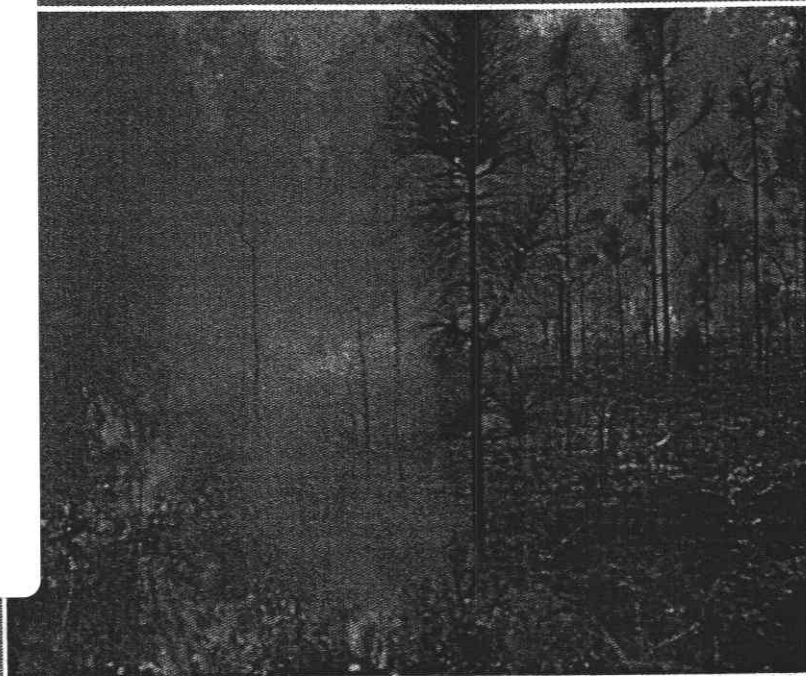# Fighting Fire with Education
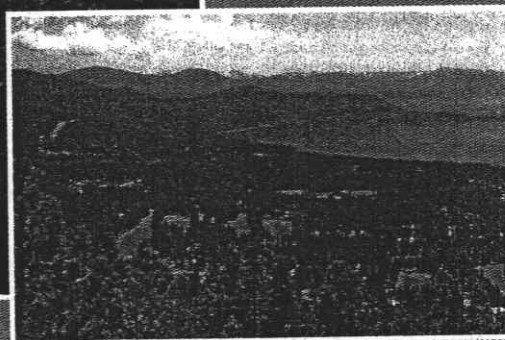
What Is the Best Way to Reach Out to Homeowners?

USDA Forest Service, www.forestryimages.org

North Lake Tahoe Fire Protection District

Ed Smith

■ Sarah M. McCaffrey

ABSTRACT

Better understanding is needed of what makes educational efforts most effective in increasing public support for wildfire management and mitigation efforts. Results of a mail survey of homeowners in Incline Village, Nevada, indicate that personalized contact is key in the educational process and that which type of contact—government or personal—is more influential depends on the type of practice involved. Notably, prescribed burning appears to have more in common with defensible space than with thinning in terms of how homeowners respond to educational efforts.

Keywords: communication; public perception; wildfire; wildland-urban interface

A great deal of effort and creativity has been put into developing materials to educate the public about the current wildfire problem, fuels management issues, and hazard mitigation. A quick peek in the filing cabinets of many fire programs will easily produce informational materials dating back at least 10 and sometimes 25 years. Although the format of current materials has been updated, in many cases the content has changed little over the years. The availability of information does not necessarily mean that it will reach its audience or be effective once it gets there.

However, this does not mean these communication efforts should be abandoned—far from it. Several surveys have demonstrated a positive

Above: (left) Prescribed understory burn; (top) evening prescribed burn in North Lake Tahoe; (bottom) looking out over Incline Village toward Lake Tahoe.

Table 1. Respondent use and opinions about usefulness of fire management information sources, Incline Village, Nevada, 1998.

Which materials made you aware of ...

Source category	Defensible space (n = 241)	Thinning (n = 244)	Prescribed burning (n = 248)
Newspaper or magazine article	79%	73%	75%
Educational material	66	55	53
Television	44	45	47
Personal contact	27	20	12
Actual experience	23	23	40
Neighborhood meeting	15	7	5
Government representative	11	9	8

How useful was each source in understanding fire danger and/or the Incline Village fire management program?

Source	Knew about source			Never used, of people who knew about source	Did not know about source
	Very useful	Somewhat useful	Not useful		
High awareness and useful					
Fire department (n = 216)	59%	27%	2%	12%	19%
Print news (n = 235)	54	43	1	3	10
Brochures and newsletters (n = 207)	51	43	2	5	20
Television and radio (n = 210)	47	41	6	6	19
Less awareness and useful					
Personal experience (n = 166)	41	36	8	14	28
Nevada Department of Forestry (n = 183)	41	26	6	28	30
USDA Forest Service (n = 184)	36	31	6	27	28
School programs (n = 132)	51	23	7	20	47
Less awareness and less useful					
Displays (n = 163)	30	45	9	15	36
Trade group presentations (n = 119)	33	38	13	17	52
Neighbor (n = 163)	23	43	20	14	33
Local government representative (n = 125)	22	42	15	22	49
Nevada Cooperative Extension (n = 106)	20	35	13	32	57
Tahoe Regional Planning Agency (n = 167)	17	31	26	26	34
Block parties (n = 86)	19	22	22	37	65
Neighborhood leader (n = 91)	14	35	13	37	63

association between understanding of fire issues and support for fire management strategies (Cortner et al. 1990). A phone survey (Cortner et al. 1984), designed in part to educate, found that only a few minutes of exposure to information could increase respondent approval of prescribed burning. The study also confirmed previous work showing an association between education, fire knowledge, and tolerance of various fire management practices. Carpenter et al. (1986) found that approval of prescribed burning increased with the specificity of information provided to respondents. Shelby and Speaker (1990) found that when forest managers gave specific information about the reasons, plans, and effects of

doing prescribed burns there was a high level of public acceptance. More recent studies (e.g., McCaffrey 2002; Blanchard 2003; Shindler et al. 2003) provide additional evidence that better understanding of natural resource management issues and of specific fire management practices is associated with greater public support for various fire hazard mitigation efforts.

Given the preponderance of available fire information materials, and with indications that more-informed views are important to acceptance of fire management techniques, one could expect there to be more support for fire management efforts than there appears to be; a disconnect has occurred somewhere. One possible explanation is that

the communication medium may be as important as the message. This raises the question of what types of informational resources are most influential in fostering greater public support for defensible space and fuels management efforts.

Study Area

In part to explore the usefulness of various sources of fire information, a survey was conducted in Incline Village, Nevada, a community at the forefront of trying to educate its residents about the wildfire hazard, defensible space, and fuel management methods. Incline Village is located on the northeast shores of Lake Tahoe and is a classic example of residential-wildland

Table 2. Newspaper and magazine articles as information sources and respondents' sense of responsibility.

Newspapers and magazines were an information source on...

Percentage response to question or statement	Yes	No
	Defensible space	
What role should the *individual* have in local fire planning? (n = 233)		
Major role	51***	22
Supporting or no role	49	78
How important a reason in your decision to put in defensible space measures was the fact that it was your *choice* to live in a high-fire-hazard area? (n = 164)		
Very important	82*	70
Somewhat to not important	18	30
	Prescribed burning	
What role should the *fire department* have in local fire planning? (n = 240)		
Major role	85**	73
Supporting or no role	15	27
	Thinning	
What role should the *fire department* have in local fire planning? (n = 240)		
Major role	86*	75
Supporting or no role	14	25
What role should the *federal government* have in local fire planning? (n = 237)		
Major role	78*	67
Supporting or no role	22	33
As a thinning method, how acceptable is use of *selective timber harvest*? (n = 229)		
Acceptable	72*	84
Somewhat to not acceptable	28	16

*Chi-square p *<.10, **<.05, ***<.01.*

intermix. Clearcutting of the Lake Tahoe basin in the late 1800s and subsequent fire suppression have created a forest of overly dense, even-aged, and fire-susceptible white fir *(Abies concolor)*. The town is composed of houses, condominiums, and strip malls intermixed throughout this forest.

In the late 1980s, Incline's fire marshal, Gerald Adams, began to take steps to decrease the town's wildfire risk exposure. Working closely with University of Nevada Cooperative Extension local agent Ed Smith, he developed a diverse array of educational materials. Articles were prepared for a local newspaper and a series of television spots were produced; how-to brochures and portable displays were created; presentations were given to various groups—i.e., Chamber of Commerce, local realtors, and

schools—with each presentation targeted toward a specific audience by highlighting how fire might affect them. For instance, realtors were asked how they would like to sell a house overlooking a blackened landscape (Casey 1994). A computer-generated wildfire scenario was created, for use in written materials and presentations, that showed the likely progression a fire would take in Incline Village during typical severe fire conditions. The results indicated that, even with the full support of regional firefighting forces, within one hour 114 houses would be lost (Smith and Adams 1991). The educational materials culminated in a comprehensive handbook (Incline Village 1990) that was so popular that the initial run of 10,000 copies was exhausted and a second printing was required—this in a town with a perma-

nent population of roughly 9,000 (Huntsinger et al. 1998).

As understanding of the wildfire hazard grew, efforts turned toward actively engaging the public in the fire management process. In 1990, Neighbors for Defensible Space was created, a community organization involving residents and government personnel (Casey 1994). Volunteers were recruited to become neighborhood leaders who attended workshops on local fire history and behavior, vegetation identification, and defensible space practices. With this information, neighborhood leaders worked to distribute information, assess defensible space needs, and coordinate efforts to remove excess vegetation

To investigate the effect of these educational efforts, a mail survey was posted in June 1998 to a random sample of 643 individual property owners following Salant and Dillman's (1994) three-wave approach. A total of 279 completed questionnaires were received with a response rate of 46 percent after bad addresses were removed. Specific questions were then selected representing various factors—such as sense of responsibility, risk perception, knowledge levels—thought to influence attitudes and behavior in relation to fire management. Significant associations were then examined between these factors using Pearson's chi-square. Because the focus of the study was to identify *potential* factors that could help explain support for wildfire mitigation activities, a relatively low significance level ($p < 0.10$) was chosen.

Although nonrespondents were not contacted, survey respondents closely reflected two key variables that define the population of Incline Village, thereby reducing the risk of significant nonrespondent bias. Fifty four percent indicated they used their Incline Village property for less than eight months of the year. This is comparable to the 53 percent of housing units found vacant in the 1990 census and to 1998 calculations that Incline Village had a permanent population of 9,354 residents and a summer population of roughly 18,000 (Incline Village 2001). In addition, 64 percent of respondents owned single-family residences and 34

Table 3. The connection between television and respondents' sense of responsibility and use of defensible space measures.

Television was an information source for...

Percentage response to question or statement	Defensible space		Prescribed burning		Thinning	
	Yes	No	Yes	No	Yes	No
What role should the *state* have in local fire planning? (n = 237–243)						
Major role	85**	75	84*	74	88**	75
Supporting or no role	15	25	16	26	12	25
What role should the *individual* have in local fire planning? (n = 233–241)						
Major Role	36**	52	34**	50	30*	50
Supporting or no role	64	48	66	50	70	50
How important a reason in your putting in defensible space measures was the fact that it was your *choice* to live in a high-fire-hazard area? (n = 164–160)						
Very important	73*	84	72**	85	NS	NS
Somewhat to not important	27	16	28	15	NS	NS
I have put in some defensible space characteristics. (n = 213–199)						
Agreed with statement	67**	81	69**	84	64*	84
Disagreed with statement	33	19*	31	16	26	16

Chi-square p *<.10, **<.05, ***<.01; NS = p ≥ .10. Value of n varies slightly by practice.

percent owned condominiums. This parallels 1990 census data showing that 34 percent of condominiums and 62 percent of noncondominiums were owner-occupied. Respondents were wealthier, better-educated, and older than the general 1990 census demographics for Incline Village. Much of this variation is likely owing to the fact that US Census data includes both homeowners and renters, whereas this survey was sent only to homeowners.

Results

To understand the usefulness of information sources, two types of questions were asked. The questionnaire contained separate sections on defensible space, thinning, and prescribed burning. At the start of each section, respondents were asked to check a generalized list of information sources that helped inform them of that particular practice. The generalized list was used to control survey length. A later question asked respondents to rate a more specific list of information sources for their overall usefulness in informing them of the wildfire hazard.

Of general information sources, newspaper and magazine articles were cited most frequently for all three man-agement tools, and educational materials ranked second *(table 1)*. Relative usefulness of the more-specific list of information sources can be divided into three general groups. The first group includes sources that most respondents knew about and a high percentage rated as very useful. Notably, the fire department had the highest percentage (59 percent) of respondents who found it a "very useful" information source. Other sources with high awareness and a high level of usefulness were print news, brochures and newsletters, and television and radio.

The next group had a larger proportion of individuals who did not know about the source and a smaller proportion of those who were familiar rated it as "very useful." But when combined with "somewhat useful" the sources still appear to be reasonably helpful. This group includes personal experience, the Nevada Department of Forestry, and the USDA Forest Service. Also included in this group were presentations at schools. School programs have a narrow target audience, and it is to be expected that homeowners without school children would not have heard of the program. This was reflected in the number of respondents (47 percent) who checked "don't' know" for school programs. However, for respondents who were aware of school programs, 51 percent found them "very useful," indicating that individuals exposed to the programs found them effective.

For the final group, over one-third of respondents did not know about the source, and those who did tended to find it less useful. Of note is that two information sources that had been believed to be influential—block parties and neighborhood leaders—had the highest levels of nonrecognition, and those who did know about and had used them felt they were only somewhat useful.

The issue then becomes whether different information sources can be linked with more supportive attitudes toward fuels management and use of defensible space. To assess this, I examined associations between information sources that respondents checked off for each treatment method and selected questions reflecting key views and beliefs on general fire practices and on the particular practice associated with the information source (i.e., views on prescribed burning were only correlated with prescribed burning informa-

tion sources). Although the survey differentiated informational content in terms of the specific practices addressed, it did not attempt to establish more-specific content. Therefore, results suggest which sources may be influential relative to a specific practice but do not provide specific insights into *how* they are influential. Associations between usefulness of materials and selected views and beliefs were also examined but few significant relationships were found.

Print Media and Television

Newspaper and magazine articles did not appear to be a particularly influential source of information, except on views related to sense of individual or organizational responsibility *(table 2)*. Respondents who cited magazines or newspapers as a source of information on defensible space were more likely to favor a major individual role in fire planning. They also were more likely to indicate that they put in defensible space measures because it was their choice to live in a high-hazard area. By contrast, citing newspapers and magazines as an information source on thinning or prescribed burning was associated with a larger preferred role for the fire department in fire planning. A larger role for the federal government was also preferred by respondents who indicated newspapers and magazines were a source of information on thinning. That newspaper and magazine articles only influenced views on responsibility may reflect that these sources often treat the subject at a general level and do not address either local conditions or specific information about the three practices. This lack of detailed information may be reflected in the finding that citing newspaper and magazines as a source of thinning information was associated with a 12 percent decrease in acceptability of selective timber harvest.

Interestingly, television had a fairly consistent negative association *(table 3)*. Respondents who cited TV as an information source for all three practices were less likely to think an individual should have a major role in fire planning. Adding to the picture of decreased sense of individual responsibility for fire management, those who cited TV as a source of information on defensible space or prescribed burning were less likely to indicate that they used defensible space measures because it was their choice to live in a high-hazard area. Most importantly, those who cited TV as an information source for all three practices were 15 to 20 percent less likely to have taken defensible space measures. In fact, when rating usefulness of various information sources, respondents who cited TV as "very useful" were 12 percent less likely to have taken defensible space measures than those who cited it as only "somewhat useful." Amazingly, 95 percent of respondents who cited televi-

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Table 4. The connection between defensible space–prescribed burning educational materials and respondents' beliefs.

Educational materials were an information source on ...

Percentage response to question or statement	Yes	No
Defensible space		
How severe is the fire hazard in the *Tahoe Basin?* (n = 238)		
Very to moderately severe	83**	68
Somewhat to not very severe	17	32
How severe is the fire hazard in *Incline Village* (n = 238)		
Very to moderately severe	65*	54
Somewhat to not very severe	35	46
What role should the *individual* have in local fire planning? (n = 233)		
Major role	52***	30
Supporting role	45	58
No role	3	12
How important a reason for your putting in defensible space was the fact that it was *cost-effective?* (n = 166)		
Very important.	60***	47
Somewhat important	29	30
Not important	11	23
Prescribed burning		
Ecological and management issues		
Prescribed burning improves *wildlife* habitat and diversity. (n = 191)		
Agree	93***	75
Disagree	7	25
As a management tool prescribed burning best *mimics nature.* (n = 226)		
Agree	92*	83
Disagree	8	17
Prescribed burning is unnecessary as *nature does fine* without human intervention. (n = 224)		
Agree	7*	15
Disagree	93	85
Personal concerns		
I don't like the *look* after a prescribed burn. (n = 226)		
Agree	53*	65
Disagree	47	35
Smoke causes health problems for a member of the household. (n = 219)		
Agree	30***	50
Disagree	70	50

*Chi-square p *<.10, **<.05, ***<.01.*

sion as "never used," or "not useful" had implemented defensible space measures.

These results suggest that television may not be the most productive method of educating individuals about fire mitigation. There are several possible explanations for this phenomenon. Television may be more likely to present a superficial explanation of the issue and may enable the viewer to create more distance from the event, which could contribute to decreased risk perception. The most positive explanation is that this is a reflection of the effectiveness of Incline Village's fire education program. There is support for this explanation: For all three practices, single-family homeowners and permanent residents—groups the fire program targeted—were on average 23 percent less likely to cite television as an information source.

Educational Materials

Respondents who indicated that educational materials had made them aware of defensible space were more inclined to see the hazard in the Tahoe Basin and Incline Village as more severe *(table 4)*. They also were more likely to favor a major individual role in local fire planning and to cite cost-effectiveness as a very important reason for using defensible space measures. Although educational materials for thinning practices showed little significant influence, materials for prescribed burning showed a positive effect on understanding and acceptance of the practice. Notably, even though educational materials had a broad influence they were not linked to increased likelihood of using defensible space measures, despite the fact that they were universally linked with a 12 to 17 percent increased likelihood of having an evacuation plan. This suggests that educational materials effectively raise the sense of exposure enough to encourage evacuation but not enough to foster more active measures.

Neighborhood Meetings

Even though neighborhood activities were not rated as a particularly useful information source *(table 1)*, they nevertheless appear to be influential in

Table 5. The connection between government–personal contacts and respondents' views about thinning and prescribed burning.

Government contacts were a source of information on ...

Percentage response to question or statement	Yes	No
	Thinning	
As a thinning method, how acceptable is use of *heavy equipment?* (n = 216)		
Acceptable	77**	54
Somewhat to not acceptable	23	46
As a thinning method, how acceptable is use of *herbicides?* (n = 203)		
Acceptable	32**	12
Somewhat acceptable	14	32
Not acceptable	55	56
	Prescribed burning	
I don't like the *look* after a prescribed burn. (n = 226)		
Agree	32**	61
Disagree	68	49

Personal contacts were a source of information on prescribed burning

Percentage response to question or statement	Yes	No
I don't like the **look** after a prescribed burn. (n = 226)		
Agree	37**	61
Disagree	63	49
Prescribed burning **damages** trees. (n = 223)		
Agree	11**	35
Disagree	89	65
I worry the burn will get **out of control.** (n = 236)		
Agree	41***	60
Disagree	59	40

Chi-square p *<.10, **<.05, ***<.01.

important areas. Those who cited neighborhood meetings as a source of information for defensible space showed an impressive 17 percent greater likelihood of having taken some defensible space measures. In addition, as a source of information on thinning, neighborhood meetings had a rather dramatic effect on increased risk perception. Those who cited meetings were much more likely to see the hazard as very severe (75 percent versus 36 percent for the Tahoe Basin and 88 percent versus 60 percent for Incline Village). Given that a goal of neighborhood meetings was to ensure that individuals were aware of the hazard's seriousness and what could be done about it, it is likely this is one place where the links between fuel load, severity of fire hazard, and associated thinning prac-

tices were made most clearly. It may also reflect the interactive nature of such meetings, which may allow for individuals to clarify concerns or uncertainties, a process not possible with more static educational methods. This dynamic is supported by findings related to the influence of personal and government contacts.

Government and Personal Contacts

Although government and personal contacts were listed separately, the distinction may be somewhat misleading. Respondents were asked to indicate the nature of the government representative or personal contact. Although many checked off the category but did not write anything, the answers that were provided suggest that the differentiation between government and

personal contacts is not that clear-cut, particularly when the government contact is local. It appears that for government contacts respondents thought of agencies, whereas for personal contacts they thought of individuals, whether or not the contact was acting as a representative of a government agency.

For government contacts the two primary written responses were either the fire department or a forestry agency (Nevada Department of Forestry or USDA Forest Service). Forestry agencies were cited almost twice as often as the fire department for thinning and slightly less for defensible space and prescribed burning. For personal contacts, the two primary responses were fire department representatives and neighbors. Each was cited roughly equally for defensible space and prescribed burning, although fire department representatives were cited slightly more often as a source of thinning information. Although for government contacts the fire department itself generally was cited, for personal contacts the fire chief was the most cited, followed by firefighter, and then a few general fire department responses. However, for prescribed burning, although the fire chief was cited several times, firefighters were not cited at all. This may reflect that with prescribed burning actual experience was a much more common source of information than individual contacts (table 1).

Perhaps most importantly, government and personal contacts both appear useful in increasing support for more controversial aspects of fuels management (table 5). Individuals who cited a government contact as an information source on thinning were roughly 20 percent more likely to find heavy-equipment thinning and use of herbicides acceptable. For prescribed burning information, both government and personal contacts decreased respondents' concerns about aesthetics. Personal contacts also decreased the likelihood of respondents worrying that a prescribed burn would get out of control or thinking it would damage trees. It seems that whether the concern is centered at a more government or personal level, the parallel type of contact is most influential: Concerns

about thinning practices—most of which would be either implemented or overseen by a government agency— were most influenced by government contacts, whereas prescribed burning concerns—with their connection to more personal issues associated with fear, smoke, and aesthetics—were more influenced by personal contacts.

Individual Participation

It is also useful to see whether different information sources were associated with increased support for homeowner participation in various fire management activities. Defensible space information sources (newspapers, educational materials, neighborhood meetings, and government contacts) were most influential, particularly for increased support for individual financial contributions and participation in local fire planning. Prescribed burning information sources (educational materials and government and personal contacts) were associated with increased support for participation in fire management planning, whereas thinning information sources (educational materials and government contacts) increased support for participation on emergency preparedness committees. Notably, although the range of increased support associated with most materials was 12 to 19 percent, government contacts increased support for financial contributions by 20 percent and for homeowner participation in fire management planning and emergency preparedness committees by 30 percent.

Conclusion

Overall results indicate that efforts to educate individual homeowners about the fire hazard and different mitigation methods can be effective. Although more general media sources seem appealing because they can reach a large segment of the population, results indicate that they are of questionable value, having either a limited effect (in the case of magazines and newspapers) or a negative association (in the case of television). Educational materials, on the other hand, increased risk perception, development of evacuation plans, understanding and accep-

tance of prescribed burning, and support for active homeowner involvement in fire management activities. In addition, personal contacts were particularly influential in increasing support for more-controversial aspects of prescribed burning, and government contacts were influential in increasing the acceptance of more-controversial thinning methods.

These last results suggest that how a contact is perceived, as well as which type of contact is more influential, depends on the type of practice involved. In fact, prescribed burning appears to have more in common with defensible space than thinning in terms of how homeowners respond to educational efforts. This may be because both defensible space and prescribed burning involve more "personalized" issues with a potential direct impact on the homeowner's land, whereas thinning may be seen as a process with a more externalized effect and associated response. Although not an entirely distinct pattern, it is nevertheless one that bears further thought and investigation. The useful effect of government contacts also suggests that assumptions that individuals tend to prefer and trust information from neighbors and friends more than from the "government" are not necessarily true.

Ultimately, coupling educational materials with more-personalized contact appears to be the most effective method for providing information on wildfire management and mitigation. This is illustrated by the finding that neighborhood meetings—perhaps the clearest combination of the two methods—although not well known and not seen as very useful by respondents—in fact had a dramatic effect on increasing risk perception and use of defensible space measures. The importance of personalized contact also likely explains the poor public use of the plethora of brochures and handbooks that have been produced. The positive effect of educational materials shows that such materials are not inherently ignored; rather, to be effective, these materials may need to be placed directly into people's hands and not delivered impersonally via mailings, display tables, or newsstands.

Finally, the study suggests a key area that merits further research. Although findings provide an initial indication of how different information sources may be influential, because the actual information content was not established beyond the type of management practice discussed, only general conclusions can be drawn. For instance, the association between defensible space educational materials and support for a larger individual role in fire planning could reflect content that emphasized the critical role individuals can play, or it could reflect a dynamic whereby people who tend to think that individuals should be active in resource management are more likely to seek out educational materials. Thus, future studies should work to more precisely establish the relative contribution made by the type of information source and its actual content. This can only further help managers target their educational efforts.

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Sarah M. McCaffrey (smccaffrey@fs.fed. us) is research social scientist, USDA Forest Service, North Central Station, 1033 University Place, Suite 360, Evanston, IL 60201.