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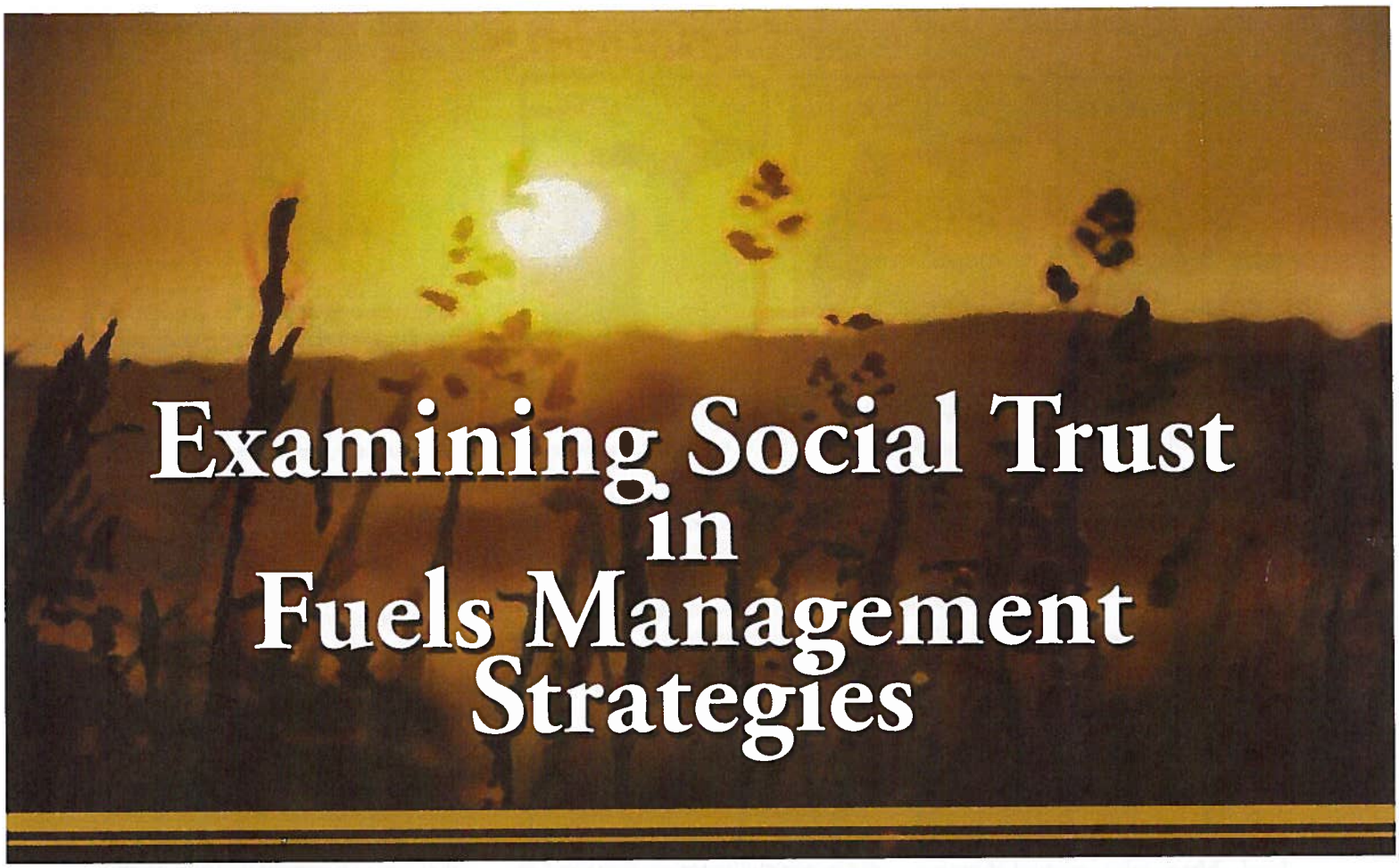

Examining Social Trust in Fuels Management Strategies

Greg Winter, Christine A. Vogt, and Sarah McCaffrey

ABSTRACT

Surveys of homeowners in three different ecosystems with varying fuels management approaches reveal that homeowners' trust in natural resource agencies is significantly associated with perceived risks and benefits and with perceived agency competence. A weaker association between forest value orientation and agency trust is evident. Focus group interviews provide further contextual support that the characteristics of competence, care, and credibility associated with an agency are influential in shaping trust. The correlation between trust and acceptance of each fuels management strategy at each of the study sites suggests that trust-building and trust maintenance should be key goals of agency-citizen interactions.

Keywords: public opinion; resource management; social trust; wildland fires; fuels management; public acceptance; fuel treatments

Recently passed by Congress and signed into law by President Bush, the Healthy Forests Restoration Act of 2003 commits an impressive amount of federal resources to reduce the threat of catastrophic wildfires. It is estimated that 190 million acres of public lands are at "elevated risk of severe wildfires." In the last 2 years, five western states experienced some of their worst fire seasons in recent memory. In 2002, more than 88,000 fires burned 7 million acres, 800 structures, and resulted in the death of 23 firefighters. Last year in California, 22 civilian lives and more than 3,600 homes were lost to wildland fires (USDA/USDOI 2003).

These and other tragedies prompted the federal government to triple the funding for hazardous fuel reduction to $546 million between 2000 and 2003. The Bush administration proposed to further increase funding to $760 million in fiscal year 2005. This commitment requires increased use of various fuels management strategies in and near wildland urban interface communities. These strategies aim to reduce hazardous fuels and restore fire-adapted ecosystems by thinning trees and removing dense underbrush using prescribed fire and mechanical methods (USDA 2004).

As they attempt to implement these ambitious fuels reduction initiatives, forest managers may encounter public opposition. Prior to the catastrophic 2002 Rodeo and Chediski fires in Arizona, the USDA Forest Service be-

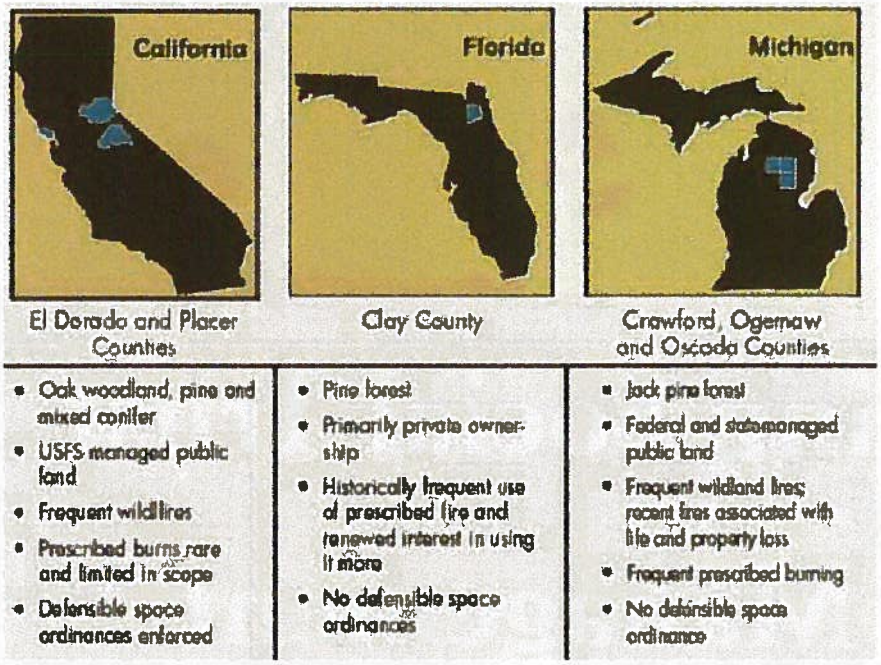

Figure 1. **Study site characteristics.**

lieved that commercial thinning of the fuel-dense Black Mesa District was the only way to avoid a disaster. The agency encountered opposition from local citizens who opposed thinning "because they moved here for the forest." And environmental organizations questioned the agency's motives: the leader of one group said, "The Forest Service is hijacking important concepts like fuels reduction to disguise traditional timber sales" (Trachtman 2003). Public land managers also encounter opposition to prescribed fire in locales where citizens' memories of notorious escaped fires have reduced confidence in this approach to fuels management (e.g., Winter et al. 2002).

Some think that a key factor necessary for social acceptability of these policies is social trust. Many studies find that trust is strongly associated with natural resource and risk management policy acceptance. Wide variations in agency trust and their correlated levels of policy acceptance suggest that in some locales land managers need to implement trust-building initiatives to gain wider acceptance (Shindler and Toman 2003). Yet there have been few attempts to systematically examine specific factors associated with trust judgments about natural resource management policies.

At a general level, social trust is the willingness to rely on those who have the responsibility for decisions and actions related to risk management. However, there are several alternative views of how trust may influence public views. Risk management researchers often cite citizens' trust of risk managers as a necessary condition for acceptable and effective management strategies (e.g., Kasperson et al. 1992, Slovic 1993, Jungermann et al. 1996, Siegrist and Cvetkovich 2000). Much of this literature postulates that trust is correlated with perceptions of a hazard's risks and benefits (e.g., Siegrist and Cvetkovitch 2000, Trumbo and McComas 2003, Hunt and Frewer 2001). For example, in their study of support among Nevada residents for locating a nuclear waste repository, Flynn et al. (1992) found that the level of trust in those responsible for repository management directly influenced risk perceptions, which, in turn, directly influenced attitude toward the repository.

A comprehensive review of the hazards and risk literature by Johnson (1999) identified three common, and sometimes overlapping, dimensions of hazard-related trust: competence, care, and consensual values. Competence may be indicated by possessing certain credentials (e.g., formal education or certifications), demonstrating a command of information, experience (e.g., years in the field), and performance (e.g., track record of success or failure). Care indicators include fiduciary responsibility (e.g., serving the public interest), engaging in fair process (e.g., level of public participation, accountability, consistency), honesty, and respect. Consensual values refers to the notion that trustworthy agents share one's values.

Earle and Cvetkovich (1995) specifically examined the notion of shared values between agency and the individual as key to determining trust. In this conception, a key function of social trust is to reduce the complexity people face when judging the acceptability of technology for which they themselves lack extensive knowledge. In a study of public opinions about fire management, Winter and Cvetkovich (2003) found significant regional variation in trust ratings of the Forest Service among citizens in Arizona, California, Colorado, and New Mexico. They determined that trust ratings are primarily related to shared values between the agency and the public and are predictive of respondents' approval of various resource management strategies. Employing a similar conception of social trust, Winter and Palucki (1999) found that trust predicted general attitudes toward fees and willingness to pay for National Forest recreation passes.

Some suggest that low levels of public trust in natural resource managers result from agency decisionmaking processes that do not explicitly incorporate public trust-building components.

Table 1. Agency trust.[a]

Fuel management approaches	California site Mean	SD	Florida site Mean	SD	Michigan site Mean	SD
I trust the government to make the proper decisions about the use of *prescribed burning*.	4.11[b,c]	1.77	4.49[c,d]	1.71	3.28[b,d]	1.79
I trust the government to make the proper decisions about the use of *mechanical fuel reduction*.	4.23[c]	1.64	4.14[c]	1.63	3.50[b,d]	1.73
I trust the government to make the proper decisions about *enacting and enforcing defensible space ordinances*.	3.85[c]	1.70	3.64[c]	1.83	2.98[b,d]	1.70

[a] *Agency trust scale ranged from 1=strongly disagree to 7=strongly agree.*
[b] *Statistically different than Florida.*
[c] *Statistically different than Michigan.*
[d] *Statistically different than California.*

Table 2. Perceived benefits and risks of fuel management approaches.[a]

	California site Mean	SD	Florida site Mean	SD	Michigan site Mean	SD
Prescribed burning						
Impacts scenery (risk)	4.61[c]	1.32	4.47[c]	1.46	5.10[b,d]	1.55
Creates more smoke now, less long-term (benefit)	5.04[c]	1.28	5.09[c]	1.26	4.48[b,d]	1.45
Reduces cost of firefighting (benefit)	5.31[c]	1.44	5.47[c]	1.33	4.38[b,d]	1.61
Restores wildlands to more natural condition (benefit)	4.77[b,c]	1.58	5.09[c,d]	1.46	4.26[b,d]	1.77
Improves wildlife conditions (benefit)	4.80[c]	1.60	5.05[c]	1.62	4.52[b,d]	1.73
Could allow uncontrollable fires (risk)	4.47[b,c]	1.52	3.90[c,d]	1.55	4.86[b,d]	1.58
Mechanical treatment						
Impacts scenery	4.33[c]	1.40	4.40[c]	1.48	4.68[b,d]	1.52
Extracts wood products	5.27	1.36	4.74[c,d]	1.49	5.00[b,d]	1.52
Reduces cost of firefighting	5.33[c]	1.37	5.10[c]	1.41	4.60[b,d]	1.51
Restores wildlands to more natural condition	4.45[c]	1.59	4.34[c]	1.65	3.91[b,d]	1.66
Improves wildlife conditions	4.60[c]	1.59	4.49[c]	1.70	4.19[b,d]	1.70
Defensible space						
Impacts scenery	4.03[b,c]	1.70	4.52[d]	1.85	4.58[d]	1.81
Extracts wood products	3.72	1.70	3.64	1.67	3.53	1.74
Reduces cost of firefighting	5.19[b,c]	1.55	4.31[d]	1.73	4.03[d]	1.70
Improves wildlife conditions	3.69[b,c]	1.81	3.35[c,d]	1.87	3.00[b,d]	1.74

[a] *Belief strength scale ranged from 1=zero likelihood, to 7=certain.*
[b] *Statistically different than Florida.*
[c] *Statistically different than Michigan.*
[d] *Statistically different than California.*

Table 3. Agency competence.[a]

	California site Mean	SD	Florida site Mean	SD	Michigan site Mean	SD
The government does a good job of protecting private property from wildland fires.	5.15[b,d]	1.47	4.89[c,d]	1.53	3.94[b,d]	1.65
The government does a good job of notifying the public about upcoming prescribed burns.	3.97[b,c]	1.67	3.60[c,d]	1.73	3.35[b,d]	1.65
The government does a good job in managing public land.	3.87[b,c]	1.48	4.11[c,d]	1.51	3.54[b,d]	1.59
The government does a good job communicating with the public about forest issues.	3.60[c]	1.56	3.65[c]	1.60	3.03[b,d]	1.59

[a] *Agency competence scale ranged from 1=strongly disagree to 7=strongly agree.*
[b] *Statistically different than Florida.*
[c] *Statistically different than Michigan.*
[d] *Statistically different than California.*

Shindler et al. (2002) identified lack of trust as an important barrier to social acceptance of natural resource policies. Their problem analysis of the social acceptability of forest management practices conceives of trust as "sincerity and credibility" of natural resource agencies and staff. In their analysis, a key component of agency trustworthiness is whether or not citizens consider an agency's decision process to be fair. Examining interactions between citizens and resource agencies, Shindler and Aldred-Cheek (1999) identified common factors of trustworthy relations: inclusiveness, sincerity, commitment, continuity, sound organization and planning skills, and efforts that lead to action.

Study Objectives

Our study used focus groups and a mail survey to assess views of fuel management approaches (FMAs) by wildland-urban interface (WUI) homeowners in California, Florida, and Michigan. During focus group interviews with WUI homeowners, trust in public land managers emerged as an important factor in the decision to support or oppose fuels management approaches (Winter et al. 2002). Although not explicitly designed to test different conceptions of social trust, the survey did assess trust levels and several of the factors that are thought to be associated with trust. These provide insight into the concept of trust as it applies to the problem of WUI fuels management. The survey included questions related to risks and benefits associated with each FMA. Finally, the survey assessed how different values influenced homeowner opinions. However, our definition of values centered on biocentrism versus anthropocentrism rather than the role of shared values between agency and public examined by Earle and Cvetovich (1995).

The analysis presented here tests three views of social trust: perceived risks and benefits of FMAs, perceived agency competence, and forest value orientation. These factors are associated with agency trust in implementing three FMAs: prescribed burning, mechanical thinning, and defensible space ordinances. The following relationships are expected: (1) agency trust is positively related to perceived FMA benefits (and negatively associated with risks); (2) agency trust is positively associated with perceived agency competence; and (3) agency trust is associated with forest value orientation (biocentric/anthropocentric).

Methods

These social science factors were examined with data from mail surveys conducted in three areas of the United States facing WUI management challenges: El Dorado and Placer Counties in the Sierra Nevada foothills of northern California; Clay County in northern Florida; and Crawford, Oscoda, and Ogemaw Counties in Michigan's northern Lower Peninsula region. The three study sites were selected to represent a spectrum of ecological and land management characteristics. The California site contains oak woodland, pine, and mixed conifer forests and is federally managed. There are frequent wildfires and rare prescribed burns. Defensible space ordinances are enforced by the California Department of Forestry. The Florida site is primarily pine forest and primarily privately owned, mostly by forest products firms. There are frequent wildland fires and prescribed burns. The Michigan site contains primarily jack pine forests managed by federal and state agencies. There are moderately frequent wildland fires and prescribed burns.

Data were collected in fall 2001 and early winter 2001–02 in Florida and California and in spring 2002 in Michigan. The study population for each site consisted of homeowners living near large tracts of public land with a high potential for wildland fire. Homeowner lists were obtained from local tax assessors. A modified Dillman (1978) mail procedure was used whereby each household in the sample received an initial mailing comprised of a personalized letter, business reply envelope, and a numbered questionnaire. One week after the initial mailing, a reminder or thank you postcard was sent to the entire sample. Three weeks into the process, nonrespondents were mailed another personalized letter, business reply envelope, and a questionnaire. Survey response rates for each state were 49% in California with 544 completed surveys, 31% in Florida with 357 completed surveys, and 53% in Michigan with 1,253 completed surveys.

The California and Michigan samples were demographically similar. For both samples, approximately seven out of 10 respondents were male, one-third of the respondents were college graduates, and three out of 10 respondents were in the high-income group ($80,000 or more in annual household income). Michigan homeowners had a longer home tenure than California homeowners, and Michigan homeowners were much more likely to be seasonal residents. Florida respondents were more likely to be female, more likely to have only a high school education, and less likely to be in the high-income group.

Questionnaire Format and Scale Measurement

The questionnaire was identical for each study area except for any location-specific references. The eight-page booklet included a map showing the area under study, a description of the study, a page of definitions of terms used (i.e., prescribed burning, mechanical fuel reduction, defensible space ordinance), and six pages of questions.

Measurement of agency trust. The trust and competence measurements were adapted from Flynn et al. (1992). The question read "How would you rate the government agencies that manage wildlands in (insert geographic area)?" Three questionnaire items comprised the fuels management trust measures. These included: "I trust the government to make proper decisions about the use of prescribed burning"; "I trust the government to make the proper decisions about the use of mechanical fuel reduction"; and "I trust the government to make the proper decisions about enacting and enforcing defensible space ordinances." All trust items used a seven-point scale labeled "1" equaled strongly disagree, "4" neutral, and "7" strongly agree.

Measurement of agency competence. Three items comprised a scale of the government's competence. Specifically, the items read: "The government does

Table 4. Value orientation.[a]

	California site		Florida site		Michigan site	
	Mean	SD	Mean	SD	Mean	SD
Humans should have more love, respect, and admiration for forests. *(biocentric)*	6.03[b,c]	1.28	6.34[d]	1.05	6.30[d]	1.13
Forest resources can be improved through human management. *(anthropocentric)*	5.67[c]	1.27	5.66[c]	1.40	5.30[b,d]	1.51
Forests have a right to exist for their own sake, regardless of human concerns and uses. *(biocentric)*	4.94[b,c]	1.96	5.39[c,d]	1.75	5.15[b,d]	1.84
Wildlife, plants, and human have equal rights to live and develop. *(biocentric)*	4.86[b,c]	2.02	5.26[d]	1.88	5.15[d]	1.91
The primary use of forests should be for products that are useful to humans. *(anthropocentric)*	3.76[b,c]	1.97	3.45[d]	1.94	3.34[d]	1.87
Forests should be used primarily for timber and wood products. *(anthropocentric)*	3.33[c]	1.79	3.16[c]	1.72	2.90[b,d]	1.68
We should actively harvest more trees to meet the needs of a much larger human population. *(anthropocentric)*	3.22[b,c]	1.90	2.94[c,d]	1.85	2.56[b,d]	1.62
Plants and animals exist primarily for human use. *(anthropocentric)*	2.61	1.86	2.72	1.84	2.73	1.89
Additive scale (range 8-anthropocentric to 56-biocentric)	37.15[b,c]	9.62	39.15[d]	8.28	39.82[d]	8.12
Cronbach's Alpha	0.83		0.75		0.75	

[a] *Value orientation scale ranged from 1=strongly disagree, to 7=strongly agree.*
[b] *Statistically different than Florida.*
[c] *Statistically different than Michigan.*
[d] *Statistically different than California.*

a good job in managing public land"; "The government does a good job communicating with the public about forest issues"; and "The government does a good job of protecting private property from wildland fires." The reliability coefficient (Cronbach's alpha) for this scale ranged from 0.72 in the California sample to 0.79 in the Michigan sample. This suggests that respondents were consistent in their patterns of response for the additive scale and that the scale items were highly intercorrelated.

Measurement of forest value orientation. The value orientation scale was adapted from Steel et al. (1994). The question read "How would you answer the following statements about things that you value?" The scale was comprised of eight items selected to represent biocentric and anthropocentric dimensions of value orientation toward forests. Five items represent an anthropocentric view and three represent a biocentric view. The seven response categories ranged from "strongly disagree" to "strongly agree." After recoding items so that higher numbers reflected a biocentric orientation and lower numbers represented an anthropocentric orientation, the responses were summed to form an indicator of forest values ranging from 8 to 56. This scale indicates that respondents at all three sites tended toward having a more biocentric orientation. The reliability coefficient for the Forest Values Scale ranged from 0.75 in the Florida and Michigan samples to 0.83 in the California sample.

Measurement of perceived FMA benefits and risks. Perceived benefit and risk measures used in the survey were developed from findings of focus groups conducted at two of the three study sites. Seven salient benefits and risks were identified; however, not all of them pertained to each FMA. All benefits and risks were measured on a seven-point scale where "1" equaled zero likelihood (of occurring), and "7" equaled a certainty that each benefit or risk would result from a particular FMA. The seven belief items included: impacts scenery, extracts usable wood products, creates more smoke in the short-term but less smoke over time, could allow fires to get out of control, restores wildlands to a more natural condition, saves money by reducing the cost of fighting a wildfire, and improves conditions for wildlife.

Results

Trust. Trust in the government varied by site, with Michigan respondents returning the lowest average trust level for all three FMAs (Table 1). Of the three FMAs, trust in the government to make proper decisions about defensible space ordinances received the low-

est trust scores at all three sites. Multivariate analyses of the survey data found trust to be a strong and consistent predictor of FMA approval for all three locations.

Benefits and risks. The perceived likelihood of benefits and risks varied by study area and FMA. California respondents were more certain that a FMA would produce benefits than Michigan respondents for almost all statements, except for FMAs impacting scenery (Table 2). Florida respondents also indicated high levels of certainty that FMAs would yield particular outcomes. Overall, respondents believed it is relatively likely that each FMA would reduce the cost of firefighting.

Perceived agency competence. At all three sites, perceived government competence was relatively high for protecting private property from wildland fire, and relatively low for communicating with the public about forest issues (Table 3). Michigan respondents returned the lowest average perceived competence for all four indicators. The focus group interviews provided further contextual support that the characteristics competence, care, and credibility associated with the agency are influential in shaping trust. WUI residents referred to land managers' competence, to their abilities to control fire, and their track records of doing so. Some individuals referred to agency staff credentials, especially their experience and training. Care emerged as a trust dimension, indicated by references to agencies' efforts to communicate with the public, particularly regarding notification about upcoming agency actions (e.g., prescribed burning) and risks associated with wildland fire. Credibility, another indicator of care, was observed as a strong acceptance factor in Michigan, where some residents questioned the veracity of land manager statements about recent fuels management activities. Finally, residents occasionally questioned the motives of land managers' decisions to use mechanical fuel management strategies. In these instances, there were explicit and implicit accusations of acting in favor of special interests (e.g., timber industry) rather than the public interest.

Value orientation. Results of individual Forest Values Scale items and the

Table 5. Associations between trust and competence, value orientation, and FMA approval.[a]

		FMA trust level correlation coefficient		
		California site	Florida site	Michigan site
Prescribed burning	Competence scale	0.65*	0.68*	0.69*
	Forest values scale	–0.07	–0.03	–0.12*
	Benefit outcomes:			
	Less smoke over time	0.20*	0.04	0.16*
	Save money	0.37*	0.16*	0.43*
	Restore to natural condition	0.39*	0.18*	0.43*
	Improves wildlife habitat	0.38*	0.18*	0.39*
	Risk outcomes:			
	Scenery impacts	–0.15*	–0.11	–0.11*
	Out of control fires	–0.26*	–0.21*	–0.34*
Mechanical treatment	Competence scale	0.62*	0.65*	0.67*
	Forest values scale	–0.13*	–0.07	–0.20*
	Benefit outcomes:			
	Extracts usable wood products	0.06	–0.03	0.04
	Save money	0.25*	0.32*	0.29*
	Restore to natural condition	0.25*	0.26*	0.24*
	Improves wildlife habitat	0.24*	0.30*	0.24*
	Risk outcomes:			
	Scenery impacts	–0.05	–0.13*	–0.12*
Defensible space ordinance	Competence scale	0.61*	0.57*	0.59*
	Forest values scale	0.01	–0.05	–0.12*
	Benefit outcomes:			
	Extracts usable wood products	0.15*	0.31*	0.15*
	Save money	0.31*	0.41*	0.30*
	Improves wildlife habitat	0.25*	0.43*	0.33*
	Risk outcomes:			
	Scenery impacts	0.05	–0.07	–0.13*

[a] *The benefit/risk items were answered for each FMA; whereas the competence and value scales were answered for a general context.*
* *Correlation is significant at the 0.01 level.*

additive scale show that respondents in all three locations tended to more biocentric than anthropocentric. The one exception was for the anthropocentric item "Forest resources can be improved through human management," which scored relatively high. These results parallel those of Steel et al. (1994) who found, in their comparison of national and Oregon publics, responses with a similar magnitude and tendency toward biocentrism with the one exception being the same item as in our study (Table 4). Interestingly, given its strong proenvironment reputation, our California respondents tended to be less biocentric than respondents from other sites. California scores for seven of the eight items were statistically different than the scores from at least one other site and, in all seven cases, tended to be less biocentric. For the additive scale, Michigan and Florida respondents were not statistically different from each other, but were statistically more biocentric than California respondents.

This last example highlights the difficulty of developing a comprehensive and exclusive typology of trust concepts. Were these residents objecting to the land managers' lack of fiduciary accountability or to divergent values between the land manager and local residents?

Factors associated with trust. Perceived agency competence is positively correlated with agency trust at all sites and for all FMAs (Table 5). Forest Value Scale correlation coefficients are nearly all negative, indicating that agency trust is associated with more anthropocentric values toward forest resources; however, the association is quite weak and only statistically significant at the Michigan site for all FMAs and at the California site for mechanical treatment. FMA benefits and risks are weakly to moderately associated with agency trust. Statistically significant associations between benefits and trust are evident at all sites for prescribed burning and mechanical treatment (saves money, restores to natural condition, and improves wildlife habitat) and defensible space (extracts usable wood products, saves money, and improves wildlife habitat). As expected, risks are negatively associated with agency trust, though not significant at all sites. The risk of out-of-control fire from prescribed burning is negatively associated with trust at all sites. Scenery impacts are negatively associated with agency trust for prescribed burning at the California and Michigan sites, for mechanical treatment at the Florida and Michigan sites, and for defensible space only in Michigan.

Discussion and Management Implications

With respect to the literature and alternative conceptions of social trust, we find evidence that supports the views that trust is significantly associated with perceived risks and benefits and with perceived agency competence.

We find a weaker association between forest value orientation and agency trust, with only one location showing significant results. However, as discussed earlier, our operational definition of value differs from that of Earle and Cvetovich (1995). Our findings provide no insight into the question of shared public-agency values but do suggest that differences between holding biocentric versus anthropocentric values likely plays a limited role in shaping trust.

The correlation between trust and acceptance of each fuels management strategy at each of the study sites suggest that trust-building and trust maintenance should be key goals of agency-citizen interactions. Though we still lack an integrated theory of social trust in natural resource management, several topical avenues for trust-building are evident. Citizens should have access to information related to an agency's competence and care in fuels management. Our extensive interviews with WUI residents prior to the survey showed that people do want to know that land managers "know what they're doing," and our statistical results in turn show that believing managers are competent will lead to greater trust. Such communication efforts are also important given the association between benefits and risk associated with an FMA and trust. Whether accurate understanding of the benefits and risks

leads to increased trust or greater trust leads to lower perceived risk, the clear association between the two indicates that efforts to increase either trust or understanding will likely contribute to increasing the other variable. As studies show that both are key components of public acceptance of fuels management practices, such efforts are clearly worthwhile.

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