

# Predicting Wildland Fire Policy Support

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## Abstract

Theoretically grounded empirical models can improve our understanding of public support for (or opposition to) wildland fire policies. Based on the specificity principle (general to specific versus specific to specific variable associations), we empirically examined the influence of three sets causal influences (general socio-demographics, general situational indicators, specific psychological indicators) on two specific agency actions (prescribed fire and mechanical thinning) and two specific homeowner actions (defensible space and firewise construction). Data were obtained from a mailed survey of Colorado wildland-urban interface residents (n = 532). Logistic regression analyses indicated that the predictor variables had different patterns of influence on agency and homeowner actions. Consistent with the specificity principle, the specific psychological measures were more predictive of specific agency / homeowner actions than either the general socio-demographic or the general situational variables. Recognizing these differential causal influences can improve policy development, situated communications, and local community involvement strategies.

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## Introduction

Recent catastrophic wildfires have reinforced the need for successful mitigation strategies that are coordinated across all levels of government (federal, state, county, local) and that address the needs and concerns of affected homeowners living in the wildland-urban interface (WUI). Despite the growing body of social science literature on agency initiated wildland fire policies and homeowner mitigation strategies, knowledge gaps remain (Cortner and Field, 2004). To better manage the human dimensions of wildland fire, a better understanding of the underlying mechanisms that influence public support for agency and homeowner behaviors is needed.

Half a century ago, Lasswell (1951) emphasized the importance of merging social science and policy. Work in policy arenas (e.g., housing, labor) has empirically linked

public beliefs and policy issues (Hyman *et al.*, 2001). Natural resource managers have similarly recognized that the social sciences can inform the decision making process (O’Laughlin, 2003). Hoover and Langner (2003), for example, noted “the importance of understanding ...attitudes, perceptions and beliefs about fire in developing feasible fire management strategies.” Despite this recognition, social science based analyses of wildland fire policies are only starting to emerge in the literature (Cortner and Field, 2004).

This paper examines the differential influence of three sets of predictors (i.e., general socio-demographics, general situational factors, and specific psychological variables) on two specific agency policies (prescribed fire and mechanical thinning) and two specific homeowner actions (defensible space and firewise construction). The “specificity” principle (i.e., correspondence between the measured concepts; general to general versus specific to specific) provided the basis for explaining differences in the strength of relationships between social and psychological predictor variables and the policies related to wildland fire mitigation management actions.

### Predicting Policy Support

Combinations of underlying factors have been shown to influence support for wildland fire management alternatives (Kneeshaw *et al.*, 2004; Taylor *et al.*, 1988). In general, the wildland fire literature has addressed three categories of predictor variables: socio-demographic, situational, and psychological factors.

*Socio-demographic* variables are commonly measured in social science surveys, and are frequently reported in wildland fire management studies. Variables such as age, sex, education and income have been shown to be related to residents’ perceptions of wildland fires and potential mitigation strategies (Hoover and Langner, 2003). Individuals with more income, for example, have more personal resources to adopt some homeowner wildland fire mitigation strategies (e.g., firewise construction).

*Situational* factors define a given context and influence what the public perceives as acceptable or feasible (Kneeshaw *et al.*, 2004; Taylor *et al.*, 1988). Large tracts of forested land often surround homes built in the wildland-urban interface. Proximity of a home to a forest is likely to enhance homeowners’ general awareness of the potential dangers associated with wildland fires and their willingness to accept mitigation efforts.

*Psychological variables* such as specific beliefs and attitudes regarding wildfires are perhaps most important to understanding wildland fire policy support. The public often under- or over-estimates wildfire risks and large attitudinal differences sometimes exist between experts and non-experts in risk situations (e.g., Vogt *et al.*, 2005).

Not all of these classes of predictors (socio-demographic, situational, and psychological), however, are likely to contribute equally to support (or opposition) to agency wildland fire policies or homeowner mitigation strategies. Social-psychological theories offer an explanation for these disparities, suggesting that the “specificity” principle (i.e., correspondence between the measured concepts) influences the strength

of observed relationships between variables (Fishbein and Ajzen, 1975; Vogt *et al.*, 2005). This principle predicts that *general* socio-demographic variables (e.g., education, income) and *general* situational variables (e.g., home ownership) that are not issue specific will explain less of the variability in support for agency (e.g., prescribed burning) or homeowner wildland fire mitigation strategies (e.g., defensible space) than more topic *specific* psychological variables (beliefs about effectiveness and aesthetics of mitigation efforts). Situation variables such as proximity to a forest may raise awareness of the potential risks of wildland fires, but are less specific than the psychological variables.

## Methods

Data for this study were obtained from a mail survey of residents living in six wildland urban interface counties in Colorado. A random sample of these residents was mailed a survey in May 2004. After a postcard reminder and two repeat mailings, 532 completed surveys were returned (response rate = 47%). A telephone survey of non-respondents suggested “minimal” (effect sizes <0.2) non-response bias and the data were not weighted.

### Variables in the Model

The survey contained four separate *dependent variables* representing different wildland fire mitigation strategies. Each was introduced with a short description and a captioned illustration. Two strategies dealt with homeowner activities (i.e., defensible space and firewise construction) and two concerned agency activities (i.e., mechanical thinning and prescribed burns). For the homeowner activities, respondents indicated whether or not they currently practiced defensible space or firewise construction. For the agency action strategies, respondents rated three prescribed burn questions (Cronbach  $\alpha = .83$ ) and four mechanical thinning items (Cronbach  $\alpha = .87$ ), each measured on 7-point agree-disagree scales. For analysis consistency with the homeowner activity variables, these composite indices were collapsed into dichotomous variables where 0 reflected opposition and 1 indicated support for each agency action.

Three sets of *independent variables* were examined. The *socio-demographic* predictors included age, sex, total annual household income, and education. Four general *situational* predictors were examined: (1) year round residency, (2) distance of home from forested area, (3) own or rent property, and (4) years living in Colorado. The psychological variables measured respondents’ specific familiarity with, perceived effectiveness of, and aesthetic impacts of prescribed burning and mechanical thinning. For defensible space and firewise construction, individuals also indicated whether or not the actions enhanced the safety of their property. These variables were coded on 9-point scales (e.g., 1 = not at all familiar, 9 = extremely familiar).

## Results

Over three quarters (79%) of the WUI residents practiced at least one type of defensible space activity (e.g., cleaning gutters, pruning trees) and 47% engaged in some form of

firewise construction. Nine out of ten (90%) respondents approved of mechanical thinning and 82% supported prescribed burning activities.

The respondents were typically male (65%), about 56 years old, had at least some college education and reported household incomes slightly over \$70,000 per year. These socio-demographic results are typical of homeowners in WUI settings. A majority of respondents were year round (84%) homeowners (93%) with many years of Colorado residency (average= 26.7 years) and who lived in or very near the forest. Finally, in terms of the psychological variables, the respondents were supportive of both agency and homeowner mitigation efforts, with averages ranging from 5.32 to 6.83 on a 9-point scale.

Separate logistic regression models were fitted for each of the three sets of predictor variables on each of the four criterion variables (Table 1). Among the socio-demographic indicators, only age (mechanical thinning model) and income (firewise construction, mechanical thinning and prescribed burning models) were statistically significant. None of the socio-demographic variables statistically influenced defensible space activities. The socio-demographic variables explained at most only 2% (Nagelkerke  $R^2$ ) in the personal mitigation strategies and 6% of the variance in the agency actions (Table 1).

**Table 1.** Socio-demographic, situational and psychological influences on policy variables.

Independent Variables	Personal Actions				Agency Actions			
	Defensible Space		Firewise Construction		Mechanical Thinning		Prescribed Burning	
	Exp(B) or $R^2$	Sig.	Exp(B) or $R^2$	Sig.	Exp(B) or $R^2$	Sig.	Exp(B) or $R^2$	Sig.
<i>Socio-demographic:</i>								
Gender	1.01	.971	.93	.709	1.20	.612	.87	.584
Age	1.01	.413	1.01	.254	1.04	<b>.003</b>	.99	.418
Education	1.09	.409	.92	.390	.78	.110	1.06	.543
Income	1.00	.074	1.00	<b>.043</b>	1.00	<b>.044</b>	1.00	<b>.004</b>
Sub-model: Nagelkerke's $R^2$	.021	(ns)	.017	(ns)	.063	<b>(.042)</b>	.054	<b>(.004)</b>
<i>Situational:</i>								
Year-round resident	.77	.455	.91	.729	.63	.343	.98	.961
Forest proximity	.73	<b>.001</b>	.82	<b>.024</b>	1.11	.483	.94	.567
Home ownership	.39	<b>.013</b>	.58	.140	.81	.711	1.46	.446
Years in Colorado	1.01	<b>.039</b>	1.01	.091	1.00	.748	.97	<b>.018</b>
Sub-model: Nagelkerke's $R^2$	.073	<b>(&lt;.001)</b>	.032	<b>(.021)</b>	.007	(ns)	.020	(ns)
<i>Psychological:</i>								
Familiar with policy	1.63	<b>&lt;.001</b>	1.64	<b>&lt;.001</b>	.823	<b>.027</b>	.844	<b>.045</b>

Think it's effective	1.54	<b>&lt;.001</b>	.99	.946	1.54	.120	1.84	<b>&lt;.001</b>
Think it's safe	1.25	<b>.034</b>	1.15	.078	n/a	n/a	n/a	n/a
Think it improves look	1.06	.437	1.02	.772	1.88	<b>.048</b>	1.74	<b>&lt;.001</b>
Sub-model: Nagelkerke's R <sup>2</sup>	.441	<b>(&lt;.001)</b>	.270	<b>(&lt;.001)</b>	.390	<b>(&lt;.001)</b>	.393	<b>(&lt;.001)</b>

Three of the four situational variables (forest proximity, home ownership, years in Colorado) influenced participation in defensible space actions (Table 1) with an R<sup>2</sup> of 7%. In the firewise construction model, only distance from the forest was significant (R<sup>2</sup> = 3%). None of the four situation predictors influenced mechanical thinning and only years living in Colorado was significant (R<sup>2</sup> = 2%) in the prescribed burning equation. The psychological variables explained more of the variability in both the personal and agency action models than either the socio-demographic or situational variables. The R<sup>2</sup>s ranged from 27% (firewise construction) to 44% (defensible space). In the two agency action models, the R<sup>2</sup> was 39%. Perceived familiarity with the action was significant in all four models. Effectiveness influenced defensible space and prescribed burning actions. Safety was significant in the defensible space model. Aesthetic impacts influenced ratings of agency actions, but not the homeowner actions.

## Discussion

Variables in each of the three classes of predictors can influence agency policy and individual homeowner behavior. Consistent with the specificity principle, the specific wildland fire beliefs and attitudes (i.e., psychological predictors) had more predictive power than either the general socio-demographic or general situational indicators.

The policy-specific pattern of significance also differed between the socio-demographic, situational, and psychological predictors. The socio-demographic variables had more influence in agencywide policy models, while the situational variables were relatively more important in understanding homeowner actions. Among the psychological variables, perceived familiarity with the agency or homeowner actions had a strong and consistent influence on each policy. This suggests that greater support for these policies / actions may be possible if the communication strategy enhances residents' knowledge or understanding of the rationale for them.

To enhance compliance with firewise construction and defensible space strategies, agencies should pay attention to the psychological drivers and to the situational variables such as proximity to the forest. Given the homeowners' costs associated with adopting firewise construction, and the barriers that these might pose to compliance, our results also suggest that residential land developers and the home construction industry should be an important target for communication efforts, especially if they will agree to incorporate firewise principles more often or more aggressively market such an option to customers.

Overall, this work represents an initial step toward bridging traditional discursive policy analysis with the theoretical grounded empirical approach espoused by Lasswell (1951).

Our three-factor causal model offers a theoretical framework for better understanding policy support and homeowner behavior. However, given that at best less than half of the variance was explained in any of the models, more work is needed to identify a comprehensive model of policy support for wildland fire actions and to demonstrate its use in other geographic or resource settings. This general modeling approach should also be broadly applicable to other policy arenas, especially those focused on natural resource management or natural disaster issues. Recognizing these causal influences can improve policy development, situated communications and local community involvement strategies. These results especially point to the utility of including psychological determinants in the policy analysis model, and to the need to carefully assess the role of constituent influences for a specific policy. The use of social science data to inform wildland fire policy can clarify different considerations that are important in affecting support, opposition or behavioral compliance with wildland fire policy.

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