” and acceptance was found. A few other significant factors were identified at one site only.

Table 22 features the results of the self-rated compliance model where a single self-evaluation variable is regressed on risk perceptions, beliefs about vegetation management as a strategy, the influence of outside sources, personal importance, and selected demographics. At one site (Oakland), the adjusted R-square reached over 30% explained variance. A generous $p < .10$ alpha level was applied given the exploratory nature of this research. Two independent variables had a significant influence on self-evaluation of vegetation management – “for community wildfire protection, it is important that one’s own household manage vegetation” (positive relationship with self-evaluation) and “I don’t know how to go about managing my yard for fire safety” (negative relationship with self-evaluation). A few other significant relationships were found, but not within “voluntary” or “mandatory” sites. A few other significant factors were identified at one site only.

Table 21. Regression Analysis of Mandatory Vegetation Management Acceptance Model

Dependent variable: Attitude toward mandatory vegetation management ordinance (1=extremely negative; 5=extremely positive)		WUI Site			
		Larimer	Grand Haven	Ruidoso	Oakland
	Adjusted R ²	0.385	0.326	0.345	0.176
	Independent variables specified:	Standardized Beta Coefficient			
Risk perception	Likelihood of wildfire occurrence	.015	.082	.110	.079
	Likelihood of wildfire home damage	.003	.086	-.114	-.019
	Concern wildfire change quality of life	-.038	.040	.028	-.049
	Concern about threat of wildfire	-.015	-.036	-.008	.053
Beliefs about vegetation mgmt as a strategy	Good way to protect home	.032	-.002	.209	.068
	Thinning trees and shrubs effective	.003	.088	.016	.040
	Maintain green area is effective	-.024	-.090	.039	.009
	Remove shrubs low branches effective	.038	.022	.062	.044
Beliefs about the role of local government	Gov't responsible to require mgmt of property so not to endanger neighbors	.522	.417	.297	.258
	Gov't should promote community health and safety	.057	.052	.086	-.043
Outside influences	Local ordinance requiring the homeowner to take veg. mgmt. actions	.175	.034	.207	.269
Personal importance	For community wildfire protection, important that my own household manages veg. for wildfire safety	.051	.127	-.012	.092
Demographics	Gender	.032	.088	.066	-.032
	Age	.031	-.035	-.055	-.053
	Income	.006	-.154	.026	.097

Bold highlight of the independent variable indicates a significant relationship was found at least one site (p<.10).

Table 22. Regression analysis of self-rating of vegetation management compliance model

Dependent variable: How well my own household maintains vegetation for fire safety (1=poor; 5=excellent)		WUI Site			
		Larimer	Grand Haven	Ruidoso	Oakland
	Adjusted R ²	0.247	0.234	0.284	0.342
	Independent variables specified:	Standardized Beta Coefficient			
Risk perception	Likelihood of wildfire occurrence	.105	.091	.023	.038
	Likelihood of wildfire home damage	-.187	-.113	-.091	-.194
	Concern wildfire change quality of life	.154	-.117	.036	-.034
	Concern about threat of wildfire	-.094	.117	-.002	.131
Beliefs about vegetation mgmt as a strategy	Good way to protect home	-.124	-.134	-.064	.071
	Interferes with things I want from yard	-.009	-.040	-.012	-.056
	Makes sense; insurance won't replace	.017	.295	.009	-.084
	Costs too much to do right	-.129	.013	-.071	-.079
	I don't know how to do this	-.191	-.246	-.196	-.192
	I don't know what to do with yard waste	-.069	-.077	-.071	.074
	Thinning trees and shrubs effective	.081	-.031	.107	.114
	Maintain green area is effective	.051	-.023	-.014	-.075
	Remove shrubs low branches effective	.132	-.145	.027	.069
Outside influences	Quality of local wildfire protection and prevention education services	.117	.068	.077	-.057
Personal importance	For community wildfire protection, important that my own household manages veg. for wildfire safety	.121	.189	.321	.410
Demographics	Gender	-.034	-.036	-.016	-.003
	Age	-.023	.096	.120	.103
	Income	-.013	-.157	-.090	.023

Bold highlight of the independent variable indicates a significant relationship was found at least one site (p<.10).

Discussion and Conclusions

This research and its findings provide ground-breaking research on defensible space practices. In recent years, social science research on wildfire has gained considerable attention, however, no studies to date have tested the influence or impact of mandatory policies on the acceptance of policies and practices. Oakland, California clearly showed positive outcomes from a long-standing program that is funded by property taxes. Ruidoso, New Mexico showed a community that has recently organized many fire and resource stakeholders and designed a program funded mostly from grants and local match. Larimer County showed an area at high risk, but lacking a more formalized approach with the exception of new home construction and fire resistant landscaping. And finally, Grand Haven Township showed an area with wildfire history (mostly caused by people), but few local programs and no ordinances except for new home construction.

Overall, this research found that local policies with mandatory programs seem to be more accepted and successful in terms of modifying behaviors. Both Oakland and Ruidoso would be considered WUI areas with high risks where mandatory programs should be in place as one of many government services. In Larimer County, strong acceptance for programs and assistance, not local ordinances, was found and shows that homeowners recognize the risk of wildfires and the likelihood of a wildfire occurring near their home in the next five years.

Assistance with vegetation management appeared to be important to all communities. Homeowners appeared to utilize the programs in place in their community. Homeowners living in the two mandatory sites clearly held strong support for their curbside pickup service. Few respondents at all sites knew about the availability of free, on-site consultations with local officials about fire-safe landscaping and vegetation management. A “show me” approach to vegetation management with supportive services (like pick-up or drop-off) was rated more positively than “tell me” or “selective enforcement” approaches. Homeowners in all locations were most concerned about vacant lot owners (or even vacant houses) not managing vegetation which can inherently create risk for nearby homes.

Additional promotion of defensible space programs to homeowners, including the services by local fire officials, is recommended for all four study sites. Messages that were accepted by homeowners in the two mandatory policy sites were “improves the way my yard looks,” “makes sense to do because insurance can’t replace everything” (like personal or sentimental items), and “a good way to protect home in case of a wildfire.” These three statements all feature benefits to the homeowner – better looking yard, holding on to sentimental items, and a homeowner’s own assurance for protection. Findings also revealed that defensible space practices for “community health and safety” reasons were supported by homeowners from all four study sites.

Forms of communications that received positive attitudes were education materials distributed by local fire departments or other local government agencies and presentations to homeowners (via neighborhoods or associations). The influence of laws and promotions, however, were rated at low to moderate levels. To elevate the influence (impact) of these efforts and investments it may be that homeowners need to be further engaged in neighborhood or community efforts so that vegetation management takes on greater importance, which then may lead to higher levels of support and compliance. To improve the level of influence of programs, including assistance or education materials, efforts may need to be revised

to better tailor (using some of the suggested messages to gain awareness and interest) to audiences or be delivered in different ways (like adding more web-based resources, add other times of the year). A local ordinance was rated as having the greatest influence on homeowners in the mandatory study sites, followed closely by government and more specifically fire departments. In the voluntary policy study sites, the fire department and neighborhoods were rated as having the greater influence over other means, however, influence was judged as being relatively low.

A final comment is that vegetation management is both a homeowner's and a community's responsibility. Homeowners in the two mandatory sites were motivated by the local policy (ordinance), but also understood and appreciated the services that the policy provided. Enforcement that is applied to homeowners equitably was highly regarded and considerate of both public and private land and structures were important. The findings reveal that a "carrot" with a friendly approach and advice that offers some alternatives with choices is most positively accepted by homeowners with vegetation management needs.

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About the Authors

Christine Vogt is an associate professor in the Department of Community, Agriculture, Recreation and Resource Studies in the College of Agriculture and Natural Resources at Michigan State University. She studies resident attitudes on tourism and natural resource issues; survey and evaluation research techniques; and tourism communications and the study of people collecting and using information. Vogt's published work appears in *Society and Natural Resources*, *Journal of Forestry*, *Annals of Tourism Research*, *Journal of Travel Research*, *Journal of Travel and Tourism Marketing*, *Journal of Consumer Psychology*, *Leisure Sciences*, *Journal of Leisure Research*, and *Journal of Park and Recreation Administration*. She can be reached at vogtc@msu.edu

Jeamok Kwon is a post-doctoral research associate of Dr. Christine Vogt's research projects in the Department of Community, Agriculture, Recreation and Resource Studies at Michigan State University. She is a recent graduate of Michigan State University. She has been involved in a variety of research projects about recreation and tourism industries and in areas of human dimensions of natural resources. Dr. Kwon's research interests include recreation management, planning, development and marketing; and community residential assessments in rural and wildland-interface areas. She can be reached at kwonjea@msu.edu

Greg Winter owns a research and planning firm in Bellingham, Washington. His research interests include public participation in natural resource management and risk management. Other interests include rural sociology with a focus on community needs and government and nonprofit services. His publications have appeared in *Society and Natural Resources*, *Journal of Forestry*, *Forest Science*, and the *International Journal of Wildland Fire*. He can be reached at gregw@cstonestrategies.com

Sarah M. McCaffrey, Ph.D. is a Research Social Scientist for the USDA Forest Service, Northern Research Station. Her research focuses on the social aspects of fire management and has included National Fire Plan and Joint Fire Science sponsored projects examining issues around the social acceptability of prescribed fire, thinning, and defensible space. Ongoing research is examining issues related to maintenance of defensible space, voluntary and involuntary incentives for fostering defensible space, the role of volunteer fire departments in wildfire management. More recently she has begun work on the social issues that occur *during* fires including examining alternatives to evacuation and public views of Appropriate Management Response. She can be reached at smccaffrey@fs.fed.us

For additional wildfire and defensible space research from these researchers see www.fire-saft.net

OMB 0596-0209; Exp 1/21/2011
Living with Wildfires in
[CITY/COUNTY]



WHAT DO YOU THINK?

A community-wide survey about fire management in the [INSERT PLACE HERE]

This survey is part of a research project designed to help local officials better understand the public's views on wildfire fire so that they can develop better fire protection programs can result. This research is funded by the USDA Forest Service, Northern Research Station, and the Joint Fire Science Program. Please answer all of the questions and add any comments in the space provided on the last page of the survey.

Please return the survey in the postage paid envelope when you are finished.

Thanks for your help!

Department of Community, Agriculture, Recreation and Resource Studies

131 Natural Resources Building

Michigan State University

East Lansing, MI 48824-1222

BURDEN AND NONDISCRIMINATION STATEMENTS

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0596-0209. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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First Section of questions asks about your home ownership and residency in [CITY/COUNTY] and your concern for wildfire.

Q1. How long have you owned a home in [CITY/COUNTY]? (please fill in a number, IF LESS THAN ONE YEAR, WRITE "<1")

_____ YEARS

Q2. Which of the following best describes your residential status in [CITY/COUNTY]? (please ✓ one)

- I am a full time, year-round homeowner in [CITY/COUNTY].
- I am a full time, year-round renter in [CITY/COUNTY].
- I own a vacation home in [CITY/COUNTY]. My primary place of residence is in _____ zip code
- None of the above describes my residential status in [CITY/COUNTY].

Please explain: _____

Q3. Which of the following best describes your home in [CITY/COUNTY]? (please ✓ one)

- Single-family house
- Condominium
- Other multi-family unit (e.g. duplex)
- Manufactured or mobile home
- Other type of house

Q4. How likely do you think a wildfire will occur near your neighborhood in the next five years? (please ✓ one)

- Not likely at all Slightly likely Somewhat likely Likely Very likely

Q5. How likely do you think a wildfire will damage your home in the next five years? (please ✓ one)

- Not likely at all Slightly likely Somewhat likely Likely Very likely

Q6. On a scale from 1 to 5, how concerned are you about each of the following issues in [CITY/COUNTY]: (please use the scale of 1=Not concerned to 5=Very concerned)

	Not concerned			Very concerned	
Local economy	1	2	3	4	5
Quality of local public schools	1	2	3	4	5
[CITY/COUNTY] budget	1	2	3	4	5
Threat of wildfires in local area	1	2	3	4	5
Crime in local area	1	2	3	4	5
Wildfire could change your quality of life	1	2	3	4	5
Access to health care	1	2	3	4	5
Health of the local environment	1	2	3	4	5

The second section of questions asks about your rating of public services and understanding of wildfire laws and practices in [CITY/COUNTY].

Q7. On a scale from 1 to 5, please rate the quality of the following in [CITY/COUNTY]. (please use the scale of 1=No influence to 5=Much influence)

	Poor				Excellent
The [CITY/COUNTY]'s financial management	1	2	3	4	5
Overall [CITY/COUNTY] government services	1	2	3	4	5
Local fire department services	1	2	3	4	5
Local services to prevent and protect the community from wildfires	1	2	3	4	5
Local services to educate homeowners about wildfire protection and prevention	1	2	3	4	5

Q8. Concerning [CITY/COUNTY], are the following required by local wildfire safety laws? (please ✓ one box for each item)

Are these required?	Yes	No	Not sure
Fire-resistant construction materials for all new homes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire-resistant landscaping and vegetation for new homes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire-resistant landscaping and vegetation for existing homes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Annual fire department inspection of landscaping for fire safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q9. Are the following vegetation management incentives offered to homeowners in [CITY/COUNTY]? (please ✓ all that apply)

Are these offered?	Yes	No	Not sure
Monthly or more frequent curbside pick-up of <u>unlimited</u> yard waste (trimmings, branches, leaves, needles, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monthly or more frequent curbside pick-up of <u>limited</u> yard waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Less frequent curbside pickup of yard waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A free drop-off site where I can take my yard waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A pay drop-off site where I can take my yard waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Home visits by [CITY/COUNTY/] or fire department official to offer free advice about fire-resistant landscaping options	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Financial assistance to property owners to help with costs of fire-resistant landscaping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q10. Please indicate your level of agreement with each of the following statements about managing the vegetation on your property for wildfire protection. (please use the scale of 1=Strongly disagree to 5=Strongly agree)

Vegetation Management is....	Strongly disagree	Neutral	Strongly agree		
a good way to protect my home in case of a wildfire	1	2	3	4	5
improves the way my yard looks	1	2	3	4	5
interferes with other things I want from my yard	1	2	3	4	5
makes sense to do because insurance can't replace everything	1	2	3	4	5
costs too much to do it right	1	2	3	4	5
hard to do the first time, but easy every year after	1	2	3	4	5
makes my yard more attractive to wildlife	1	2	3	4	5
I don't really know how to go about managing my yard for fire safety	1	2	3	4	5
I don't know what to do with all the yard waste it creates	1	2	3	4	5

Q11. To what extent has each of the following influenced your household's actions to protect your home from wildfires using vegetation management techniques? (please use the scale of 1=No influence to 5=Much influence)

	No influence	Much influence			
Fire department	1	2	3	4	5
City, town, or county government	1	2	3	4	5
Fire or forestry department official visiting with me at my home	1	2	3	4	5
Neighborhood or homeowner's association	1	2	3	4	5
Insurance company (educational materials)	1	2	3	4	5
Insurance company (cost of coverage)	1	2	3	4	5
Insurance company (discounts for fire-resistant landscaping/vegetation)	1	2	3	4	5
Insurance company (possibility of losing home coverage)	1	2	3	4	5
Newspaper ads/announcement	1	2	3	4	5
A local ordinance that requires I take vegetation management actions	1	2	3	4	5
Talking to an individual neighbor	1	2	3	4	5

Observing neighbors' actions	1	2	3	4	5
University or cooperative extension	1	2	3	4	5
A letter my household received telling us what to do	1	2	3	4	5
A member of my family	1	2	3	4	5
A realtor	1	2	3	4	5
A home builder or developer	1	2	3	4	5

Q12. The following list includes possible features of your home and actions that your household may have taken for the purpose of protecting your home from wildfires, or for some other reason (e.g. yard beauty or protection from other natural hazards). For each item, please check the ONE box that BEST explains if or why your household took that action. (please ✓ only one box per row.)

	1. Not a feature of my home or property	2. Action not necessary, as already existed when purchased home	3. My household took this action <u>primarily for wildfire safety reasons</u>	4. My household took this action <u>primarily for other reasons</u>	5. Have not done this to my home or property
Roof and rain gutters are kept free of leaves, needles, and twigs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overhanging and dead branches are removed within 10 feet of roof	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Firewood and lumber are stacked at least 30 feet from all buildings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A green vegetation area is maintained at least 30 feet around house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trees and shrubs are thinned out within 30-50 ft. of house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shrubs and lower tree branches that could carry flames from the ground into the crown of the trees are removed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
House has a fire-resistant roof (e.g. asphalt shingles or metal)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dead vegetation, leaves, and needles are cleared at least 30 feet from home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
House construction materials (e.g. siding, porches and decks) are fire-resistant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Underside of deck is enclosed to keep debris from collecting underneath	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yard is landscaped with fire-resistant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

vegetation					
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Q13. For the actions mentioned above in Q12 that your household has taken *PRIMARILY FOR WILDFIRE SAFETY* reasons (column 3 of Q12), which of the following describe why you took these actions? (please ✓ all that apply)

- My household did not take any of the actions and I did not check any item in column 3 of Q12
- Voluntarily took one or more of these actions
- Took one or more actions because it was required by law
- My insurance company requires one or more of these actions
- None of the above

Q14. For overall community wildfire protection in [CITY/COUNTY], how important is it that each of the following residents, agencies and businesses manage vegetation for wildfire safety on land that they own or manage? (please use the scale of 1=Not important to 5=Very important)

	Not important			Very important	
My immediate neighbors	1	2	3	4	5
Owners of vacant lots in my neighborhood	1	2	3	4	5
Seasonal or vacation homeowners	1	2	3	4	5
My own household	1	2	3	4	5
[CITY/COUNTY] government	1	2	3	4	5
Federal or state agencies	1	2	3	4	5
Utility companies	1	2	3	4	5
Local parks	1	2	3	4	5
Businesses	1	2	3	4	5

Q15. How would you rate how well the following residents, agencies and businesses maintain their vegetation for fire safety on the property they own or manage? (please use the scale of 1=poor to 5=excellent)

	Poor			Excellent	
My immediate neighbors	1	2	3	4	5
Owners of vacant lots in my neighborhood	1	2	3	4	5
Seasonal or vacation homeowners	1	2	3	4	5
My own household	1	2	3	4	5
[CITY/COUNTY] government	1	2	3	4	5
Federal or state agencies	1	2	3	4	5
Utility companies	1	2	3	4	5
Local parks	1	2	3	4	5
Businesses	1	2	3	4	5

Q16. How would you rate your general attitude toward each of the following fire protection approaches? (please use the scale of 1=extremely negative to 5=extremely positive)

	Extremely negative		Neutral	Extremely positive	
Local government distributing educational materials to homeowners to encourage them to maintain their vegetation for fire safety	1	2	3	4	5
A presentation by local government officials to my neighborhood or homeowners association about maintaining vegetation for fire safety	1	2	3	4	5
A visit to my home by a local government official to show me how to manage the vegetation on my property for fire safety	1	2	3	4	5
Local ordinances that require homeowners to manage their vegetation for fire safety	1	2	3	4	5
A special taxing district in high wildfire risk areas to pay for enforcement of a local ordinance that requires homeowners to manage their vegetation for fire safety	1	2	3	4	5
Curbside pickup of any yard waste that results from managing vegetation for fire safety	1	2	3	4	5
Programs that will help homeowners with the cost of maintaining vegetation for fire safety if the homeowner will manage vegetation beyond the minimum standards	1	2	3	4	5
Programs that will help lower-income households with the cost of maintaining vegetation for fire safety	1	2	3	4	5
Homeowners insurance policies that require homeowners to maintain their vegetation for fire safety	1	2	3	4	5

Q17. In your opinion, how effective are the following fire safety actions in reducing the risk of severe damage to your home if a wildfire occurred in your neighborhood? (please use the scale of 1=not effective to 5=very effective)

	Not effective			Very effective	
Roof and rain gutters are kept free of leaves, needles, and twigs	1	2	3	4	5
Overhanging and dead branches are removed within 10 feet of roof	1	2	3	4	5
Firewood and lumber are stacked at least 30 feet from all buildings	1	2	3	4	5

A green vegetation area is maintained at least 30 feet around house	1	2	3	4	5
Trees and shrubs are thinned out within 30-50 ft. of house	1	2	3	4	5
Shrubs and lower tree branches that could carry flames from the ground into the crown of the trees are removed	1	2	3	4	5
House has a fire-resistant roof (e.g. asphalt shingles or metal)	1	2	3	4	5
Removed shrubs and lower tree branches that could, carry flames from the ground into the crown of the trees	1	2	3	4	5
Dead vegetation, leaves, and needles are cleared at least 30 feet from house	1	2	3	4	5
House construction materials (e.g. siding, porches and decks) are fire-resistant	1	2	3	4	5
Underside of deck is enclosed to keep debris from collecting underneath	1	2	3	4	5
Yard is landscaped with fire-resistant vegetation	1	2	3	4	5

Q18. Please indicate your level of agreement with each of the following statements about the role of local government. (please use the scale of 1=strongly disagree to 5=strongly agree)

	Strongly disagree		Neutral		Strongly agree
Generally speaking, local government should promote community health and safety.	1	2	3	4	5
Local government has the responsibility to require property owners to manage their property in a way that does not endanger their neighbors or the community.	1	2	3	4	5
Local government may require property owners to manage their property in a certain way, but only if the risk to neighbors is very high.	1	2	3	4	5
Local government does not have the right to tell property owners how to manage their property.	1	2	3	4	5
Local government has the right to require property owners to manage their property in certain ways if the rules are enforced fairly and consistently.	1	2	3	4	5

If you would like to tell us anything else, please use the space below.

Thank you for your participation. Your answers will be very helpful.

If you have any questions, please contact:

Dr. Christine Vogt, Department of Community, Agriculture, Recreation and Resource Studies, 131 Natural Resources Building, Michigan State University, East Lansing, MI 48824-1222;

Phone: (517) 432-0318 or Email: vogtc@msu.edu

Appendix B

Cover letter for first and second mailing of survey

Reminder postcard

First Cover Letter

April 10, 2008

[NAME]
[ADDRESS]
[CITY, STATE ZIP]

Dear [NAME],

Researchers at Michigan State University (MSU) and other local and federal collaborators are studying homeowners' perceptions of living in fire prone areas. You have been randomly selected in Larimer County as a homeowner for a community-wide survey about wildfire protection. We are interested in learning about your opinions on this topic. This survey is part of a research project designed to help officials understand the public's views on wildfire management and home and yard design and maintenance. This research is funded by the Joint Fire Science Program and the USDA Forest Service, Northern Research Station.

Your views are important whether or not you know a great deal about wildfire. For the results of this survey to truly represent the full range of views of homeowners in your community, it is important that we hear from everyone who receives this questionnaire. You may live in the community full-time or as a seasonal resident – we are interested in both types of residents.

Please have any adult who lives in your household complete the survey. The survey will take approximately 15 minutes to complete. You indicate your voluntary agreement to participate by completing and returning this survey; however, you are under no obligation to participate in this survey. If you could return the completed survey by Wednesday, March 19th we would be grateful.

If you have any questions about this project, please call me at MSU: (517) 432-0318 or contact me at vogtc@msu.edu. If you have any questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact Peter Vasilenko, Ph. D., Director of the Human Research Protection Programs (HRPP) at Michigan State University: (517) 355-2180, fax: (517) 432-4503, email: irb@msu.edu, or regular mail: 202 Olds Hall, East Lansing, MI 48824.

We greatly appreciate your cooperation!

Sincerely,

Christine A. Vogt, PhD
Associate Professor, Michigan State University
vogtc@msu.edu

Enclosures: survey, postage paid envelope

Second Cover Letter

May 9, 2008

[NAME]
[ADDRESS]
[CITY, STATE ZIP]

Dear [NAME],

About three weeks ago, we wrote to you asking about your thoughts and opinions on wildfire protection in the County. As of today, we have not yet received your completed questionnaire. The March 19th deadline mentioned in the first letter was incorrect. If you have already returned your questionnaire, please accept our sincere thanks. The response has been encouraging so far. However, the accuracy of the results depends upon you and others who have not yet responded. Your views are important whether or not you know a great deal about wildfire or wildfire protection.

The United States Forest Service and Michigan State University (MSU) are studying residents' perceptions of fire management in Larimer County. You have been randomly selected as a homeowner for a community-wide survey about wildfire protection in your community. We are interested in learning about your opinions on this topic. This survey is part of a research project designed to help local officials understand the public's views on wildland fire management so they can improve fire management programs. This research is funded by the Joint Fire Science Program and the USDA Forest Service, Northern Research Station.

Please have any adult who lives in your household complete the survey. The survey will take approximately 15 minutes to complete. You indicate your voluntary agreement to participate by completing and returning this survey; however, you are under no obligation to participate in this survey. *Please note: If you own more than one home in the county, As you answer the survey questions, please think about the one home that you believe is in greatest wildfire danger.*

If you have any questions about this project, please call Dr. Christine Vogt, Associate Professor at MSU: (517) 432-0318 or contact her at vogtc@msu.edu. If you have any questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact Peter Vasilenko, Ph. D., Director of the Human Research Protection Programs (HRPP) at Michigan State University: (517) 355-2180, fax: (517) 432-4503, email: irb@msu.edu, or regular mail: 202 Olds Hall, East Lansing, MI 48824.

We greatly appreciate your cooperation!

Sincerely,

Christine A. Vogt, PhD
Michigan State University
vogtc@msu.edu

Enclosures: survey, postage paid envelope

Reminder Postcard

Hello,

Recently, we sent you a survey about home protection and fire. The area we are studying is either where you live permanently or own a seasonal home. If you have already returned the survey, thank you for your timely response. We appreciate your time and effort.

If you have not yet sent the survey back in the prepaid envelope, please take some time now to complete the survey. Your response is very important for the completion of our study and accurate representation of residents who live near wildfire prone areas. The deadline of March 19th was incorrectly mentioned in the cover letter sent with the survey.

Once again, thank you for your help in completing this research. If you have any questions, please do not hesitate to call me at 517-432-0318 or e-mail me at vogtc@msu.edu. Thanks again for your help!

Sincerely,

Christine Vogt, Michigan State University

Appendix C

Press release copy

Contact:

Greg Winter

gregw@cstonestrategies.com or visit www.fire-saft.net for more information on related research

E-mailed on 5/12/08

For Immediate Release (survey to be mailed on Thursday, April 10, 2008 and again on May 12, 2008 to nonrespondents); please run for a few weeks.

Research Study of Ruidoso Residents Living in Fire Prone Areas

Researchers at Michigan State University (MSU) and other local and federal collaborators are studying homeowners' perceptions of living in or near fire prone areas. Homeowners in Ruidoso New Mexico, along with homeowners in California, Colorado and Michigan, were selected for a national study of residents' perceptions of wildfire management and home and yard design and maintenance. This research is funded by the Joint Fire Science Program and the USDA Forest Service, Northern Research Station.

Homeowners may receive mail from Michigan State University in the month of April or May. The study is designed to learn more about full-time and seasonal residents who live in areas where wildfire and fuel management, including private homeowners' efforts, play a central role for local fire departments and state and federal natural resource managers. A random sample of residents was selected to receive a questionnaire that should take approximately 15 minutes to complete. Participation is voluntary but encouraged, so the data will accurately represent the opinions of the full range of residents.

###

Appendix D

Nonresponse letter and survey

Table with nonresponse results compared to main study responses

June 13, 2008

«Name»

«Address»

«City», «State» «Zip»

Dear «Name»:

Over the last several weeks I wrote to you asking about your thoughts and opinions on wildfire protection in the County.

First, thanks for your patience. This is the last letter you will receive from us. Here's why I am asking for your help one last time: We have mailed several letters to you and others in your community to try to increase the number of people who respond to this survey. We have enclosed a much shorter questionnaire that will help us find out whether or not those who completed the longer survey have different opinions from those who did not. This is very important so that we can determine if those who responded accurately represent your community.

We hope to hear from you even if you feel you don't have any special knowledge about or interest in forest fires and forest management.

Please have any adult who lives in your household complete the survey. The survey will take approximately 15 minutes to complete. You indicate your voluntary agreement to participate by completing and returning this survey; however, you are under no obligation to participate in this survey. Your information will be kept confidential.

This survey is part of a research project designed to help local officials understand the public's views on wildland fire management so they can improve fire management programs. This research is funded by the Joint Fire Science Program and the USDA Forest Service, Northern Research Station.

If you have any questions about this project, please call Dr. Christine Vogt, Associate Professor at MSU: (517) 432-0318 or contact her at vogtc@msu.edu. Thank you for your assistance.

Sincerely,

Christine A. Vogt, PhD
Michigan State University
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Enclosures: survey, postage paid envelope

Living with Wildfires in Larimer County



WHAT DO YOU THINK?

This survey is part of a research project designed to help local officials understand the public's views on wildfire fire management so they can develop better fire protection programs. This research is funded by the USDA Forest Service, Northern Research Station and the Joint Fire Science Program. Please answer all of the questions and add any comments in the space provided on the last page of the survey.

Please return the survey in the postage paid envelope when you are finished.

Thanks for your help!

How likely do you think it is that a wildfire will occur near your neighborhood in the next five years?
(please ✓ one)

- Not likely at all Slightly likely Somewhat likely Likely Very likely

How likely do you think it is that a wildfire will damage your home in the next five years?
(please ✓ one)

- Not likely at all Slightly likely Somewhat likely Likely Very likely

How concerned are you that a wildfire could change the quality of your life? (please ✓ one)

- Not concerned at all Slightly concerned Somewhat concerned Concerned Very concerned

***** Please go on to the next page (over) *****

How would you rate your general attitude toward each of the following fire protection approaches? (please use the scale of 1=extremely negative, and 5=extremely positive)

	Extremely negative			Extremely positive	
Local government distributing educational materials to homeowners to encourage them to maintain their vegetation for fire safety	1	2	3	4	5
A visit to my home by a local government official to show me how to manage the vegetation on my property for fire safety	1	2	3	4	5
Local ordinances that require builders of NEW homes in high wildfire risk areas to landscape for wildfire safety.	1	2	3	4	5
Local ordinances that require homeowners in high wildfire risk areas to manage their vegetation for fire safety	1	2	3	4	5
A special taxing district in high wildfire risk areas to pay for enforcement of a local ordinance that requires homeowners to manage their vegetation for fire safety	1	2	3	4	5
Curbside pickup of any yard waste that results from managing vegetation for fire safety	1	2	3	4	5
Programs that will help homeowners with the cost of maintaining vegetation for fire safety if the homeowner will manage vegetation beyond the minimum standards	1	2	3	4	5
Programs that will help lower-income households with the cost of maintaining vegetation for fire safety	1	2	3	4	5
Homeowners insurance policies that require homeowners to maintain their vegetation for fire safety	1	2	3	4	5

If you have any questions, please contact:

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Table 23. Nonresponse survey results – Independent samples t-tests

Variables	<u>Oakland</u>			<u>Larimer County</u>			<u>Ottawa County</u>			<u>Ruidoso</u>		
	Respond (N=258)†	Nonresp. (N=80) †	t	Respond (N=571)	Nonresp. (N=19)	t	Respond (N=381)	Nonresp. (N=33)	t	Respond (N=532)	Nonresp. (N=15)	t
Likelihood of wildfire occurrence ^a	Mean (SD) 2.74 (1.05)	Mean (SD) 3.04 (1.37)	-2.08*	Mean (SD) 3.23 (1.11)	Mean (SD) 3.83 (1.04)	-2.27*	Mean (SD) 2.27 (.97)	Mean (SD) 2.15 (.80)	.67	Mean (SD) 2.88 (1.01)	Mean (SD) 2.80 (.94)	.29
Likelihood of wildfire damage ^a	2.07 (.85)	2.23 (1.23)	-1.05	2.33 (.88)	2.47 (.84)	-.71	1.86 (.86)	1.76 (.71)	.65	2.40 (.93)	2.13 (1.06)	1.09
Attitude toward: ^b												
Gov't education materials ^b	4.12 (.86)	4.25 (1.13)	-.92	3.93 (.95)	4.11 (.68)	-.79	3.78 (.99)	3.79 (1.11)	-.03	3.91 (.99)	3.60 (1.12)	1.21
Visit by official to show how ^b	3.44 (1.13)	3.83 (1.49)	-2.13*	3.27 (1.29)	3.11 (1.33)	.55	2.91 (1.27)	2.73 (1.33)	.80	3.33 (1.19)	2.79 (1.42)	1.66
Ordinance that requires veg. mgmt. ^b	3.98 (.97)	4.41 (1.21)	-3.28**	2.92 (1.26)	3.42 (1.43)	-1.70	2.69 (1.21)	3.10 (1.38)	-1.81	3.66 (1.16)	3.80 (1.52)	-.46
Tax to pay for enforcement ^b	3.02 (1.34)	3.26 (1.50)	-1.34	2.16 (1.16)	2.32 (1.29)	-.56	2.01 (1.11)	2.06 (1.39)	-.22	2.49 (1.27)	2.71 (1.44)	-.66
Curbside pickup of green waste ^b	4.54 (.69)	4.59 (1.00)	-.36	3.58 (1.30)	3.95 (1.18)	-1.23	3.66 (1.18)	3.61 (1.03)	.25	4.41 (.83)	4.33 (1.18)	.35
Cost-share program ^b	3.74 (1.16)	3.68 (1.61)	.35	3.38 (1.30)	3.63 (1.30)	-.85	2.89 (1.29)	3.33 (1.16)	-1.91*	3.66 (1.21)	3.79 (1.19)	-.39
Low-income subsidies ^b	3.75 (1.20)	3.93 (1.51)	-1.07	3.18 (1.35)	3.84 (1.21)	-2.11	3.01 (1.29)	3.00 (1.12)	.04	3.48 (1.25)	3.14 (1.46)	.99
Insurance that requires veg. mgmt. ^b	3.29 (1.19)	3.94 (1.60)	-2.06	2.85 (1.23)	2.74 (1.37)	.38	2.62 (1.21)	2.55 (1.37)	.35	3.11 (1.18)	3.00 (1.31)	.35

a: scale where “1” is not at all likely; “3” somewhat likely; “5” very likely

b: scale where “1” is extremely negative; “3” neutral; “5” extremely positive

c: Nonresponse study for Oakland by phone (per OMB request); others by mail survey.

p* < .05, ** *p* < .01, and * *p* < .001.

† Number of respondents varied slightly by question due to item non-response. Oakland ranged from 242 to 258 for respondents and all 80 non-respondents answered each question; Larimer ranged from 551 to 571 for respondents and 18 to 19 for non-respondents; Ottawa County ranged from 363 to 381 for respondents and all 33 non-respondents answered each question; Ruidoso from 521 to 522 for respondents and 14 to 15 for non-respondents.