# Fuel Treatments at the Wildland-Urban Interface

## *Common Concerns in Diverse Regions*

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ABSTRACT

Forest fuels reduction has the best chance of success if managers understand the factors that influence public acceptance of fuel management. This article reports an analysis of focus group interviews with wildland-urban interface residents at sites selected to provide variation in fire regime, fire history, land-use and ownership patterns, and socioeconomic profile. Analyzed within a framework developed from the human dimensions and social psychology literature, the focus group data reveal four common factors that affect the acceptance of three fuel management strategies (prescribed fire, mechanical treatment, and defensible space requirements): beliefs about the outcomes of fuel management, personal importance of fuel management, situational specificity, and agency trust.

**Keywords:** fire; public relations; social science

A combination of fire suppression, urban sprawl, and migration to rural areas has created an extensive wildland-urban interface where wildfire poses a serious threat to people, property, and resources (US General Accounting Office 1999). Achieving fuel reduction in such ecosystems is considered critical to reducing the likelihood of future catastrophic fires (USDA 2000) and has spawned several nationally prioritized initiatives to expand fuel treatment implementation and research. Fuel reduction relies on prescribed fire and prescribed natural fire and/or mechanical treatments (e.g., fuel load reduction via chainsaws and brush mowers). Enactment and enforcement of defensible space ordinances targets vegetation fuels in the vicinity of residential and other developed areas.

Fuel reduction has the best chance of success if managers understand the factors that influence public acceptance of fuel management sufficiently to provide effective responses to the questions, objections, and concerns of residents on the wildland-urban interface. Prescribed fire has generated controversy because of the vast distances over which the resulting smoke disperses (i.e., over living, work, and travel areas) and the potentially disastrous effects of prescribed fires that escape. Mechanical treatment has led some to be concerned that fuels reduction would be used as a pretext for justifying harvest of mature trees (Jehl 2001). And defensible space initiatives may run counter to residents' individual landscaping objectives.

### Background

We report an analysis of focus group data within a framework—developed from the human dimensions of natural resources literature and social psychological models of human behavior—that accounts for theoretical and empirically observed factors associated with the social acceptability of natural resource management policies.

Social acceptability of forest management practices results from individual judgments that "compare the perceived reality with its known alternatives" and "decide whether the 'real' condition is superior, or sufficiently similar, to the most favorable alternative condition" (Brunson and Kruger 1996).

***Above:*** **A mechanical thinning operation east of Ridgeway, Colorado, and near Uncompaghre National Forest.**

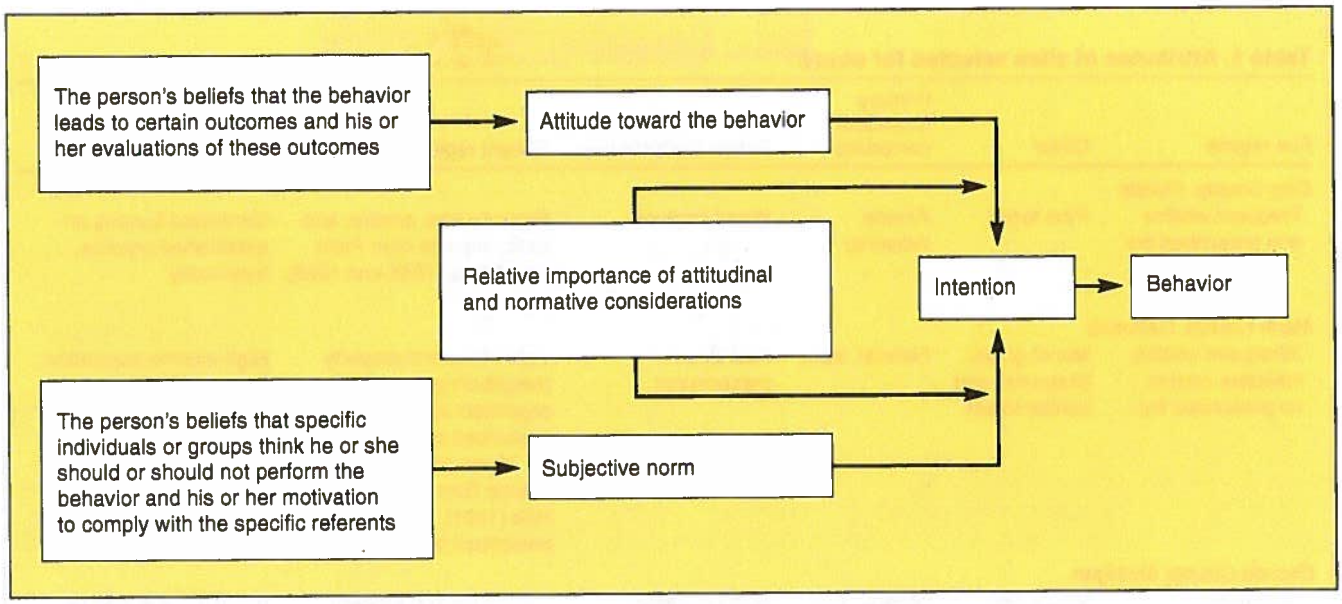


***Figure 1.*** **Schematic of the Theory of Reasoned Action.** ***Source:*** **Ajzen and Fishbein (1980).**

These individual judgments are influenced by attitudes and are generally not observable. The absence of social acceptability is expressed by individuals who initiate behaviors that attempt to shift existing conditions toward a preferred alternative (Brunson and Kruger 1996). The USDA Forest Service's transition toward "ecosystem management" and statements by the agency's leaders (e.g., Robertson 1991) imply that management practices on federal forests should be ecologically sustainable, economically feasible, and socially acceptable (Brunson and Kruger 1996, p. 8):

> If public acceptability is to be an explicit objective of national forest management, the Forest Service will require methods to measure acceptability of current practices, predict acceptability of proposed practices, and understand the reasons for failures to achieve acceptability.

The Theory of Reasoned Action (Ajzen and Fishbein 1980) provides a framework to study the relationship between attitudes and behaviors, specifically the social acceptance of fuel treatments *(fig. 1)*. The most important determinant of a person's behavior is behavioral intent. The individual's intention to perform a behavior, such as the decision to support a fuel management policy, depends on attitude toward performing the behavior (an evaluation of whether the behavior is favorable or unfavorable), the strength of his or her belief that performing the behavior will result in certain outcomes, and the evaluation of those outcomes (Bright et al. 1993).

Several studies have addressed the question of how the public perceives the outcomes of prescribed fire (Gardner et al. 1985; Shindler and Reed 1996; Winter and Fried 2000) and mechanical thinning (Shindler and Reed 1996). Public unwillingness to accept prescribed fire is undoubtedly related to the potential for negative impacts. Previous experiences with wildfire and land management agencies sometimes magnify fears of negative consequences (Fried et al. 1999; Winter and Fried 2000). At Sequoia National Park, topography and prevailing winds tend to minimize the property loss risk and intensify smoke impacts in adjacent communities, making smoke the most salient negative outcome from the perspective of local residents (Winter and Robbins 1999). Residents of jack pine forests in Michigan's northern lower peninsula were most concerned about life and property loss, due mostly to a history of such loss linked to prescribed fire (Winter and Fried 2000). Residents of Oregon's Blue Mountains shared this concern about prescribed fires that escape but also opined that trees consumed by prescribed fire would be better used commercially (Shindler and Reed 1996).

The human dimensions literature suggests that personal importance, situational specificity, and agency trust are associated with an individual's attitude toward and intention to support natural resource policies. The personal importance of an issue has been shown to have strong moderating effects on the relationship between attitudes and behaviors (Bright and Manfredo 1996) and the effect of information on attitudes and behaviors (Bright et al. 1993).

Situational specificity has been shown to change the strength of the relationship between beliefs, attitudes, and behavior (Ajzen and Fishbein 1980). For example, in a study of wildlife management actions, the acceptability of destroying problem wildlife depended greatly on the specifics of each scenario: that is, the species in question and the type of problem behavior (Zinn et al. 1998).

Trust in those responsible for managing technology—especially in situations with a high hazard potential—is an important explanatory factor of risk perception and support for resource management policies (Kasperson et al. 1992; Wagner et al. 1998). Only half of the respondents in Shindler and Reed's Blue Mountains study (1996) trusted the Forest Service "to implement a responsible and effective prescribed fire program," while the rest were nearly evenly divided as not trusting the agency or being neutral on the issue. Their results showed that trust levels were slightly higher for a mechanical thinning program.

The objectives of our study were to: (1) develop a con-

**Table 1. Attributes of sites selected for study.**

| Fire regime | Cover | Primary forestland ownership | Forest resource use | Recent regional fire history | Other site attributes |
|---|---|---|---|---|---|
| *Clay County, Florida* | | | | | |
| Frequent wildfire and prescribed fire | Pine forest | Private industrial | Wood products | Property loss, smoke, and traffic impacts from Palm Coast fires (1985 and 1998) | Controlled burning an established practice, historically |
| *Marin County, California* | | | | | |
| Infrequent wildfire, intensive control, no prescribed fire | Mix of grass, chaparral, and conifer forest | Federal, state | Recreation, preservation | Loss of life and property (neighboring county), organized opposition to prescribed burning. Mt. Vision Fire (1995); nearby Tunnel Fire, Oakland Hills (1991), Mt. Tamalpais prescribed burns (1984–85) | High-income population; high real estate values |
| *Oscoda County, Michigan* | | | | | |
| Moderately frequent wild and prescribed fire | Mostly jack pine forest | Federal, state | Wood products, recreation, endangered species restoration | Loss of life and property. Mack Lake Fire (1980); nearby Stephan Bridge Road Fire (1990) | Relatively low-income population; high percentage of seasonal homes |
| *Tuolumne County, California* | | | | | |
| Frequent wildfire, infrequent prescribed fire, increasingly frequent mechanical treatment | Oak woodland, pine, mixed conifer | Federal | Recreation, wood products | Loss of life, smoke impacts. Stanislaus Complex fire (1987) | Site of Southwest Interface Project, a novel multiagency project to mitigate fire problems in highly developed and highly traveled highway corridors |

tent-rich conceptual model using the Theory of Reasoned Action as a base to understand fuel management acceptability, and (2) within this model, identify the explanatory factors related to the acceptability of fuel management approaches among residents of fire-prone wildland-urban interface areas across the United States.

## Methods

Previous studies demonstrate significant regional variation in the public's attitudes toward wildfire and fuel management (Manfredo et al. 1990). Sites for this study were selected to provide variation in fire regime, fire history, land-use and ownership patterns, and socioeconomic profile *(table 1)*. Focus groups were selected as the technique that would best help us reveal and understand such regional variances.

Much of suburban Marin County, California, is surrounded by state and federal land used primarily for recreation and preservation; income and property values are very high there. Timber production and recreation are both important in the forests of Tuolumne County, California. Rural Clay County, Florida, is characterized by scarce public land, large areas of industrial pine plantation, an economy dependent on wood products, and rapid population growth. Rural Oscoda County, Michigan, is comparatively low-income, dominated by seasonal homes, and consists mostly of state and federal forestland. It is also the site of the 1980 Mack Lake fire, an escaped prescribed burn that claimed one life and 44 structures.

Focus group interviews were conducted with residents on the wildland-urban interface at each site. Participants were recruited at random from a sample frame of homeowners developed from county tax assessors' databases. Advance letters with return postcards and follow-up phone calls were used to recruit volunteer participants. Focus group size ranged from four to 10 participants, averaging 6.5 per each of the 12 groups *(table 2)*.

Focus group data consists of transcribed tape recordings of 90-minute group interviews moderated by the senior author, each of which followed a standard interview protocol consisting of six open-ended questions. These questions encouraged participants to discuss their beliefs about fuel management outcomes, attitudes toward specific fuel treatment approaches, and intention to support or oppose the use of each fuel treatment technique. Participant remarks were coded into variables

**Table 2. Number of resident focus groups and participants by site.**

| Site | Groups | Participants |
|---|---|---|
| Clay County, Florida | 3 | 19 |
| Marin County, California | 3 | 21 |
| Oscoda County, Michigan | 2 | 12 |
| Tuolumne County, California | 4 | 26 |
| Total | 12 | 78 |

of the conceptual model of fuel treatment acceptance. For example, the following remark was coded as "acceptance" and as "outcome belief" because it indicated a fuel treatment preference (mechanical treatment is acceptable) based on a belief about the outcome of an alternative treatment (home destruction and fatalities from prescribed burning).

> I don't care if they call it controlled or prescribed, you can't control it, and the only thing that is really going to work is mechanical. Yes, it's more expensive, but the other alternative is people can die and homes can burn. I'm not willing to take that chance. (Oscoda, MI)

## Results

A total of 1,745 individual remarks by 78 individuals were analyzed for "acceptance" and "factors affecting acceptance" according to the model based on the Theory of Reasoned Action. Of that total, 319 remarks were associated with the dependent variable "acceptance." Factors influencing fuel treatment acceptance were organized into four main categories: fuel treatment outcome beliefs (221 remarks), personal importance (16 remarks), situational specificity (22 remarks), and agency trust (67 remarks). These factors were further supported by 13 subtopics. *Table 3* shows the fuel treatment acceptance factors and subtopics that emerged during focus group discussions at individual sites, and the total number of focus group interviews during which each factor or subtopic emerged.

Residents indicated their personal acceptance of fuel treatment by expressing a preference for one or more techniques. The following examples demonstrate focus group participants' acceptance of prescribed burning, a combination of mechanical treatment and prescribed burning, and nonacceptance of a defensible space requirement, respectively.

> [I prefer] the controlled burning because of the fact that it is controlled and generally speaking they do take precautions and make sure that the fires don't get out of control. (Clay, FL)

> I support both [mechanical treatment and prescribed fire] if it's done under the right conditions—if they get somebody that has some experience and not some greenhorn out there that starts to burn up the whole state. (Tuolumne, CA)

> Personally, one of the reasons I live where I live is because I like the trees and I like the vegetation that is around my house. If I had to clear all that out of there, what would be the sense of living there? ...I might as well live in the city, and that's why I pay insurance. (Oscoda, MI)

Residents discussed the pros and cons of various fuel treatment strategies (reflecting their attitudes toward each practice) and their personal level of support for each one. Thus, focus group participants revealed factors that affected their acceptance decision directly as indicated by their level of support, or indirectly as indicated by their attitude toward each fuel treatment. Remarks were coded into the variables of the conceptual model of acceptance: outcome beliefs, personal importance, situational specificity, and agency trust.

## Outcome Beliefs

Residents commonly referred to air quality, cost, escaped and catastrophic fire, and aesthetics in their deliberations about fuel treatment techniques.

*Air quality and smoke.* Residents acknowledged the relationship between prescribed burning and air quality.

> When you have a lot of burns, you're going to have some air quality problems. (Clay, FL)

> The smoke pollution can be kind of nasty if it's a big enough burn. (Marin, CA)

They also expressed varying degrees of tolerance for the smoke generated by either prescribed burns or wildfires.

> I think the smoke in the environment is the pits. (Marin, CA)

> I can deal with the smoke and a little bit of ash. (Clay, FL)

> They get a lot of flack from the visitors and others, and it's very difficult to do what they want to do. The smoke gets in people's noses, and often they have to stop it if it gets to be too much. (Tuolumne, CA)

*Cost.* Frequently, participants considered their own perceptions of likely costs in their evaluation of fuel treatments. Often, they associated costs with the physical resources required for the job.

> I think the mechanical means would really be expensive—to have a man go out to the woods, 100 guys doing that. (Clay, FL)

> If I had 1,000 acres of woods, I would much rather manage it in a low cost way, and mechanical is going to be a lot more money to go in there. I mean, think of clearing 40 acres with machines or by hand or whatever, getting all that brush out of there. You're talking a lot of money. (Oscoda, MI)

Some considered as unacceptable costs the risk of escaped fire from prescribed burning and its associated negative outcomes.

> Even though a burn sounds like it will be cheaper, if it got out of hand it costs more, so there's a higher risk there. (Marin, CA)

*Escaped and catastrophic fire.* Participants at all sites acknowledge the possibility that prescribed burning will result in an escaped fire.

> They make all sorts of promises, and then they can't control it. (Marin, CA)

Residents recalled the recent escaped fire near Los Alamos, New Mexico. Similarly, Oscoda County participants referred to the 1980 Mack Lake fire.

> If somebody came to me and said, "We're going to have a controlled burn out here, what do you think of that?" Up until Los Alamos, I would have probably said, "Go for it." But now I would say, "Boy, I don't know, who is going to be in control there?" (Tuolumne, CA)

> I know that everybody around here has got a bad taste for prescribed burns because of Mack Lake. (Oscoda, MI)

*Aesthetics.* Participants expressed an interest in the aesthetic outcomes of prescribed burning, mechanical treatment, and defensible space. As with the issue of cost, there is no consensus on whether one fuel treatment is superior in this regard.

> [Referring to fire breaks as mechanical treatment] Us local guys

**Table 3. Factors affecting fuel treatment acceptability by site.**

| Acceptance factor | Clay County, Florida | Marin County, California | Oscoda County, Michigan | Tuolumne County, California | Interviews per factor* |
|---|---|---|---|---|---|
| *Outcome belief* | | | | | |
| Escaped fire | ✓ | ✓ | ✓ | ✓ | 8 |
| Cost-effectiveness | ✓ | ✓ | ✓ | ✓ | 7 |
| Catastrophic fire potential | ✓ | ✓ | ✓ | ✓ | 4 |
| Smoke, air quality impacts | ✓ | ✓ | — | ✓ | 5 |
| Aesthetic impacts | ✓ | ✓ | — | ✓ | 4 |
| *Personal importance* | | | | | |
| Property rights | ✓ | ✓ | ✓ | ✓ | 4 |
| Vegetation amenity | ✓ | ✓ | ✓ | — | 4 |
| *Situational specifics* | | | | | |
| Situation-dependent | ✓ | ✓ | ✓ | ✓ | 7 |
| Site-specific considerations | | | | | |
| Planning | ✓ | ✓ | ✓ | ✓ | 6 |
| Resources | ✓ | ✓ | ✓ | ✓ | 4 |
| Size of treatment | ✓ | ✓ | ✓ | — | 5 |
| Proximity to homes | ✓ | ✓ | — | ✓ | 3 |
| *Agency trust* | ✓ | ✓ | ✓ | ✓ | 8 |

**Total number of focus group interviews during which each factor or subtopic emerged.*

never realized how wide that thing is until some flatlander came up here and said, "Hey, well look at that. That looks ugly." And then you stop and look at it and say, "Jeez, you know, you're right." (Tuolumne, CA)

## Personal Importance

Three dimensions of personal importance emerged: the amenity value of residents' vegetation, perceived property rights, and smoke impacts.

*Vegetation amenity.* Capital investment in creating defensible space and the perceived opportunity cost of eliminating or reducing vegetation on one's lot are barriers to defensible space compliance.

> That's our choice. We live in the woods and that's why we're out in these areas, because we want to live in the woods. (Clay, FL)

*Property rights.* The issue of property rights also enters into the acceptance decision, particularly when one considers the acceptability of enforcing a defensible space ordinance.

> I think the con is, how do you manage mechanically the control of growth, and not invade people's privacy and their own control of what they want for foliage around their homes? (Marin, CA)

*Smoke impacts.* Certain population subgroups are particularly smoke-sensitive, including those with respiratory ailments such as asthma.

> It affects the air that we breathe and of course we have a lot of people like myself in Florida that have asthma and stuff like that. It affects them a lot, especially when there is fire in the area where the smoke is so thick you could almost cut it with a knife, which it was in '98. (Clay, FL)

## Situational Specifics

Residents often assessed the acceptability of a fuel treatment technique in the context of situation- and site-specific considerations.

> I would support both ways. One, mechanical probably around homes with owned property, I suppose. [Prescribed] fire, I guess, if you were more out in the woods you would have [a large expanse of] natural forest. (Oscoda, MI)

> [The fuel treatment technique] depends on the area. Because on one side of the hill there is some type of growth and on the other side of the hill there is something else because Mother Earth is not the same all over. (Tuolumne, CA)

Residents' acceptance decisions sometimes depend on the areal extent of the fuel treatment, the degree of planning that precedes implementation, the adequacy of the resources (human, equipment, and fiscal) available to the managing agency, and the proximity of the fuel treatment to developed areas.

*Size of fuel treatment.* The acreage involved was a concern to residents.

> I'd have to have more information. I'd have to know how close it is, how big the burn area is supposed to be. (Marin, CA)

> They should be realistic on how much they are going to burn. (Oscoda, MI)

*Planning.* Residents were interested in knowing that fuel treatments were part of larger plans.

> I think if they plan this and were able to keep it under control, I would be all for it. (Clay, FL)

> I think if they are going to have a prescribed burn, they should figure out where they want to have it and take about a year ahead of time and look at it. (Oscoda, MI)

*Firefighting resources.* Residents wanted to know that the appropriate number of professionals handled fuel treatment work.

> If I realized that [a prescribed fire near my home] was professionally done and they've got the trucks and they've got the firefighters

standing by to protect anybody's property, that would be all right. (Clay, FL)

They should make sure they have enough manpower before they strike the first match. (Oscoda, MI)

*Proximity to developed areas.* Residents wanted prescribed burning to occur away from residential neighborhoods.

It would not be appropriate to have a little burn too close to Pine Mountain Lake [a subdivision], but certain elevations and so forth. (Tuolumne, CA)

One is not better than the other. For instance, around homes, I would presume that mechanical would be better, and out in more rural areas a fire would be better. (Marin, CA)

## Agency Trust

Residents' attitudes toward and acceptance of fuel treatments are associated with their perceptions of management agencies' ability to control fire, professional skill, credibility, and adequacy of communication efforts.

*Ability to control fire.* Residents recognize the catastrophic potential of wildland fire, and some question the land manager's ability to control it.

Well, that's what they thought out West too, and look what happened. When the federal land managers set a fire they couldn't put out. (Clay, FL)

How can they predict no wind? Because I imagine that wind is the most feared thing in controlled burning. (Marin, CA)

*Professional skills.* The perceived degree of professional skill influences residents' acceptance decisions. Indicators of professional skill include experience, education, and training.

Controlled burns, yes, as long as they are done by professionals and the conditions—they know what they're doing—let them handle it. (Clay, FL)

I would not be willing to support [mechanical treatments] unless I knew what it was they were doing and why, and who was in charge, and how educated they were about it.... If people know what they're doing, if they can reassure us that they know what they're doing, then probably they would get a lot more support. (Marin, CA)

*Agency credibility.* Credibility surfaced as an issue during the focus groups in Oscoda County, where rumors about local agencies and their responses to recent wildfires appeared to have taken hold and, evidently, influenced residents' acceptance decisions.

[Contrary to what we were told by agency personnel], I think this summer's fire was set by the Forest Service. (Oscoda, MI)

Credibility issues can also be more subtle.

[Regarding prescribed burning:] But I kind of wonder sometimes as to whether they actually have things under control, the way they try to assure us that they have things under control. (Clay, FL)

*Agency communication effort.* Residents commented on local agencies' efforts to communicate with the public.

They're also pretty conscientious about advising all of us who live in these heavily wooded areas to try and keep the brush away from the house for some distance. I think the prescribed distance is something like 30 feet or so from the walls of the house. So, some effort is being made. (Marin, CA)

As far as fires go, we don't have a whole lot of heads-up on these things. And of course there are some that happen by nature and by accident that they don't have a heads-up on either. (Oscoda, MI)

## Discussion

Factors affecting fuel treatment attitude formation and acceptance are remarkably similar across diverse regions of the country *(table 3)*. Support for fuel management appears to be related to perceived outcomes. Fuel management strategies are "bad" if they lead to escaped and catastrophic fires, are not cost-effective, result in long-duration smoke events, or reduce the aesthetic quality of surrounding landscapes.

Residents generally will support a proposed fuel management strategy if it is known to be well-planned, it includes some level of citizen participation, the responsible agency has adequate resources to manage the risks, and the size of the treatment is manageable. Mechanical treatments are the preferred option close to developed areas.

Agency trust emerged as an important acceptance factor at all sites. Many of our observations conform to the *competence* dimensions of social trust wherein "trust is gained only when the individual or institution in a social relationship is judged to be reasonably competent in its actions over time" (Kasperson et al. 1992). Before residents will support a proposed fuel treatment, they want assurance that it will be carried out by professionals that "know what they're doing."

The acute trust problem in Oscoda County, Michigan, is exacerbated by the proximity of the Mack Lake fire and other contemporary catastrophic wildfire events (see Winter and Fried 2000). But close proximity is not a prerequisite for erosion of social trust. The recent Cerro Grande fire near Los Alamos raised comparable trust issues nationally.

## Conclusion and Recommendations

Legislation and recent agency directives (e.g., USDI and USDA 1995; National Park Service 1998) emphasize the need for meaningful public participation in the development of natural resource plans and policies. Faced with these realities, public land managers have the best chance of developing plans that can be successfully implemented if they communicate and work with the public. Understanding how citizens perceive fire and specific fuel treatments is essential to land managers' success in negotiating mutually acceptable fire management plans (Manfredo et al. 1990; Lichtman 1998).

Successful implementation of fuel management necessarily involves behavioral change among residents on the wildland-urban interface. Specifically, land managers seek support for specific fuel management strategies from current nonsupporters and encourage individuals to invest in fire-safe landscaping to maintain defensible space. Land managers should listen to residents who do not currently support specific fuel management plans to understand the reasons behind their reluctance and to develop alternative plans or public involvement programs that are sensitive to residents' beliefs about fuel treatment outcomes and attitudes toward fuel treatments.

Generally, the fuel treatment acceptance factors proposed

in our conceptual model are evident in diverse wildland-urban areas across the country; however, the relative importance of particular factors may vary greatly depending on the proposed fuel management strategy and a variety of site characteristics, especially past agency performance.

Commonly encountered acceptance factors suggest that fire managers should include information on the following topics in their communication and public involvement processes:

*Prescribed burning*

• Technical competence of personnel and how the agency incorporates lessons learned from past escaped fires.

• Specific planning and preparation steps taken prior to implementation, including stakeholder involvement.

• Plans that recognize certain conditions must be met (i.e., weather conditions) or the prescription could be delayed and possibly cancelled for the scheduled year.

• Availability of resources necessary to successfully implement the program.

• Mitigation measures to reduce the air quality and aesthetic impacts.

• Contingency measures in place to respond in the event of escape.

• Cost-effectiveness of the program versus alternative fuel-reduction strategies.

*Mechanical treatment*

• Specific planning and preparation steps taken prior to implementation, including stakeholder involvement.

• Mitigation measures to reduce aesthetic impacts.

• Cost-effectiveness of the program versus alternative fuel reduction strategies.

*Defensible space*

• Specific "how-to" instructions tailored to local conditions that consider diverse homeowner site characteristics (e.g., slope, development, and density) and that direct homeowners to assistance.

• Mitigation measures homeowners can use to reduce aesthetic impacts.

• Where applicable, equitable regulation and enforcement of ordinances.

This research points to the need to continue the dialogue and understanding between fire managers and residents living in wildland-urban interface areas. Researchers play a unique role in assisting in the dialogue and in the building of knowledge that can help achieve a balance between ecological principles and human values.

## Suggestions for Further Research

This study is limited in its ability to represent the targeted population at each site. The participants were chosen scientifically but, using groups of six to 12 people, the findings cannot be projected onto the entire population. Nor can we relate people's views to their specific situations, demographic characteristics, and experiences. A logical progression for research is the systematic sampling of the wildland-urban population using a georeferenced sampling frame that ties responses to demographic characteristics and site-specific situations (e.g., degree of risk faced, likely extent and nature of potential fire impacts, and defensible space compliance).

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*Funding was provided by the USDA/USDI Joint Fire Science Program.*