Fire and Fuel Management Communication Strategies: Citizen Evaluations of Agency Outreach Programs

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Abstract

Wildfire impacts have increased in recent years. In response, public agencies have undertaken measures to reduce forest fuels and improve forest health conditions. To be successful these programs require a supportive local constituency. Research has identified a relationship between public understanding of, and support for, fuel and fire management activities. Correspondingly, in many areas federal agencies have focused their communication strategies on fuel management programs. This paper draws upon findings from research in adult learning to develop a framework to evaluate citizen reactions to eleven different outreach programs at study locations in Arizona, Colorado, Oregon, and Utah. Few differences in citizen reactions were found among study locations, but results suggest interactive formats were more effective than uni-directional methods and are also more consistent with principles of adult learning. However, people were less likely to have participated in interactive activities. Contributions of learning theory principles and the efficacy of individual formats are discussed.

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Introduction

Recent years have seen a marked increase in the extent and severity of wildfire impacts nationwide (Agee 1997; National Interagency Fire Center 2003). One important response by federal agencies is the use of fuel treatments to reduce the risk of catastrophic wildfire events, particularly at the wildland-urban interface where rapid population growth has led to the most eminent threats to private property and human life. Citizen support is necessary to ensure successful treatment implementation particularly as population in the WUI continues to increase. Accordingly, a number of land management units have recently focused their communication strategies on community outreach activities to influence citizens' understanding of fuel reduction practices.

Considerable research has identified mixed results on the effectiveness of outreach programs for influencing public understanding and changing citizens' attitudes (see Arcury 1990 for a review). With respect to fuel management activities, particularly the use of prescribed fire, numerous studies have recognized an association between citizen knowledge and support for practices (e.g., Stankey 1976, Carpenter et al. 1986, Loomis et al. 2001). Three longitudinal studies tested knowledge levels over time. McCool and Stankey (1986) argued that an increase in knowledge was likely a result of increased agency education efforts, although they acknowledged their design did not allow them to draw a causal influence. Marynowski and Jacobson (1999) found that educational materials significantly increased knowledge of fire ecology, but they did not identify a corresponding increase in support for fire management activities. However, the third such study by Loomis et al. (2001) provided empirical evidence of

both increased knowledge of, and support for, prescribed fire after the introduction of educational brochures.

While research has established the role of citizen understanding in fuel management, there is a lack of information about the specific types of communication methods most effective for building support for fuel treatments. Federal agencies have many outreach options (e.g., brochures, newspapers, public service announcements, visitor centers) but limited resources dedicated to providing information to their publics. Thus far results of these efforts have been mixed. For example, recent research suggests that managers' preferences and information-gathering practices differ from those of their client publics (Fernandez-Gimenez et al. 2005). Ultimately, agency professionals have to make difficult, but informed, choices about the most effective use of their resources in communicating with citizens.

Overall, our purpose is to improve understanding of the communication process to help focus the development of effective outreach activities. We do this first by examining theoretical and experimental literature on communication and learning to develop a framework to evaluate communication activities. We then consider implications for effective public outreach using survey data from forest communities at risk to wildfire. Specifically, principles of adult learning are used to examine citizen reactions to eleven communication methods commonly used by federal agencies at four study sites in the western U.S. (communities in Arizona, Colorado, Oregon, and Utah).

Contextual Background

Throughout much of their history, federal land management agencies have viewed fire suppression as an integral part of their mission. Recognizing the public's role in achieving this goal, these efforts have long been accompanied by prevention programs, most notably the

message championed by Smokey Bear. From his emergence 60 years ago, Smokey has successfully carried his message to multiple generations.

However, in recent years fire managers and scientists have become increasingly aware of the complex and often beneficial role that fire plays in forest and rangeland ecosystems. Correspondingly their focus has shifted from strict suppression to a more holistic fire management strategy (Dombeck et al. 2004). An important component of this new focus is to proactively manage forest conditions prior to a fire event, primarily using prescribed fire and mechanical vegetation removal to manipulate fuel loads. Although Smokey's message of personal responsibility is still valid, it is clear that a more complex message is necessary to accompany this shift in fire management philosophy.

From a research perspective, the *content* of such messages has long been discussed (e.g., Carpenter et al. 1986, Manfredo et al. 1990, McCool and Stankey 1986); however, the *process* of how this information is to be delivered has received far less attention. Many different outreach methods are available to managers. In a general sense, these methods can be classified as either *uni-directional* (e.g., brochures, television ad campaigns) or *interactive* (e.g., visitor centers, guided field trips) depending on the type of communication experience they offer. Uni-directional approaches are those that typically involve a one-way flow of communication from the agency to the public, often in a setting unrelated to the message. Interactive programs provide for either personal contact with agency representatives or on-the-ground learning experiences. While other method classifications have been previously proposed (e.g., broad vs. direct programs Marynowski and Jacobson 1999), we believe the proposed designations are more descriptive of the process of communication exchange fostered by different communication activities.

Substantial research supports the notion that any new practice, like prescribed fire, is more likely to be accepted if citizens understand the rationale for it and have a chance to personally engage in a discussion about its merits, risks, and potential outcomes (e.g., Shindler and Neburka 1997, Yaffee and Wondolleck 1997). Ultimately, fire managers are seeking methods to provide information that citizens believe is useful and will lead to acceptance of agency fuel reduction programs. At the very least, outreach programs can provide information necessary to facilitate effective stakeholder participation in decision making (Bright and Tarrant 2002, Jacobson 1999). Beyond this role, they may play an even greater function by providing a means of relationship building between agencies and their publics.

Models of persuasive communication

The most influential research on outreach evaluation has come from social psychology studies on persuasive communication. The two most dominant contemporary theories of attitudes and persuasion are the Theory of Reasoned Action (TRA, Ajzen and Fishbein 1980) and the Elaboration Likelihood Model (ELM, Petty and Cacioppo 1981). As both models have been written about extensively, we will only briefly summarize them here.

The TRA confines its focus to intended behaviors under the volitional control of individuals (Erwin 2001). Model components include beliefs and evaluative aspects, attitudes, subjective norms, behavioral intention, and behavior. Beliefs and evaluative aspects (positive or negative valuing of belief outcome) influence attitudes and subjective norms, which in turn influence behavioral intention and, finally, behavior (Ajzen and Fishbein 1980). Model components are directly linked to adjacent variables (e.g., attitudes and behavioral intention) and only indirectly influence non-adjacent components (e.g., attitudes and behavior). The model assumes the influence of contextual or other variables is mediated through attitudes and

subjective norms (Erwin 2001). Thus, TRA specifies that behavior change results from a shift in behavioral intention; a shift in behavioral intention is influenced by an attitudinal change and/or alteration to the perceived subjective norm towards some action. Thus, behavior change may be promoted by communication activities that target attitudes (beliefs in, and evaluation of, likely outcomes of behavior) or subjective norms (either altering normative beliefs or motivations to comply) (Ajzen and Fishbein 1980, Bright et al. 1993).

The ELM specifies that persuasion occurs through one of two routes; either via cognitive responses to message content (termed the "central route") or through a "peripheral route" based on non-content factors such as source attractiveness, perceived expertise, or credibility (Petty and Cacioppo 1981, Petty et al. 1983). The central route involves active cognitive processing of the message content, while only limited cognitive elaboration occurs in the peripheral route (Erwin 2001). According to the ELM, attitude change resulting from central processing is stronger and more resistant to change than that from the peripheral route (Petty et al. 1995). Central route processing predominates when individuals are motivated to consider an issue, such as when the message topic has high personal relevance (Bright and Manfredo 1997). Further model refinement, encouraged by a series of critiques (e.g., Stiff 1986, Stiff and Boster 1987) suggested that ELM allows for parallel processing, that is, an individual may simultaneously use both central and peripheral routes to evaluate message information (Petty et al. 1987).

Both of these models have proven useful in analysis of communication activities and have improved our understanding of the process of persuasion and attitude change. For example, communication should target salient beliefs, content relevance influences cognitive elaboration, contextual factors, including source credibility, influence message effect (Petty et al. 1981, Bright et al. 1993, Bright and Manfredo 1997). Findings from this research have demonstrated

the importance of considering message content, relevance, and tangential factors (e.g., credibility, perceived expertise of information provider). While acknowledging these contributions, we return to a concern raised by Bright and Manfredo, who argued that traditional approaches to studying persuasive communication "viewed the individual as a passive recipient of information" (1993: 265). Subsequently, the authors argued for the evaluation of message content through models such as the TRA. While the TRA recognizes the role of participant attitudes and social norms, it is still largely focused on the content and not the process of communication activities.

It is our contention that this emphasis on content has continued to treat individuals as passive recipients by neglecting the process of information exchange. The following section presents principles from adult learning theory about the expectations and needs of citizens as participants in outreach activities.

Contributions from Adult Learning

The adult learning literature provides insight into the manner that adults learn, interpret, and internalize new information. We draw upon this rich but relatively unexplored (among natural resource professionals) field to outline important concepts. As defined by Long (1999: 29) learning is "a cognitive *process* that is influenced by a variety of other elements: a) existing or prior knowledge…; b) attitudes and beliefs…toward the source, content, topic and mode of presentation; and c) the state of the learner, e.g., whether the learner is rested, tired, well, sick, angry, anxious, and so forth" (italics in original). This definition emphasizes learning as a dynamic process as opposed to simple exposure to information. Indeed, credible content is necessary but is insufficient on its own to ensure an effective learning exchange. As Jamieson

(1994) argues, it is not the information itself that leads to understanding; scientific facts do not speak for themselves, but must be appreciated and interpreted.

These ideas are further developed through the concept of *andragogy*, one of the most influential ideas in the field of adult learning (Merriam and Caffarella 1999). Andragogy is built around the following six central principles (Knowles et al. 1998):

1) *The learner's need to know:* Adult learners want to understand why the new information is important before seeking to learn it; they need to see its relevancy.
2) *The learner's self-concept:* Adults seek autonomy; they value opportunities to participate in and contribute to the learning process.
3) *The role of the learner's experience:* Adults come to the learning situation with rich and diverse experiences.
4) *Readiness to learn:* Adult learners are more inclined to listen when they perceive the information is applicable to their real-life situation.
5) *Orientation to learning:* Adults take a problem-centered approach to learning; to what extent does something need fixing?
6) *Motivation:* Adult learners are motivated primarily by internal (improved quality of life or job satisfaction) rather than external incentives (high test scores or awards).

These principles can be consolidated into four main concepts of adults as learners. First, adults typically approach learning situations from a problem-based rather than a subject-based approach (Knowles 1998; Merriam and Caffarella 1999). As Wlodkowski (1999) argues, adults are highly pragmatic learners; they are more likely to retain information that provides insight into a currently perceived problem. As adults fulfill many different roles (e.g., spouse, parent, employee, homeowner, etc.) that can supersede the role of learner, they will seek to integrate their learning within the specific context of their lives (Merriam and Caffarella 1999). Thus, effective outreach programs will relate information to contextual conditions, particularly places people know and care about.

Second, the variety of prior experiences and knowledge adults bring to the learning situation is of substantial value in solving natural resource problems. Such experience often creates a heterogeneous learning group and can provide a rich resource for learning activities

(Knowles et al 1998). For instance, members of affected interests (e.g., residential areas targeted for fuel reduction treatments) may be ready to accept new scientific information because they have witnessed wildfires in neighboring communities and struggle with their own vulnerability. Effective communication activities can help participants to build bridges between this prior experience and current conditions.

However, prior experiences can also lead to biases and assumptions that must be addressed to enable the learning of new ideas. For example, citizens in forest communities are likely to view information in light of their previous experiences with the information provider, e.g., the Forest Service or the Bureau of Land Management. Indeed, Shindler and Toman (2003) found a high correlation between support for prescribed fire and citizens' views of prior relationships with Forest Service personnel and beliefs that the agency provided credible information. Considerable research substantiates the importance of direct and indirect (e.g., observing demonstration sites) experience on the strength and likelihood of supporting new activities (e.g., Rogers 1995, Erwin 2001). At the very least, these points emphasize the importance of taking participants' experiences into account to facilitate an effective learning exchange. Failure to do so may result in a lack of interest among the intended audience, serve to discourage participants, or in some cases even lead to feelings of distrust and resentment (Knowles et al. 1998).

Third is the degree of autonomy adults seek in their learning experiences (Merriam and Caffarella 1999). Because they feel they have relevant experiences and interest, adults often desire to play an active role in the information exchange process. To illustrate, Freire (1970) distinguishes between traditional "banking" education (where deposits of knowledge are made by the expert instructor into empty student receptacles or passive recipients) and "problem-

posing" education (characterized by cooperative investigation by students and instructors into their common reality). Simply, adults are more likely to be effectively engaged when they can participate in educational activities that allow them to learn from peers as well as technical experts. This may suggest a limit to the usefulness of prepackaged information programs.

The final point from the learning theory literature is the importance of creating a trusting and safe environment to facilitate effective information exchange (Knowles et al. 1998). Such an environment is critical to encourage active participation where an exchange of ideas and experiences can occur. Recent research points to public trust as central to an agency's ability to act (e.g., Yaffee 1994, Kramer 1999). Unfortunately, many citizens do not trust our federal forest agencies and therefore do not support their decisions or the way those decisions are made (Shindler et al. 2002). Moreover, adults are not likely to believe information from a source they do not view as credible (Steel et al. 1992-1993). This situation is especially complicated in natural resource management, where the perceived credibility of the information provider (the resource agency) is linked to citizen beliefs about the appropriateness of agency management activities (Jacobson 1999). This can be particularly important in situations where citizens may have interests or concerns about a proposed activity, but know little about its application. In such cases, Wright and Shindler (2001) noted that citizens and organizations found information about an upcoming project more useful when they had trust in the agency that provided it.

METHODOLOGY

Based upon these principles it can be expected that successful outreach activities will not only provide accurate information but will also facilitate an effective learning and communication process. Incorporating these principles of adult learning, we expect outreach programs will be judged as more credible and more helpful to participants overall if they are

viewed by citizens as relevant to their experiences, connected to a meaningful context, and provide opportunities for a personal exchange with resource professionals. Ultimately, we expect that interactive methods will more likely be viewed as useful communication activities than uni-directional or one-way information programs.

Study locations

Fire-prone communities in Arizona, Colorado, Oregon, and Utah were selected as study locations based on the following criteria suggesting fire and fuel management would be relevant to local residents (see Brunson and Shindler 2004 for a more in-depth discussion of selection criteria):

- Wildland fire is a significant ecological disturbance agent in adjacent wildlands.
- Federal land management agencies in the area have proposed to reduce wildland fuel levels using prescribed burning, thinning, brush removal, and/or livestock grazing.
- The agencies have launched public outreach/education programs to raise awareness of wildfire hazard and fuels issues.
- Population growth exceeds national averages in all or part of the locales, with significant growth in the wildland-urban interface.

Research Approach

The findings reported here derive from a general population mail survey conducted between January and March 2001 (prior to large wildfires that occurred in three of the states in 2002) among a random sample of households in the four study locations (see Table 1 for details). The original sample consisted of 500 households per location; however, due to varying delivery rates (i.e., incorrect addresses) final samples ranged from 346 to 476 with a total adjusted sample size of 1561 and a 47% response rate overall. Survey mailing was conducted in three waves following the Total Design Method (Dillman 1978). Ten percent of non-respondent households were randomly selected in each location to receive an abridged, telephone version of the survey.

Responses to this non-respondent survey were similar to the mail questionnaire except telephone respondents provided more "neutral" and "don't know" responses.

Table 1: Study locations and response rates

State	Counties surveyed	Surveys Delivered	Surveys received	Response rate
Arizona	Yavapai	367	173	47%
Colorado	Boulder, Larimer	346	164	47%
Oregon	Jefferson, Deschutes	372	192	52%
Utah	Salt Lake (western suburbs), Tooele	476	203	43%
	Total	1561	732	47%

The survey included categorical and Likert-type items. Variables measured attitudes toward fire and fuel management techniques on public lands, i.e., national forests or lands administered by the U.S. Forest Service, Bureau of Land Management, or National Park Service (see Brunson and Shindler 2004 for a presentation of these data). Additionally, a portion of the questionnaire was devoted to citizen evaluations of commonly used methods for communicating information about agency fire and fuel management. Participants evaluated eleven methods by first indicating if they had experience with the given program and then indicating whether it was a trustworthy source of information (yes, no) and rating its overall level of helpfulness on a three-point scale (not, slightly, very). Respondents were asked how helpful the various message formats are for understanding management actions such as fire prevention, prescribed burning, and thinning hazardous fuels.

RESULTS

Usefulness of communication programs

Table 2 displays ratings of each communication program across all four study locations. Programs are categorized into uni-directional and interactive formats here for presentation

purposes (they were randomly ordered on the questionnaire). Displayed percentages first indicate those individuals who had experience with or exposure to the specific communication method. Respondents who were familiar with the method then went on to rate the degree to which each was trustworthy and helpful (only responses of "very helpful" are reported here). Thus, scores in Table 2 reflect ratings of participants who had experience with each specific method. Significance testes indicate differences in trustworthy and helpfulness ratings between study sites.

Table 2: Ratings of communication methods by type and study site

Exposure			Percent rating program as very helpful or trustworthy[1] Total	AZ	CO	OR	UT	X^2
Uni-directional								
Smokey Bear	92	**Trustworthy**	95	96	92	93	98	9.96
		Helpful	47	54	33	47	54	31.72**
TV public service messages	84	**Trustworthy**	91	92	87	91	92	2.75
		Helpful	47	50	45	46	47	3.13
Brochures	73	**Trustworthy**	94	92	96	91	97	4.96
		Helpful	49	52	60	46	40	10.56
Special sections in newspapers	61	**Trustworthy**	90	91	92	86	89	2.23
		Helpful	47	54	54	45	38	8.85
Regular newsletters	51	**Trustworthy**	90	89	92	82	95	7.22
		Helpful	44	47	50	43	37	5.53
Internet web pages	33	**Trustworthy**	70	68	87	59	66	10.35*
		Helpful	29	41	44	17	16	18.54**
Interactive								
Interpretive centers	88	**Trustworthy**	95	96	95	94	94	.69
		Helpful	69	67	68	66	74	2.60
Conversations with agency employees	51	**Trustworthy**	78	70	90	71	83	11.08*
		Helpful	49	49	63	46	39	20.05**
Elementary school programs	48	**Trustworthy**	93	90	90	86	99	11.17*
		Helpful	60	56	56	58	65	6.59
Guided field trips	45	**Trustworthy**	95	90	95	92	100	7.08
		Helpful	66	68	67	61	68	5.19
Government public meetings	42	**Trustworthy**	54	58	63	47	50	3.85
		Helpful	28	40	35	23	17	13.77*

* $p < .05$, ** $p < .01$

[1] Only respondents who had experience with the program.

As might be expected, exposure levels varied among the communication methods; probably reflecting the traditional nature of some and others that are relatively new or require specific opportunities for participation. Of the six uni-directional methods, a majority of respondents had experienced all but one (the Internet). Exposure to interactive approaches was considerably less, with only two (interpretive centers and conversations with agency employees) registering with a majority. Overall, Smokey Bear was the most widely recognized method. Exposure rates were remarkably similar across the four study sites. Experience with the individual methods was the same between states except for two methods (significance not reported in the table): Utahans had significantly greater exposure to elementary school programs and less experience with brochures.

Regarding trustworthiness, respondents overall were highly positive in their ratings of agency outreach activities. Cumulative scores across all sites (total column) indicate all but one method (public meetings) were seen as trustworthy by at least 70% of participants. Closer inspection shows that all but two of these (internet web pages, conversations with agency personnel) were rated as trustworthy by 90% or more.

Total ratings indicate that uni-directional methods were rated as very helpful by a moderate amount of respondents; scores ranged from 44% to 49% with only Internet web pages rated lower at 29%. Interactive methods were generally rated higher, with interpretive centers, elementary school programs, and guided field trips all registering at 60% or more. However, government public meetings (28%) received the lowest rating of any program.

Responses also were tested for differences among study sites. For the most part, ratings across locations were similar with a few exceptions. Among uni-directional methods, Smokey Bear was very helpful to 54% of respondents in Arizona and Utah but only 33% of the

participants from Colorado. The Internet also received different ratings. Colorado residents tend to view this format as more trustworthy and Oregonians and Utahans saw it as much less helpful. As for interactive methods, conversations with agency employees were both particularly trustworthy and helpful among Colorado participants. Almost all Utahans (99%) rated elementary programs as trustworthy. And while helpfulness ratings for public meetings were generally low, this was particularly the case in Oregon and Utah.

Two other findings emerged from the totals category in Table 2. The two most highly rated methods for trustworthiness—interpretive centers and guided field trips—also garnered the top rating for helpfulness. The same is true at the other end of the scale. Two methods—Internet web pages and public meetings—received the lowest scores in each category.

Comparison of communication formats

Responses presented in Table 2 suggest differences between the uni-directional and interactive communication formats. Four of the five most helpful methods were interactive—interpretive centers, guided field trips, elementary school programs, and conversations with agency employees. However, responses also indicate that exposure levels are higher for uni-directional activities. To further assess differences between formats, we created and compared three indices: familiarity (exposure), trustworthiness, and helpfulness ratings for the two communication types (see Table 3). The participation index represents the proportion of communication methods that respondents had experienced for each format. Thus, the familiarity index scores could range from 0 (no experience with any of the methods) to 1 (prior experience with all the methods). The trustworthiness index is based on the mean rating of programs participants had experienced for each format. These values could also range from 0 (no) to 1 (yes). For the helpfulness index, ratings for each method (1=not, 2=slightly, and 3=very) were

added and then averaged to calculate mean index scores for both formats (range 1-3). Because of substantial variance in the size of target populations, responses were weighted and aggregated results are presented in Table 3. Index scores were compared using a paired t-test. Although not displayed, similar indices and comparisons were made within each location (non-aggregated data) and resulted in identical findings.

Table 3: Comparisons of interactive and uni-directional programs

Communication Format	Familiarity Index	Trustworthy Index	Helpfulness Index
Uni-directional Programs	.553	.927	2.381
Interactive Programs	.459	.894	2.525
T-statistic	-5.477**	-2.073*	3.842**

* $p < .05$, ** $p < .01$

The index indicates that people are significantly more likely to be familiar with uni-directional communication activities. This finding is not surprising given that uni-directional methods have been the long-standing approach taken by agencies to provide information. Moreover, they may be less costly to deliver since they rarely require personnel to participate in delivery. Contrary to our expectations, uni-directional methods as a group were rated as slightly more trustworthy than interactive formats. However, responses in Table 2 indicate that one method, public meetings, received significantly lower ratings than the others. To assess the influence of scores for public meetings on the interactive index, we removed them and calculated a new trustworthiness index. Results indicate public meetings were quite influential on the overall index score; without public meetings the trustworthiness index score for interactive programs is .930, statistically similar to the score for uni-directional activities. The final column

indicates that interactive approaches were rated significantly more helpful than uni-directional methods.

DISCUSSION

This paper is an exploratory attempt to utilize learning theory principles to help focus agency communication strategies. Effective message delivery is particularly important for outreach activities that target fire and fuel management, given the high levels of risk and uncertainty the public associates with these practices (Shindler et al. 2002). Learning theory concepts indicate that adults take a problem-based approach to learning, have a range of prior experiences and knowledge levels, and are more likely to believe information from a trusted source. We expected interactive methods of outreach to be more consistent with learning theory principles and, thus, receive higher ratings from study participants. Findings supported this hypothesis in regards to helpfulness; however, they were less clear in regards to trustworthy scores. These findings were substantially influenced by negative ratings of public meetings suggesting it might be beneficial to rethink the structure of this oft used outreach activity. Some ideas on how to do this are discussed below.

Several other key findings emerged from citizen responses that merit additional discussion. First is the relative consistency in ratings across the four study locations. Given the potential for contextual and content variation across locations, we thought there could be greater variation in participant ratings. Although each site offered all forms of information exchange, the emphasis given by fire managers and educators at each location was different. For example, the agencies in Colorado had recently utilized a campaign involving a Sunday newspaper insert, while guided trips to project sites were more prevalent in Oregon. Although, we expected

geographic variation in exposure levels, few surfaced. Similarly, few programs were rated differently across study sites for their level of trustworthiness and helpfulness.

On balance, it may be that certain program formats appeal to citizens regardless of location. For example, visitor and interpretive centers are part of the American recreation experience—they are prominent, easily accessible, and place few demands on the visitor. As for TV public service announcements and informational brochures, they are largely inescapable in today's society. Ultimately while a greater proportion of participants were familiar with uni-directional methods, interactive approaches appeared to be more helpful. The central message here may be to recognize the strengths and limitations of the different communication methods and select the appropriate approach based upon the communication objectives.

Uni-directional methods rely upon bulk formats to convey broad messages to mass audiences. Such mass media approaches can be particularly useful for building public awareness about an issue or problem (Rogers 1995, McCombs and Bell 1996). However, because these methods offer few opportunities to ensure that information is received and understood, they should not be relied upon by agencies as a sole means of communication with local publics. Findings elsewhere suggest that interactive methods can be more effective at encouraging attitude or behavior change (Rogers 1995, Erwin 2001). Interactive programs require a different type of skill set to produce and are just now emerging as outreach tools among fire management agencies (Shindler and Toman 2003). Findings here seem to suggest the potential value of such approaches and support their continued development.

Lastly, we explore the framework provided by learning theory principles to assess participant responses. Specifically, we will draw on our earlier discussion of learning principles to examine the different ratings given to uni-directional and interactive formats.

Problem-centered approach

The problem-centered approach to learning favored by most adults suggests communication programs will be most effective if they can demonstrate applicability to salient, real-world issues. Prior research suggests that citizens seek specific information, particularly how proposed management activities will affect them or places they care about (Wondolleck and Yaffee 2000, Shindler et al. 2002). Thus, communication activities that target local conditions and public concerns about the rationale behind specific practices, potential outcomes, and implementation scenarios are more likely to resonate with participants. Although this can be accomplished in varying degrees with many forms of outreach, programs that allow for interactive exchanges, such as contacts guided field trips to project sites and conversations with agency personnel, are better suited to problem-centered learning. One limitation of many uni-directional methods (e.g., brochures, newspaper sections, television messages, or newsletters) is that they rely on fixed messages, whereas interactive formats include citizens in the discussion and can adapt to the concerns and interests of the parties involved.

Prior experiences

Peoples' knowledge and experiences largely shape their understanding of and attitudes toward management actions (Shindler et al. 2002). Uni-directional and interactive programs differ in their ability to incorporate participant experiences. The one-way flow of information in uni-directional, expert-based programs may sometimes intersect and reinforce the knowledge held by certain individuals, but more often this format precludes the inclusion of most citizens' experiences. The larger participatory role offered by interactive programs allows participants to self select from their prior experiences and incorporate relevant information for solving specific problems. For example, they might observe proposed activities on-the-ground at visitor centers

or on field trips to demonstration sites and then extrapolate the outcomes onto familiar areas. Methods that engage citizens also can provide an effective manner to build upon previous citizen-agency interactions or "mend" prior contentious experiences in forest communities.

Trust

Substantial research has indicated the importance of trustworthy citizen-agency relationships to successful management (e.g., Hoover et al. 1997, Jacobson and Marynowski 1997). Among the various communication strategies agencies could employ, trust is more likely to develop in the context of personal relationships than in anonymous information provision (Jamieson 1994). Although the give and take of interactive exchanges seem much more likely to develop such personal relationships than programs that rely on a one-way flow of information, ultimately, findings about trust in this study are inconclusive. We acknowledge the measures used were not sufficiently sophisticated to allow for more than speculation. Trust may be the central ingredient for working together effectively, but nuances of achieving and maintaining trust are difficult to quantify (Kramer 1999). Doing so will require a more rigorous research approach including the use of qualitative methods.

However, one noteworthy finding we should not ignore involves the lack of trustworthiness citizens attribute to the Internet and public meetings. Regarding the Internet, findings here may suggest the public has become wary of information from this largely unregulated source and reflects that each day most of us are overloaded with unsolicited messages and information. Furthermore, while the Internet may be useful to citizens for conducting personal business (e.g., reserving campsites or assessing an area's amenities) or for providing information about specific events (e.g., fire activity updates), we should acknowledge its limitations as a source of detailed information about the high risk problems or politicized

issues often involved in natural resource management, including fire and fuel management. Simply, most citizens do not appear to access the Internet for this purpose. On an explanatory note, while mail surveys often lead to oversampling older Americans who are least likely to have experience with the Internet, we found no correlation between age and trustworthiness ratings, or between age and experience with the Internet, among our sample.

Public Meetings

Lastly, public meetings were the most poorly rated of all outreach methods. Much has been written elsewhere about the shortcomings of traditional public meetings (e.g., Blahna and Yonts-Shepherd 1989, Lawrence et al. 1997, Yaffee and Wondolleck 1997). While these authors identify many barriers to effective participation, the most often cited constraints appear to revolve around the quality of the interaction that occurs in these meetings. Specifically, public participants have characterized these meetings as consisting largely of a one-way flow of information where they were simply "talked at." Many believe that the public's role in these setting is simply to comment on decisions previously made by agency personnel (Shindler and Neburka 1997, Cortner et al. 1998). In other words, public meetings are only nominally interactive and until these problems are addressed on a broad scale may actually fit better with the uni-directional methods in this evaluation. In light of the principles of learning theory presented here, such meetings are likely to frustrate individuals seeking to discuss and contribute to the development of management activities. Such meetings also may further erode trust, as participants will not view agency efforts to engage citizens as genuine.

Given the prevalence of public meetings, what can be done to improve their effectiveness? A review of findings from other research suggests meetings should be open and representative of all stakeholders, initiated early in the planning process to give participants the

opportunity to contribute meaningfully to plan development, and that the role of participants should be clearly defined at the outset (Blahna and Yonts-Shepherd 1989; Shindler et al. 1999; Walesh 1999). Ultimately, participants need assurance that their contributions matter; thus, participants will expect to see their comments, ideas, and concerns reflected in management plans (Yankelovich 1991; Lauber and Knuth 1999). These findings are consistent with the principles of learning theory presented in this paper, and set the stage for meaningful interactive experiences.

CONCLUSION

Overall, we believe that learning theory principles offer a worthwhile framework to evaluate agency outreach activities. The primary contribution of this framework over models of persuasive communication is an increased emphasis on citizens as outreach participants. Specifically, learning theory principles address Bright and Manfredo's (1993) admonition to move beyond seeing citizens as merely passive recipients waiting to receive information from agency experts. This is an important step in identifying communication principles that may inform outreach development across different locations.

Findings and learning theory principles presented here suggest that interactive methods may facilitate greater connection to real-world problems and better incorporate participant experiences. One implication for resource managers is the benefit of consistency among communication activities for use in different locations. However, we need to be very clear on this point: Results do not argue for the adoption of one-size-fits-all communication programs. Rather, they suggest that certain approaches are likely to be effective in multiple locations and give substantial credence to the benefits of several interactive methods. The specific program

implementation and content will depend on local conditions and needs and the ability of resource professionals to incorporate them into communication strategies.

While it may be more efficient to use standardized, agency-wide communication devices, such approaches are unlikely to be as effective as messages that target local priorities and specific environmental context (Brunson and Shindler 2004). Ultimately, programs that are able to establish a high degree of relevancy through both thoughtful process and credible content will be more successful at increasing citizen understanding and acceptance (Bright and Manfredo 1997). Such situations involving open discussion and deliberation are consistent with principles of adult learning and can be helpful in eliminating some of the uncertainty—or even serve to deflate some of the contentiousness—surrounding the use of fuel reduction treatments.

Ultimately, findings presented here represent an exploratory approach and require additional research to further examine and substantiate the learning theory framework. In particular, the next phase of research should further refine the framework by including the content of communication programs as well as assessing important contextual factors. It would also be productive to explore and establish links between the learning theory framework and models of persuasive communication.

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