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9 Modelling Public Support for Wildland Fire Policy

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Abstract

Theoretically grounded explanations of wildland fire policy can be improved by empirically documenting the causal influences of support for (or opposition to) management alternatives. This chapter proposes a model based on the specificity principle (i.e. correspondence between measured variables) to empirically examine four common wildland fire policies in relation to three sets of causal influences. Two agency actions (prescribed fire and mechanical thinning) and two homeowner actions (defensible space and firewise construction) are analysed against socio-demographic, situational and psychological precursors. Data were obtained from a survey of Colorado residents (n = 532) living in the wildland–urban interface. The predictive validity of the independent variables was assessed using logistic regression. The acceptability of the two agency and two homeowner actions had significantly different patterns of social causes and linkages. Results supported the contention that socio-demographic, situational factors and psychological variables differentially influence support for agency or homeowner actions. Consistent with the specificity principle, the psychological measures were most useful in wildland fire policy analysis. Recognizing these causal influences can improve policy development, situated communications and local community involvement strategies. Overall, theoretical-based models of natural resource policies can facilitate understanding the causal mechanisms that drive support for (or opposition to) wildland fire actions.

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 address the needs and concerns of affected homeowners living in the wildland–urban interface (WUI) (Blackwell and Tuttle, 2004). Despite the growing body of social science literature on wildland fires, knowledge gaps remain, especially with respect to wildland fire policy (Cortner and Field, 2004).

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For example, to what extent are homeowners familiar with and do they approve of alternative agency-initiated wildfire mitigation strategies (e.g. mechanical thinning, prescribed burns)? Are WUI residents willing to adopt individual behaviours that can potentially minimize the consequences of a wildland fire (e.g. defensible space, firewise construction)? Do they consider these activities effective? Do aesthetics matter? Do homeowners feel that defensible space and firewise construction make their property safer? What influences individual behaviour and support for wildland fire mitigation strategies? To better manage wildland fire a deeper understanding of the underlying mechanisms is needed. Social science can facilitate this process by informing decisions and improving communication efforts.

The importance of merging science and policy can be traced back five decades to Lasswell (1951, p. 524), who noted that a healthy policy process 'brings to light factors that hitherto operated as a determining factor . . . but which had been operating unconsciously' (i.e. unknown to the policymaker). Work in policy arenas (e.g. housing or labour) has encouraged this approach by linking public beliefs and policy issues, particularly with empirical data (Hyman *et al.*, 2001). Natural resource managers have similarly recognized that the social sciences can inform the decision-making process (O'Laughlin, 2003). Cheng (2002), for example, emphasized that responding to wildfire risks is essentially a social process that blends scientific information with attitudes. Hoover and Langner (2003) noted 'the importance of understanding . . . attitudes, perceptions and beliefs about fire in developing feasible fire management strategies'. Despite this recognition of the potential contributions that the social sciences can make, scientifically based analyses of wildland fire policies are only starting to emerge in the literature (Cortner and Field, 2004).

This chapter examines the differential influence of three sets of predictors (i.e. socio-demographics, situational factors and psychological variables) on two agency policies (prescribed fire and mechanical thinning) and two homeowner actions (defensible space and firewise construction). The 'specificity' principle (i.e. correspondence between the measured concepts) provides the basis for explanations of 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 (Taylor *et al.*, 1988; Hoover and Langner, 2003; Kneeshaw *et al.*, 2004a, b). In general, the wildland fire literature has addressed three general categories of predictor variables: socio-demographic, situational and psychological factors (Fig. 9.1).

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. Otani *et al.* (1992) showed that older

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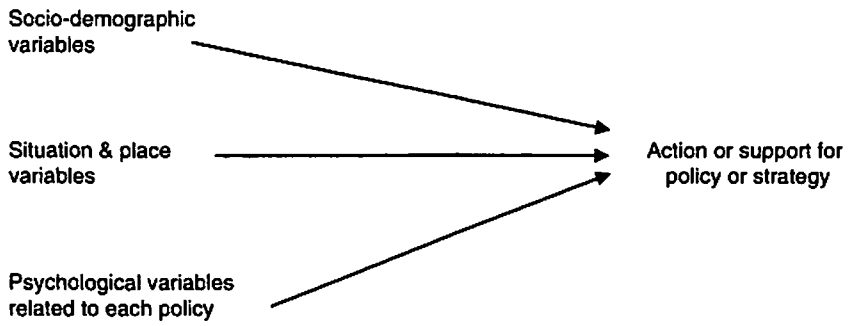

Fig. 9.1. Basic model of support for policy or action.

residents were more cautious in their interpretation of warning signs. A review of risk perception studies concluded that gender played a significant role and suggested that different meanings are socially constructed rather than genetically predetermined (Gustafson, 1998). Education and income have a role as well. Education level may be linked to knowledge about wildland fire and some homeowner mitigation strategies, such as firewise construction techniques, may be limited by income (Vogt, 2003; Vogt *et al.*, 2003).

Situational factors define a given context and influence what the public perceives as acceptable or feasible (Wittmann *et al.*, 1998; Zinn *et al.*, 1998). Large tracts of forested land often surround homes built in the wildland–urban interface (WUI). Protecting these private residences from fire is a primary consideration when managing wildland fires, and this protection influences homeowners' acceptance of fire management policy (Davis, 1990). Public support for fire management has been linked to whether the fire will affect private property (Manfredo *et al.*, 1990; Jacobson *et al.*, 2001). In areas where property damage from wildfires occurs frequently, residents supported the immediate suppression of fires that threatened personal property (Gardner *et al.*, 1987).

Studies of wildland fire beliefs and attitudes suggest that psychological variables are also important to understanding wildland fire policy support (Bright *et al.*, 2003; Vogt *et al.*, 2003, 2005; Winter, 2003; Brenkert *et al.*, 2005; Absher *et al.*, in press). The public often under- or overestimates wildfire risks (Beebe and Omi, 1993), and large attitudinal differences sometimes exist between experts and non-experts in risk situations (Zaksek and Arvai, 2004). Other research suggests that public expectations and understandings of wildland fire management in the WUI change over time and need to be affected by well-crafted public education programmes (Cortner *et al.*, 1990). More recently, however, McCaffrey (2004) concluded that such educational campaigns do not seem to be working, perhaps because of a lack of understanding or trust.

Not all of these classes of predictors (socio-demographic, situational and psychological), however, are likely to contribute equally to support for (or opposition to) agency wildland fire management polices or homeowner mitigation strategies (Fishbein and Ajzen, 1975; Eagly and Chaiken, 1993). Well-educated, wealthy homeowners (socio-demographic variables) living in the WUI (a situation variable), for example, may fail to perform defensible space activities because they

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do not consider the actions to be effective in protecting their home or worry about the aesthetic impacts on their property (psychological variables). 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). This principle predicts that general socio-demographic variables (e.g. education, income) that are not issue-specific will explain less of the variability in support for agency (mechanical thinning, prescribed burning) or homeowner wildland fire mitigation strategies (defensible space, firewise construction) 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. Consequently, the predictive power of situational variables should fall somewhere in between that of socio-demographic and psychological predictors. Previous research across a variety of natural resource management issues has supported this predicted pattern of results (Fishbein and Ajzen, 1975; Donnelly and Vaske, 1995; Whittaker *et al.*, 2006).

Methods

Data for this study were obtained from a mail survey of Colorado residents living in the WUI. The study population consisted of individuals over the age of 18 who reside in Boulder, Larimer, Gilpen, Grand, Jackson and Clear Creek counties. A random sample of resident names and addresses was purchased from a commercial sampling firm in the summer of 2004.

Mail survey administration

Four mailings were used to administer the survey beginning at the end of May 2004. Residents first received the 12-page questionnaire, a prepaid postage return envelope and a personalized cover letter explaining the study and requesting their participation. Ten days after the initial mailing a reminder postcard was sent to participants. A second complete mailing (questionnaire, prepaid postage return envelope and cover letter) was sent to non-respondents 10 days after the postcard reminder. To further increase response rate, a third complete mailing was sent 1 month following the second complete mailing. A total of 532 completed surveys were returned, with an overall response rate of 47% (532 returned/1200 sent – 56 non-deliverables).

As a check on potential non-response bias, a telephone survey was conducted of non-respondents (n = 100). Perceived effectiveness, approval and aesthetic impacts of prescribed burning and mechanical thinning variables were included in the telephone survey. For all the variables the Hedge's effect sizes were < 0.2, indicating a 'minimal' relationship (Vaske *et al.*, 2002). Non-response bias was thus not considered to be a problem and the data were not weighted.

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Variables in model

The survey contained four separate dependent variables representing four different wildland fire mitigation strategies. Each was introduced with a short description and reinforced with captioned illustrations. Two strategies dealt with activities homeowners could adopt (i.e. defensible space and firewise construction) and two concerned agency activities (i.e. mechanical thinning and prescribed burns). Each of these dependent variables was analysed as a dichotomous variable. For the homeowner activities, respondents indicated whether or not they currently practised defensible space or firewise construction. For the agency action strategies, respondents rated three prescribed burn questions and four mechanical thinning items. These variables were originally coded on separate seven-point scales that gauged the respondent's perceptions of appropriateness, effectiveness and safety of the technique. After examining the reliability of the variables associated with each concept, an additive composite index of support was calculated for prescribed burning and mechanical thinning. Cronbach alphas were 0.83 and 0.87 for prescribed burning and mechanical thinning indices, respectively. 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 (i.e. the 'neutral' point of the scale was used to differentiate the two groups, with neutral classified with the low support group).

Three sets of independent variables were examined. The socio-demographic predictors included: age (coded in years), sex (0 = male, 1 = female), total annual household income (1 = 'less than $10,000', 8 = '$150,000 or more'), and education (1 = 'less than secondary school diploma', 6 = 'advanced degree'). Four situational predictors were examined: Do you live at this address year round? (0 = No, 1 = Yes); How far from a forested area is this property? (coded in seven broad mileage categories); Do you own or rent this property? (0 = No, 1 = Yes); and How long have you lived in Colorado? (coded in years).

The psychological variables measured respondents' familiarity, perceived effectiveness and aesthetic impacts of prescribed burning and mechanical thinning. For defensible space and firewise construction, individuals were also asked to indicate whether or not the actions enhanced the safety of their property. Each of these items was coded on nine-point scales (e.g. 1 = not at all familiar, 9 = extremely familiar).

Results

Over three-quarters (79%) of the WUI residents practised at least one type of defensible space activity and nearly half (47%) engaged in some form of firewise construction (Table 9.1). Nine out of ten (90%) respondents approved of mechanical thinning and 82% agreed with prescribed burning activities.

The respondents were typically male (65%) and about 56 years old and had at least some college education and household incomes slightly over $70,000 per year (Table 9.2). These socio-demographic results differ somewhat from the

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Table 9.1. Dependent variables: results of grouping action and support variables.

Dependent variables	Mean	SD	Cronbach's alpha
Defensible space[a]	0.791	0.410	n/a
Firewise construction[a]	0.471	0.499	n/a
Mechanical thinning[b]	0.902	0.388	0.83
Prescribed burning[b]	0.822	0.297	0.87

SD, standard deviation.
[a]Response scale is 0 = have done or currently practise or 1 = have not done or never practised.
[b]Response scale is originally from 1 = not at all/strongly disapprove to 7 = extremely/strongly approve, collapsed at 4 = neutral to become a dichotomous (0, 1) variable.

general population profile of the same region, but are typical of homeowners in WUI settings.

A large majority of respondents were year-round (84%) homeowners (93%) with many years of Colorado residency (average = 26.7 years). Because of the sampling design, most lived in, or very near, the forest. In terms of situation variables, the respondents were a stable, permanent group with a long-term association with forest lands.

Finally, the psychological variables showed a general trend for support/agreement, with averages ranging from 5.32 to 6.83 on a nine-point scale (i.e. all variable means were above the midpoint of the response scales). These means, however, were not strongly skewed to the upper end of the scale, suggesting that there were differences of opinion or self-evaluation on each policy aspect measured.

Separate logistic regression models were fitted for each of the three sets of predictor variables on each of the four criterion variables, or 12 logistic models in total (Table 9.3). 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 9.4).

Three of the four situational variables influenced participation in defensible space actions (Table 9.3); distance from the forest, home ownership and years living in Colorado were all significant in this model (Nagelkerke R^2 = 7%). Only year-round residency was not significant in the defensible space model. In the firewise construction model, only distance from the forest had a statistical effect (Nagelkerke R^2 = 3%). None of the four situational predictors influenced mechanical thinning. For the prescribed burning equation, only years living in Colorado was significant (Nagelkerke R^2 = 2%).

The psychological variables explained more of the variability in both the personal and agency action models than either the socio-demographic or situational

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Table 9.2. Summary of independent variables: socio-demographic, situational and psychological.

Independent variables	Variable type: scale points relevant to mean	Mean	SD
Socio-demographic			
Gender	Nominal: 0 = male, 1 = female	0.35	0.478
Age	Ratio: In years, 23–92 years	55.8	14.126
Education	Ordinal, 6 categories: 4 = some college, 5 = 4-year college degree	4.62	1.235
Income	Ordinal, 8 categories: dollar midpoints used	$70,338.35	$37,161.25
Situational			
Year-round resident	Nominal: 0 = no, 1 = yes	0.84	0.365
Forest proximity	Ordinal, 7 categories: 1 = within forested area, 2 = less than a mile	1.92	1.120
Home ownership	Nominal: 0 = own, 1 = rent	0.07	0.258
Years in Colorado	Ratio: 1–86 years	26.71	17.942
Psychological	All psychological variables are Likert scales, 9 points: 1 = not at all (attribute), 5 = moderately, 9 = extremely (not all points labelled).		
Familiar with policy			
Defensible space		6.72	1.575
Firewise construction		5.71	2.010
Mechanical thinning		6.02	2.030
Prescribed burning		6.61	1.700
Think it's effective			
Defensible space		6.27	2.111
Firewise construction		6.15	1.937
Mechanical thinning		6.83	1.580
Prescribed burning		6.74	1.456
Think it's safe			
Defensible space		6.00	1.985
Firewise construction		5.88	1.970
Mechanical thinning		n/a	–
Prescribed burning		n/a	–
Think it improves look			
Defensible space		5.32	2.041
Firewise construction		5.72	1.573
Mechanical thinning		6.30	1.986
Prescribed burning		5.65	2.047

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Table 9.3. Socio-demographic, situational and psychological influences on policy variables: path ratio and significance from logistic regression of each set of variables on policy measure.

	Personal actions				Agency actions			
	Defensible space		Firewise construction		Mechanical thinning		Prescribed burning	
Independent variables	Exp(B)	Sig.	Exp(B)	Sig.	Exp(B)	Sig.	Exp(B)	Sig.
Socio-demographic								
Gender	1.01	0.971	0.93	0.709	1.20	0.612	0.87	0.584
Age	1.01	0.413	1.01	0.254	1.04	0.003	0.99	0.418
Education	1.09	0.409	0.92	0.390	0.78	0.110	1.06	0.543
Income	1.00	0.074	1.00	0.043	1.00	0.044	1.00	0.004
Situational								
Year-round resident	0.77	0.455	0.91	0.729	0.63	0.343	0.98	0.961
Forest proximity	0.73	0.001	0.82	0.024	1.11	0.483	0.94	0.567
Home ownership	0.39	0.013	0.58	0.140	0.81	0.711	1.46	0.446
Years in Colorado	1.01	0.039	1.01	0.091	1.00	0.748	0.97	0.018
Psychological								
Familiar with policy	1.63	< 0.001	1.64	< 0.001	0.823	0.027	0.84	0.045
Think it's effective	1.54	< 0.001	0.99	0.946	1.54	0.120	0.84	< 0.001
Think it's safe	1.25	0.034	1.15	0.078	n/a	n/a	n/a	n/a
Think it improves look	1.06	0.437	1.02	0.772	1.88	0.048	1.74	< 0.001

Table 9.4. Summary of sub-model tests: Nagelkerke R^2 and significance.

	Personal actions		Agency actions	
Independent variables	Defensible space	Firewise construction	Mechanical thinning	Prescribed burning
Socio-demographic	0.021	0.017	0.063	0.054
	(NS)	(NS)	(0.042)	(0.004)
Situational	0.073	0.032	0.007	0.020
	(< 0.001)	(0.021)	(NS)	(NS)
Psychological	0.441	0.270	0.390	0.393
	(< 0.001)	(< 0.001)	(< 0.001)	(< 0.001)

NS, not significant. Significance of test in parentheses.

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variables (Table 9.4). The Nagelkerke R^2 for the psychological models ranged from 27% (firewise construction) to 44% (defensible space). In the two agency action models, the Nagelkerke R^2 was 39%. Familiarity with the policy was statistically significant in all four logistic regressions. Perceived effectiveness influenced defensible space and prescribed burning. Aesthetics influenced approval of the two agency actions, but neither of the personal actions. For the two personal action equations, perceived safety was related to defensible space actions, but not firewise construction.

In summary, the results indicated clear differences in support patterns, both as individual variables and as categorical groupings for different types of wildland fire policies. Support for the specificity principle is mixed when considering these measures of support by predictor type because of a lack of clear differences in the socio-demographic and situational variables.

Discussion

Variables in each of the three classes of predictors can influence agency policy and individual homeowner behaviour. Consistent with the specificity principle, socio-demographic indicators had low predictive power. The strongest effects of socio-demographic variables were for agency action policies that affect multiple resource uses such as recreation, tourism, watershed and biomass outputs. Overall, these variables are probably indicative of other social processes such as previous agency–stakeholder communications and/or involvement in decision-making processes. However, such variables are not part of this data set and this supposition cannot be tested here. Future work should address the causal mechanisms for these broad classes of support indicators.

The situational variables also had limited explanatory power, and do not seem to be stronger or more frequent as significant predictors than the socio-demographic predictors. Notably, however, the pattern of significance was different. The influence of situational variables was most closely tied to policies that require homeowner actions to be successful, especially defensible space activities. Our findings suggest that many WUI residents have adopted some homeowner wildfire mitigation strategies and generally support agency-initiated efforts. These policy linkages emphasize the importance of localized communications and close working relationships with affected resident groups or communities (Nelson *et al.*, 2005).

The psychological variables displayed strong and consistent links to each policy. Even though the exact independent variable changes with the type of policy being predicted, the overall pattern supports a conclusion that an individualized approach is important for garnering support or behavioural compliance with a policy. Mechanical thinning and prescribed burns, for example, were closely tied to the psychological measures of support. For all four policies, familiarity with the policy was consistently a significant predictor of support. This suggests that better support for these policies, and perhaps compliance when action is required, may be possible if the communication strategy is tailored to the resident's individual lifestyle and crafted for separate market segments somewhat differently. The policy

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implementation phase needs to involve local people (volunteers or influentials) to generate positive social norms for a given community or residential area. For 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.

In conclusion, applying scientific data analysis methods to wildland fire policy is a relatively new endeavour. This work is an initial step that bridges traditional discursive policy analysis with a more empirical approach as espoused by Lasswell. The three-factor causal model of policy support implemented above provided a theoretical advancement and a practical analysis. Although encouraging, more work is needed to further develop a comprehensive model of policy support for wildland fire actions and to demonstrate its use in other geographical or resource settings. This general modelling 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. In particular, 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 is rapidly evolving, and yet it is already bearing fruit for decision makers by specifying the different considerations that are important in affecting support, opposition or behavioural compliance to wildland fire policy.

References

Absher, J.D., Vaske, J.J., Bright, A.D. and Kneeshaw, K. (in press) Assessment and modelling of beliefs, value, and social norms related to wildland fire management in southern California. In: Narog, M.G. (technical coordinator) *Proceedings of the 2002 Fire Conference on Managing Fire and Fuels in the Remaining Wildlands and Open Spaces of the Southwestern United States, 2–5 December 2002, San Diego, CA.* General Technical Report PSW-189, Pacific Southwest Research Station, Forest Service, US Department of Agriculture, Albany, California.

Beebe, G.S. and Omi, P.N. (1993) Wildland burning: the perception of risk. *Journal of Forestry* 91, 19–24.

Blackwell, J.A. and Tuttle, A. (2004) *California Fire Siege 2003: The Story.* USDA Forest Service, Mare Island, California.

Brenkert, H., Champ, P. and Flores, N. (2005) *Mitigation of Wildfire Risk by Homeowners.* Research Note RMRS-RN-25WWW, USDA Forest Service, Rocky Mountain Research Station, Fort Collins, Colorado.

Bright, A.D., Vaske, J.J., Kneeshaw, K. and Absher, J.D. (2003) Scale development of wildfire management basic beliefs. In: Jakes, P.J. (comp.) *Homeowners, Communities, and Wildfire: Science Findings from the National Fire Plan.* General Technical Report NC-231, North Central Research Station, Forest Service, US Department of Agriculture, St Paul, Minnesota, pp. 18–25.

Absher, J.D.; Vaske, J.J. 2007. Modelling public support for wildland fire policy.
In: Reynolds, K. M., Thomson, A. J., Kohl, M. Shannon, M. A., Ray, D., & Rennolls, K. (Eds.) Sustainable forestry: from monitoring and modelling to knowledge management and policy science. Wallingford, UK: CAB International.

Cheng, A.S. (2002) Fire social science research: opening remarks. In: Omi, P.N. and Joyce, L.A. (comp.) *Fire, Fuel Treatments, and Ecological Restoration: Conference Proceedings*. USDA Forest Service Proceedings RMRS-P-29, USDA Forest Service, Rocky Mountain Research Station, Fort Collins, Colorado, pp. 209–212.

Cortner, H.J. and Field, D.R. (2004) Introduction: humans, fire, and forests – part III. *Society and Natural Resources* 17, 659–660.

Cortner, H.J., Gardner, P.D. and Taylor, J.G. (1990) Fire hazards at the urban–wildland interface: what the public expects. *Environmental Management* 13(1), 15–62.

Davis, J.B. (1990) The wildland–urban interface: paradise or battleground? *Journal of Forestry* 88, 26–31.

Donnelly, M.P. and Vaske, J.J. (1995) Predicting attitudes toward a proposed moose hunt. *Society and Natural Resources* 8, 307–319.

Eagly, A.H. and Chaiken, S. (1993) *The Psychology of Attitudes*. Harcourt Brace Jovanovich, New York.

Fishbein, M. and Ajzen, I. (1975) *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Addison-Wesley, Reading, Massachusetts.

Gardner, P.D., Cortner, H.J. and Widaman, K. (1987) The risk perceptions and policy response toward wildland fire hazards by urban home-owners. *Landscape and Urban Planning* 14, 163–172.

Gustafson, P.E. (1998) Gender differences in risk perception: theoretical and methodological perspectives. *Risk Analysis* 18, 805–811.

Hoover, A.P. and Langner, L.L. (2003) People and wildfire: an overview. In: Jakes, P.J. (comp.) *Homeowners, Communities, and Wildfire: Science Findings from the National Fire Plan*. General Technical Report NC-231, North Central Research Station, Forest Service, US Department of Agriculture, St Paul, Minnesota, pp. 1–3.

Hyman, D., Bridger, J., Shingler, J. and Van Loon, M. (2001) Paradigms, policies and people: exploring the linkages between normative beliefs, public policies and utility consumer payment problems. *Policy Studies Review* 18(2), 89–121.

Jacobson, S.K., Monroe, M.C. and Marynowski, S. (2001) Fire at the wildland urban interface: the influence of experience and mass media on public knowledge, attitudes, and behavioral intentions. *Wildlife Society Bulletin* 29, 929–937.

Kneeshaw, K., Vaske, J.J., Bright, A.D. and Absher, J.D. (2004a) Acceptability norms toward fire management in three national forests. *Environment and Behavior* 36(4), 592–612.

Kneeshaw, K., Vaske, J.J., Bright, A.D. and Absher, J.D. (2004b) Situational influences of acceptable wildland fire management actions. *Society and Natural Resources* 17, 477–489.

Lasswell, H.D. (1951) Democratic character. In: *The Political Writings*. Free Press, Glencoe, Illinois, pp. 465–525.

McCaffrey, S. (2004) Thinking of wildland fire as a natural hazard. *Society and Natural Resources* 17, 509–516.

Manfredo, M.J., Fishbein, M., Haas, G.E. and Watson, A.E. (1990) Attitudes toward prescribed fire policies. *Journal of Forestry* 87, 19–23.

Nelson, K.C., Monroe, M.C. and Johnson, J.F. (2005) The look of the land: homeowner landscape management and wildfire preparedness in Minnesota and Florida. *Society and Natural Resources* 18, 321–336.

O'Laughlin, J. (2003) *Policy Analysis and Natural Resources: Bringing Science to Policymakers*. University of Idaho, Moscow, Idaho.

Otani, H., Leonard, D., Ashford, V., Bushroe, M. and Reeder, G. (1992) Age differences in perception of risk. *Perceptual and Motor Skills* 74, 587–594.

Taylor, J.G., Carpenter, E.H., Cortner, H.J. and Cleaves, D.A. (1988) Risk perception and behavioral context: U.S. forest service fire management professionals. *Society and Natural Resources* 1, 253–268.

Vaske, J.J., Gliner, J.A. and Morgan, G.A. (2002) Communicating judgments about practical significance: effect size, confidence intervals and odds ratios. *Human Dimensions of Wildlife* 7, 287–300.

Vogt, C.A. (2003) Seasonal and permanent home owners' past experiences and approval of fuels reduction. In: Jakes, P.J. (comp.) *Homeowners, Communities, and Wildfire: Science Findings from the National Fire Plan*. General Technical Report NC-231, North Central Research Station, Forest Service, US Department of Agriculture, St Paul, Minnesota, pp. 63–73.

Vogt, C.A., Winter, G. and Fried, J.S. (2003) Antecedents to attitudes toward prescribed burning, mechanical thinning, and defensible space fuel reduction techniques. In: Jakes, P.J. (comp.) *Homeowners, Communities, and Wildfire: Science Findings from the National Fire Plan*. General Technical Report NC-231, North Central Research Station, Forest Service, US Department of Agriculture, St Paul, Minnesota, pp. 74–83.

Vogt, C.A., Winter, G. and Fried, J.S. (2005) Predicting homeowners' approval of fuel management at the wildland–urban interface using the theory of reasoned action. *Society and Natural Resources* 18(4), 337–354.

Whittaker, D., Vaske, J.J. and Manfredo, M.J. (2006) Specificity and the cognitive hierarchy: value orientations and the acceptability of urban wildlife management actions. *Society and Natural Resources* 19(6), 515–530.

Winter, P.L. (2003) Californians' opinions on wildland and wilderness fire management. In: Jakes, P.J. (comp.) *Homeowners, Communities, and Wildfire: Science Findings from the National Fire Plan*. General Technical Report NC-231, North Central Research Station, Forest Service, US Department of Agriculture, St Paul, Minnesota, pp. 84–92.

Wittmann, K., Vaske, J.J., Manfredo, M.J. and Zinn, H.C. (1998) Standards for lethal response to problem urban wildlife. *Human Dimensions of Wildlife* 3(4), 29–48.

Zaksek, M. and Arvai, J.L. (2004) Toward improved communication about wildland fire: mental models research to identify information needs for natural resource management. *Risk Analysis* 24(6), 1503–1515.

Zinn, H.C., Manfredo, M.J., Vaske, J.J. and Wittmann, K. (1998) Using normative beliefs to determine the acceptability of wildlife management actions. *Society and Natural Resources* 11(7), 649–662.