

# **Project Title: Individual response to voluntary and involuntary incentives to mitigate fire hazard: What works and what doesn't?**

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**Duration of Project:** Two years – 2005-2007

**Abstract:** Effective wildland urban interface (WUI) risk management requires action by local communities and individual property owners. Recently enacted federal and state policies provide some strong incentives for local jurisdictions to manage the risks associated with wildland fire. This has led to an array of policies, laws, and programs targeted at local communities and their residents. Attention needs to be paid to assessing the effectiveness of these different policies and programs in order to help communities better choose, monitor and support among structural responses. This project will employ a combination of qualitative and quantitative research methods to answer several research questions including: “To what extent are WUI residents motivated to comply with voluntary versus involuntary policies? and To what extent are incentives necessary to ensure compliance?” This project will develop a matrix of policy options that local policy makers can use as a decision support tool as they develop their own local programs. Such a matrix will include the following dimensions: voluntary/involuntary; incentives; success factors; barriers to successful implementation; public perceptions; compliance factors; and key public messages to encourage compliance. The results are intended to assist policy makers, resource managers, community officials, and residents in determining and initiating the most effective and efficient wildland fire abatement programs for their jurisdictions.

## Introduction

### *Justification*

Many components of wildland urban interface (WUI) risk management programs require action by local communities and individual property owners (Daniel 2003). 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 2004a).

Natural hazards researchers have noticed that 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 that there are few local political incentives to respond to the wildland urban interface 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. In fact, local policy responses are nearly as varied as the communities that have established them.

Given the array of policies and incentives that have developed, attention needs to be paid to assessing the effectiveness of these different of policies and programs. Such an assessment will help communities better evaluate, support, and choose among structural responses. Useful case studies and anecdotal descriptions of successful and unsuccessful local WUI initiatives have begun to appear in the literature (e.g., USDA 2004, Steelman 2004b; Jakes 2003). A useful next step would be a systematic analysis of some of the more promising community responses to the WUI fire problem that have been implemented by these early adopters. Such an analysis would employ a combination of qualitative and quantitative research methods to answer the following questions:

1. What is the range of local laws, policies and incentives that have been implemented or proposed?
2. What factors led policy makers to choose these specific laws, policies and incentives?
3. What are the specific objectives of each law, policy or incentive? What are the success factors and what are the measures of success or impact?
4. How effective are the laws, policies and incentives in meeting the stated objectives?
5. What is the social acceptability of the laws, policies and incentives?
6. To what extent are WUI residents motivated to comply with voluntary versus involuntary policies? And to what extent are incentives necessary to ensure compliance?

This research effort will be used to develop a matrix of policy options that local policy makers will use as a decision support tool as they develop their own local programs. Such a matrix will include these dimensions: voluntary/involuntary; incentives; success factors; barriers to successful implementation; public perceptions; compliance factors; and key public messages to encourage compliance.

## Key project objectives

1. Employ qualitative research methods including key informant and focus group interviews to explore the motivations and meanings of community risk managers' decisions to implement particular types of wildland fire hazard mitigation laws, policies and incentives; and high-risk WUI residents' intended and actual behavior in response to those programs.
2. Construct a conceptual model of the factors that influence individuals' decisions to practice and support (or not) local wildland fire management policy based on the qualitative findings and the relevant literature.
3. 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.
4. 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.
5. 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.
6. Transfer findings to researchers and federal, state and local risk managers via a range of publications and presentations.

## Background

The attention given to the WUI fire problem and commitment to understanding and addressing the problem has led to a rapidly growing research literature over the last ten years. The social science literature in this realm focuses primarily on three general topics: public(s) perceptions and understanding of wildland fire and fire's role in ecosystems; public perceptions and social acceptability of public land managers' fire and fuels management strategies; and WUI homeowners perceptions, understanding and compliance with defensible space and other firesafe recommendations.

Recent studies show that the public has gained a better understanding of wildland fire and is generally supportive of strategies that allow wildland fires (Machlis et al 2002). But support is not universal across communities. In their study of the social acceptability of fuels management strategies in three diverse communities in California, Florida, and Michigan, Vogt, Winter and Fried (2005) found that support among WUI homeowners for mechanical fuel reductions methods ranged from 71% in Michigan to 88% at the California site; however, support for prescribed burning ranged from as low as 47% in Michigan to 87% in Florida.

Studies combining qualitative and quantitative social science research methods have been instrumental in revealing the wide range of social, environmental and economic factors associated with acceptance of and compliance with certain WUI interface fire risk reduction strategies.

Research of homeowners' perceptions and practices related to living in high-risk WUI environments reveals the existence of many factors that can deter individuals from taking protective actions. Smith and Rebori (2001) identify 15 such factors in their review of four studies about defensible space practices in the WUI. Other WUI studies suggest regulatory and economic motives influence individual protective actions. Homeowners in a California community, where vegetation management for defensible space is an enforced local ordinance, were twice as likely as homeowners in Michigan and Florida communities (91% versus 44% and 42%) to have engaged in defensible space actions on their properties (Vogt, Winter, and Fried 2005). Homeowners in a WUI area of Michigan's northern lower peninsula expressed a median annual willingness to pay of either 31 hours of work around their property or \$500 to hire contractors to undertake defensible space improvements to reduce their risk of home loss due to wildland fire (Fried, Winter, and Gilless 1999).

Current federal policy places a priority on community-based efforts to address the wildfire problem in the west (USDA and USDI 2000, WGA 2001). The policies are designed to encourage a more integrated and sustainable solution to the wildland fire problems that affect communities and ecosystems. And they have led to a combination of state and federal assistance programs offered to local jurisdictions that have developed a wide variety of programs to manage fuels, restore forests, create defensible space around homes and communities, educate the public about wildfire, and develop markets for fuels management and forest restoration by-products. (Steelman 2004b)

Steelman's (2004b) extensive case study research of state and local programs in Arizona and New Mexico examined the roles the federal and state governments had on local program implementation. The federal government was found to provide, primarily, policy direction and financial resources, which are mediated through state-level organizations, which, in turn, either helped or hindered the ability of local jurisdictions to develop community-based programs.

To the extent that proposed local WUI policies involve action on the part of individual residents (homeowners, voters, taxpayers), local planners and policy makers will find it very useful to assess the likelihood that they can build constituency interest in, and demand for their objectives. In their study of local planning efforts to mitigate natural hazards in Florida and New South Wales, Australia, Burby and May (1998) found that higher levels of commitment by local jurisdictions to hazard mitigation planning was predicted strongly by the extent of constituency demand for mitigation objectives.

State and local governments and, more recently, insurance companies offer a combination of incentives and regulations to encourage responsible fireproofing behavior by property owners (Davis 2001, Plevel 1997, Weatherspoon 1996).

Regulatory policy is exemplified by California. Following the Oakland Hills fire, which destroyed over 3,229 structures and damaged an additional 2,992 with over \$2 billion in damages and 25 fatalities, the state enacted a law requiring communities and property owners in high-risk fire zones to provide fire defense improvements including a minimal distance of defensible space between structures and wooded areas. This kind of state level land-use mandate makes it easier for local public officials to take action in the face of property-rights advocates who would otherwise present more of a political risk (Davis 2001).

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

Outside California, mandatory defensible space regulation has not been widely adopted. In 1997, the Oregon Legislature weakened provisions of the Forestland-Urban Interface Protection Act that would have required actions by high-risk WUI homeowners (Davis 2002). A notable exception is the Village of Ruidoso, New Mexico, where the local government has implemented a comprehensive interface protection program that includes mandatory vegetation management on high-risk properties (Emerson 2004). Other communities have required firesafe planning and measures for new developments, but have "grandfathered" existing homes.

Absent mandatory regulation, many communities find it challenging to get property owners to engage in firesafe landscaping, building, and retrofitting. Carroll and Daniels (2003) puts this problem in a category known as "social dilemmas", or voluntary actions that make sense, but for which there is insufficient incentive to motivate particular individuals. Research on social dilemmas concludes that socialized sanctions can be more effective than mandatory regulation in compelling individuals to engage in the appropriate behavior (Carroll and Daniels 2003).

Local communities, often working in partnership with state or federal agencies have implemented programs to add incentives or reduce barriers to private risk averting behavior. For example, in some places, providing free chipping and hauling services for removed vegetation has been quite successful in increasing vegetation management by homeowners (McCaffrey 2004). Using innovative experimental economics methods, McKee et al. (2004) find evidence that adding cost share components to programs

designed to encourage private investment in risk averting increases expenditures significantly. Such public-private partnerships make sense from the perspectives of individuals and local governments charged with public life and safety protection responsibilities. In many locales, private risk averting actions provide both a private good (individual risk reduction) and a public good (reduced risk to nearby property owners and reduced expenditures on publicly funded mitigation and emergency response measures). There is also research evidence to suggest that WUI homeowners in some locales may be willing to accept tax-financed public expenditures that result in local risk reduction. Using contingent valuation methods, Winter and Fried (2000) estimated that 75% of Michigan WUI homeowners in a high risk fire hazard region were willing to pay for public investments in mitigation measures that would result in a 50% reduction in the risk of home loss.

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

## Materials and Methods

This project will be implemented in two phases, the first qualitative and the second quantitative – similar to the successful approach used in our most recent Joint Fire Science project.

### Phase 1.

- Based on publicly available information (e.g., USDA 2004) and the literature (e.g., Steelman 2004a), we will select a sample of four communities to represent a range of local laws, policies, and incentives to mitigate the wildland fire hazard with a mix of four characteristics: voluntary policies, mandatory policies, and policies with incentives, and without incentives.

Figure 1. Community Sample Scheme: Selected communities will have implemented at least one policy focus with these characteristics

	Voluntary policies	Mandatory policies
With incentives	e.g., Carter and McCreary Counties, KY <ul style="list-style-type: none"> <li>Home risk assessments</li> <li>Insurance incentives</li> </ul>	e.g., Ruidoso, NM <ul style="list-style-type: none"> <li>Mandatory vegetation mgt. regulations</li> <li>Cost share arrangements</li> </ul>
Without incentives	e.g., Los Alamos County, NM <ul style="list-style-type: none"> <li>One-time help with firewise landscaping</li> <li>Homeowners sign pledge to maintain defensible space for five years</li> </ul>	e.g., Ventura, CA <ul style="list-style-type: none"> <li>Mandatory vegetation mgmt. regulations</li> </ul>

- Key informant interviews via phone and email will help our team determine the suitability of each site for inclusion in the project. Preliminary discussions with potential local site cooperators have already lead to letters of support for our project in these locations (see attached letters from Ruidoso, NM, and FIVCO organization in Kentucky).
- At each of the selected communities, we will conduct one focus group with local hazard mitigation leaders to assess the history, objectives, success factors, barriers to implementation of local wildland fire hazard mitigation and fuels treatment policies, and the compliance record of local residents.
- Focus groups will be held with residents of high risk WUI areas to determine the range of factors associated with their attitudes, acceptance, and understanding of the local policies and their actual and/or intended compliance with them.
- From this background work, site visits, and qualitative analysis of interview and focus group data, a conceptual model with hypothesized relationships will be developed and tested in Phase 2.

### Phase 2.

- Empirical testing of the conceptual model (from Phase 1) with demonstration of the reliability and validity of existing and newly constructed measurement scales in a quantitative survey scientifically administered to households. The survey data will allow 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.

### ***Phase One: Community selection and focus group interviews to facilitate model development***

Researchers will construct a conceptual model of the factors that influence individuals' decisions to practice and support (or not) local wildland fire management policy. The initial model will be developed based on the findings of recent research, especially as applied to natural resource policy, forest fire, and related areas (e.g., risk perception, decision making under uncertainty); and community visits, which include scripted interview sessions and focus groups with key stakeholders.

#### *Site Selection*

We propose to use four locations to represent a diverse sets of local WUI fuels management strategies found in the U.S. One community will be selected for each of the four scenarios for phase one research. In phase two, these communities will also be sites for a general population representative sample of residents. Community selection will also be guided by the land management contacts, co-operation and recommendations; community interest and co-operation; and logistical considerations.

#### *Focus Groups: Community leaders, wildfire experts, and interested publics*

In each selected community, four focus groups will be conducted. One focus group will be held with community leaders and decision makers who are key decision makers in wildland fire management policies. Three focus group interviews will then be held with property owners of high-risk WUI zones. A standard focus group process (c.f., Winter and Fried, 2000; Winter, Vogt and Fried, 2002) will be used to recruit and screen participants (advance letters, follow-up phone calls, and over-recruiting to allow for attrition), and interviews will be held at a neutral location (e.g., hotel conference facility). An experienced facilitator (one of the three researchers) using a flexible script will lead each group through discussion of the issues surrounding fire management in their region and community; abatement practices at their home, in their neighborhood and community; the influence of policy and incentives, and larger social issues that influence attitudes toward fire management (e.g., local control of public lands, government taxation and efficiency, trust in resource managers). Focus group discussions will be taped, transcribed, and analyzed using both qualitative and quantitative techniques.

#### *Refinement of Conceptual Model*

Information gained from interviews and focus groups will allow for refinement of constructs, terminology, and relationships specified in the model. At the conclusion of phase one, the conceptual model will be developed sufficiently to serve as a basis for survey design and analysis in phase two.

## ***Phase Two: Community surveys and model testing***

### *Community Selection*

Communities from phase one will be the sites for quantitative assessments of public knowledge, attitudes, and beliefs regarding wildland fire management policy, specifically, wildland fire hazard abatement efforts.

### *Survey Administration*

The measurement scales and questions developed in phase one will be administered to a random sample of community residents via mail survey, with a target sample size of 500 responses per community. In western states, particularly California, response rates have been relatively high (40-50%) compared to the Midwest and South (30-40%). For two communities, a sample size of 1,000 households is estimated; for the other communities, a sample size of 1,500 households is estimated. A Dillman (2000) mail technique will be used to yield the highest possible response rate. This technique includes a personalized letter and business reply return in the initial mailing, followed by a postcard one week later, and another personalized envelope yet two weeks later for those not responding. In communities with response rates below 50%, a nonresponse follow-up survey will be conducted to ensure any response biases are accounted for and described.

### *Survey Analysis*

Through the analysis of survey data, researchers will develop and test predictive models derived from the conceptual model. Analysis will also provide evidence regarding the patterns of association among knowledge, attitudes, acceptance, and other demographic characteristics. The relative importance of causal factors and their relationship to acceptance outcomes will be evaluated.

## **Project Duration**

2 years; Year 1: Qualitative work in 4 communities to build a conceptual model and develop and pre-test survey instruments. Year 2: Collect and analyze survey data, estimate predictive models, prepare reports and manuscripts for peer-reviewed and management or public administration oriented publications.

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