

# Emerging Principles for Using Information/Education in Wilderness Management

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**Abstract:** Studies on information/education as a wilderness management practice are highly diverse, providing both theoretical and empirical understanding, employing a variety of message types and media, and addressing a variety of management issues and target audiences. Generally, these studies suggest that information/education can be an effective and desirable management tool. Moreover, a number of principles for using information/education tools are emerging from this literature.



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## Introduction

Information/education is generally seen as an “indirect” and “light-handed” wilderness management tool; it is designed to persuade visitors to adopt behaviors that are compatible with wilderness management objectives without regulating visitors directly. This approach tends to be viewed favorably by wilderness visitors (Roggenbuck and Ham 1986; Stankey and Schreyer 1987; McCool and Lime 1989; Roggenbuck 1992; Vander Stoep and Roggenbuck 1996; Hendee and Dawson 2002). Research

suggests that information/education can be effective, and a set of principles for application to wilderness management is emerging.

## Conceptual and Theoretical Foundations

Problem behaviors of wilderness visitors can be classified into five basic types (see Table 1), and this conceptual approach suggests the potential effectiveness of information/education on each. At the two ends of the spectrum, problem behaviors can be seen as either deliberately illegal or unavoidable. In these instances, information/education may have limited effectiveness. However, the other three types of problem behaviors—careless actions, unskilled actions, and uninformed actions—may be considerably more amenable to information/education programs.

Another approach to describe the application of information/education relates to the “mindfulness” or “mindlessness” of visitors (Moscardo 1999). “Mindlessness” relies on existing behavioral routines, and this may limit a visitor’s ability to recognize and process new information. Alternatively, a “mindful” visitor actively processes new information, creates new categories for information, and consciously thinks about appropriate ways to behave. Strategies to enhance mindfulness can facilitate learning and better decision-making (Moscardo 1999).

A third conceptual approach to the application of information/education is based on two prominent theories of moral development (Kohlberg 1976; Gilligan 1982). Both theories suggest that people tend to progress through stages of moral development, ranging from being very self-centered to highly

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**Table 1. Application of Information/Education to Wilderness Management Problems**  
(adapted from Hendee, Stankey, and Lucas 1990; Roggenbuck 1992; and Vander Stoep and Roggenbuck 1996.)

Type of Problem	Example	Potential effectiveness of information/education
Illegal actions	Theft of Indian artifacts; use of wilderness by motorized off-road vehicles	Low
Careless actions	Littering; shouting	Moderate
Unskilled actions	Selecting improper campsite; building improper campfire	High
Uninformed actions	Using dead snags for firewood; camping in sight or sound of another group	Very high
Unavoidable actions	Disposing of human waste; trampling ground cover vegetation at campsite	Low

altruistic, based on principles of justice, fairness, and self-respect. A wilderness visitor may be at any of the stages of moral development. Management implications are that information/education should be designed to reach visitors at each of these stages (Christensen and Dustin 1989; Duncan and Martin 2002). For example, to reach visitors at lower levels of moral development, managers might emphasize extrinsic rewards or punishments for selected types of behavior. However, communicating with visitors at higher levels of moral development might be more effective by emphasizing the rationale for selected behaviors and appealing to a sense of altruism, justice, and fairness.

Fourth, communication theory suggests that the potential effectiveness of information/education is dependent upon a number of variables associated with the content and delivery of messages to visitors (Roggenbuck and Ham 1986; Stankey and Schreyer 1987; Manfredo 1989; Vaske et al. 1990; Manfredo and Bright 1991; Manfredo 1992; Roggenbuck 1992; Bright et al. 1993; Bright and Manfredo 1995; Basman et al. 1996; Vander Stoep and

Roggenbuck 1996). For example, visitor behavior is at least partially driven by attitudes, beliefs, and normative standards. Information/education aimed at “connecting” with or modifying relevant attitudes, beliefs, or norms may be successful in guiding or changing visitor behavior. Moreover, the substance of messages and the media by which they are delivered may also influence the effectiveness of information/education programs.

Finally, from a theoretical standpoint, information/education can be seen to operate through three basic models (Roggenbuck 1992):

1. *Applied behavior analysis.* This approach to management focuses directly on visitor behavior rather than antecedent variables such as attitudes, beliefs, and norms. For example, visitors can be informed of rewards or punishments that will be administered dependent upon their behavior. Applied behavior analysis is the simplest and most direct theoretical model of information/education. However, since it does not address underlying behavioral variables such as attitudes, beliefs, and norms, its effectiveness

may be short-term and dependent upon continued application.

2. *Central route to persuasion.* In this model, relevant beliefs of visitors are modified through delivery of substantive messages. New or modified beliefs then lead to desired changes in behavior. While this is a less direct and more complex model, it may result in more lasting behavioral modification.
3. *Peripheral route to persuasion.* This model emphasizes nonsubstantive elements of information/education messages, such as message source and medium. For example, messages from sources considered by visitors to be authoritative or powerful may influence behavior, while other messages may be ignored. This model may be especially useful in situations where it is difficult to attract and maintain the attention of visitors, such as at visitor centers, entrance/ranger stations, and bulletin boards, all of which may offer multiple and competing information/education messages. However, like applied behavior analysis, the peripheral route to persuasion may not influence antecedent conditions of behavior and, therefore, may not have lasting effects.

## Empirical Evaluations of Effectiveness

Empirical studies have examined the effectiveness of a variety of wilderness-related information/education programs. These studies can be described as: (1) those designed to influence visitor use patterns; (2) studies focused on enhancing visitor knowledge, especially knowledge related to minimizing ecological and social impacts; (3) studies aimed at influencing visitor attitudes toward management policies; and (4) studies that address depreciative behavior such as littering and vandalism.

1. *Visitor Use Patterns.* Wilderness visitor use patterns are often of uneven spatial and temporal distribution. Campsite impacts and crowding may be reduced if use patterns could be changed. An early study in the Boundary Waters Canoe Area in Minnesota explored the effectiveness of providing visitors with information on current use patterns as a way to alter future use patterns (Lime and Lucas 1977). Visitors who had permits for the most heavily used entry points were mailed an information packet including a description of use patterns, noting in particular heavily used areas and times. A survey of a sample of this group who again visited the study area the following year found that three-fourths of respondents felt that this information was useful, and about one-third were in-

fluenced in their choice of entry point, route, or time of subsequent visits.

A study in the Shining Rock Wilderness Area, in North Carolina was designed to disperse camping away from a heavily used meadow (Roggenbuck and Berrier 1981, 1982). In one treatment, a brochure explained resource impacts associated with concentrated camping and showed the location of other nearby camping areas. Another group was given the brochure in addition to personal contact with a wilderness ranger. Both groups dispersed their camping activity to a greater degree than a control group, but there was no statistically significant difference between the two treatment groups.

Prior to obtaining a backcountry permit, a sample group of hikers in Yellowstone National Park (Montana, Wyoming, and Idaho), was given a guidebook that described the attributes of lesser-used trails (Krumpe and Brown 1982). Through a later survey and examination of permits, it was found that 37% of this group had selected one of the lesser-used trails compared to 14% of a control group. Results also indicated that the earlier the information was received, the more influence it had on behavior. Studies employing user-friendly microcomputer-based information approaches (e.g., “touch screen” programs) have also been found to be effective in influencing recreation use patterns (Huffman and Williams 1986, 1987; Hultsman 1988; Harmon 1992; Alpert and Herrington 1998).

Hikers in the Pemigewasset Wilderness in New Hampshire were studied to determine the influence of wilderness rangers as a source of information/education (Brown, Halstead, and Luloff

1992). Only about 20% of visitors reported that the information received from wilderness rangers influenced their destination within the study area. However, visitors who were less experienced and who reported that they were more likely to return to the study area were more likely to be influenced by the information provided.

Potential problems in using information/education to influence visitor use were illustrated in a study in the Selway-Bitterroot Wilderness in Montana (Lucas 1981). Brochures describing current recreation use patterns were distributed to visitors. Follow-up measurements indicated little effect on subsequent use patterns. Evaluation of this program suggested three limitations on its potential effectiveness: (1) many visitors did not receive the brochure, (2) most of those who did receive the brochure received it too late to affect their decision making, and (3) some visitors doubted the accuracy of the information contained in the brochure.

2. *Visitor Knowledge.* A second category of studies has focused primarily on enhancing visitor knowledge to reduce ecological and social impacts. In Rocky Mountain National Park in Colorado (Fazio 1979b), information was provided on low-impact camping practices through a series of media. Exposure to a slide/sound exhibit, a slide/sound exhibit plus a brochure, and a slide/sound exhibit plus a trailhead sign resulted in significant increases in visitor knowledge. Exposure to a trailhead sign and brochure was not found to be very effective.

In a more recent study, a sample of day hikers to subalpine meadows in Mt. Rainier National Park in



Figure 1—Information can be provided through simple brochures on site.

Washington state was given a short, personal interpretive program on reasons for and importance of complying with guidelines for off-trail hiking (Kernan and Drogin 1995). Visitors who received this program and those who did not were later observed as they hiked. Most visitors (64%) who did not receive the interpretive program did not comply with off-trail hiking guidelines, while the majority of visitors (58%) who did receive the interpretive program complied with the guidelines.

A study of day hikers at Grand Canyon National Park in Arizona found that an aggressive information/education campaign featuring the message "heat kills, hike smart" presented in the park newspaper and on trailhead posters, influenced the safety-related hiking practices (e.g., carrying sufficient water, starting hikes early in the day) of a majority of visitors (Stewart et al. 2000). Bulletin boards at trailheads have also been found to be effective in enhancing visitor knowledge (Cole, Hammond, and McCool 1997). Visitors exposed to low-impact messages at a wilderness trailhead bulletin board were found to be more knowledgeable about such practices than visitors who were not. However, increasing the number of messages posted beyond two did not result in increased knowledge levels.

Workshops and special programs delivered to organizations can also be effective in enhancing knowledge levels as well as intentions to follow recommended low-impact practices. For example, Leave No Trace (LNT) is a public/private national educational initiative that integrates outdoor recreation research into wilderness education. LNT establishes a collaborative framework connecting

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managers and researchers and providing visitors with current minimum-impact skills and information (Monz et al. 1994). The effectiveness of these types of information/education programs has been demonstrated in several studies (Dowell and McCool 1986; Jones and McAvoy 1988; Cole, Hammond, and McCool 1997; Confer et al. 1999). Research also suggests that commercial guides and outfitters can be trained to deliver to clients information/education programs that are effective in enhancing visitor knowledge (Seig, Roggenbuck, and Bobinski 1988; Roggenbuck, Williams, and Bobinski 1992) and that trail guide booklets can also be effective (Echelberger, Leonard, and Hamblin 1978).

Not all research has found information/education programs to be as effective as indicated in the above studies. A study of the effectiveness of interpretive programs at Great Smoky Mountains National Park in North Carolina and Tennessee found mixed results (Burde et al. 1988). There was no difference in knowledge about general backcountry policies between backcountry visitors exposed to the park's interpretive services and those who were not exposed. However, the former group did score higher on knowledge of park-related hazards. A test of a special brochure on appropriate behavior relating to bears found only limited change in actual or intended behavior of visitors

(Manfredo and Bright 1991). Visitors requesting information on wilderness permits for the Boundary Waters Canoe Area Wilderness in Minnesota were mailed the special brochures. In a follow-up survey, only 18% of respondents reported that they had received any new information from the brochure, and only 7.5% reported that they had altered their actual or intended behavior.

3. *Visitor Attitudes.* A third category of studies has examined visitor attitudes toward a variety of management agency policies (Robertson 1982; Olson, Bowman, and Roth 1984; Nielson and Buchanan 1986; Cable et al. 1987; Manfredo, Yuan, and McGuire 1992; Bright et al. 1993; Ramthun 1996). These studies have found that information/education can be effective in modifying visitor attitudes so they are more supportive of wilderness and related land management policies. For example, visitors to Yellowstone National Park in Montana, Wyoming, and Idaho were exposed to interpretive messages about fire ecology and the effects of controlled-burn policies (Bright et al. 1993). These messages were found to influence both beliefs about these issues and attitudes based on those beliefs.
4. *Depreciative Behavior.* A fourth category of studies has focused on depreciative behavior, especially littering. A number of studies have found that information/education can be effective in reducing littering behavior and even cleaning up

littered areas (Burgess, Clark, and Hendee 1971; Clark, Hendee, and Campbell 1971; Marler 1971; Clark, Burgess, and Hendee 1972a, b; Powers, Osborne, and Anderson 1973; Lahart and Barley 1975; Muth and Clark 1978; Christensen 1981; Christensen and Clark 1983; Oliver, Roggenbuck, and Watson 1985; Christensen 1986; Roggenbuck and Passineau 1986; Vander Stoep and Gramann 1987; Horsley 1988; Wagstaff and Wilson 1988; Christensen, Johnson, and Brooks 1992; Taylor and Winter 1995). For example, samples of visitors to a developed campground were given three different treatments: a brochure describing the costs and impacts of littering and vandalism, the brochure plus personal contact with a park ranger, and these two treatments plus a request for assistance in reporting depreciative behaviors to park rangers (Oliver, Roggenbuck, and Watson 1985). The brochure plus the personal contact was the most effective treatment; this reduced the number of groups who littered their campsite from 67% to 41% and reduced the number of groups who damaged trees at their campsite from 20% to 4%. Types of messages and related purposes found to be effective in a number of studies include incentives to visitors to assist with clean-up efforts and the use of rangers and trip leaders as role models for cleaning up litter.

### Other Types of Studies

Several other types of studies, while not directly evaluating the effectiveness of information/education, also suggest the potential of information/education for wilderness management. First, studies of visitor knowledge indicate that marked improvements are

possible, which could lead to improved visitor behavior. For example, campers in the Allegheny National Forest in Pennsylvania were tested for their knowledge of the area's rules and regulations (Ross and Moeller 1974). Only 48% of respondents answered six or more of the 10 questions correctly. A similar study of visitors to the Selway-Bitterroot Wilderness Area in Idaho tested knowledge about wilderness use and management (Fazio 1979a). Only about half of the 20 questions were answered correctly by the average respondent. However, there were significant differences among types of respondents, type of knowledge, and the accuracy of various sources of information, providing

indications of where and how information/education might be channeled most effectively. Visitors to the Allegheny National Forest in Pennsylvania received an average score of 48% on a 12-item true-false minimum impact quiz (Confer et al. 2000), while visitors to the Selway Bitterroot National Forest in Montana received an average score of 33% on a similar quiz (Cole, Hammond, and McCool 1997).

Second, several studies indicate that information/education programs could be substantially improved (Brown and Hunt 1969; Fazio 1979b; Cockrell and McLaughlin 1982; Fazio and Ratcliffe 1989). Evaluation of literature mailed in response to visitor requests has turned up several areas of needed improvements,

**Table 2. Use and Perceived Effectiveness of 25 Information/Education Practices According to Wilderness Managers**  
(adapted from Doucette and Cole 1993)

Practice	Percentage used	Mean perceived effectiveness rating
Brochures .....	74 .....	2.5
Personnel at agency offices .....	70 .....	2.7
Maps .....	68 .....	2.1
Signs .....	67 .....	2.3
Personnel in backcountry .....	65 .....	3.8
Displays at trailheads .....	55 .....	2.6
Displays at agency offices .....	48 .....	2.7
Posters .....	48 .....	2.3
Personnel at school programs .....	47 .....	2.9
Slide shows .....	36 .....	2.9
Personnel at campgrounds .....	35 .....	2.9
Personnel at public meetings .....	34 .....	2.8
Personnel at trailheads .....	29 .....	3.3
Personnel at visitor centers .....	26 .....	3.0
Videos .....	21 .....	2.6
Agency periodicals .....	18 .....	2.3
Displays at visitor centers .....	18 .....	2.5
Guidebooks .....	13 .....	2.5
Interpreters .....	11 .....	3.6
Computers .....	11 .....	1.9
Commercial radio .....	9 .....	1.9
Commercial periodicals .....	8 .....	2.4
Movies .....	7 .....	2.6
Commercial television .....	4 .....	2.3
Agency radio .....	1 .....	2.4
Mean of personnel-based techniques .....		3.1
Mean of media-based techniques .....		2.4
Mean of all techniques .....		2.6

Effectiveness scale: 1 = "not effective"; 5 = "highly effective"

including more timely response, more direct focus on management problems and issues, greater personalization, more visual appeal, and reduction of superfluous materials.

Third, a survey of wilderness managers identified the extent to which 25 visitor information/education practices were used (Doucette and Cole 1993). Study findings are summarized in Table 2. Only six of these practices—brochures, personnel at agency offices, maps, signs, personnel in the backcountry, and displays at trailheads—were used in a majority of wilderness areas. Managers were also asked to rate the perceived effectiveness of information/education practices. It is clear from Table 2 that personnel-based practices are generally considered to be more effective than media-based practices.

Finally, several studies have examined the sources of information/education used by outdoor recreation visitors for trip planning (Uysal, McDonald, and Reid 1990; Schuett 1993; Confer et al 1999). Many respondents report using information/education sources that are not directly produced by management agencies, such as outdoor clubs, professional outfitters, outdoor stores, guidebooks, newspaper and magazine articles, and travel agents. This suggests that management agency linkages with selected

private and commercial organizations may be an especially effective approach to information/education.

## Emerging Principles for Designing and Implementing Wilderness Information/Education Programs

Despite the fact that the studies described above are diverse in terms of geographic area, methods, and issues addressed, a number of principles for using information/education are emerging from the scientific and professional literature (Roggenbuck and Ham 1986; Brown, McCool, and Manfredo 1987; Manfredo 1989, 1992; Roggenbuck 1992; Doucette and Cole 1993; Bright 1994; Basman et al. 1996; Vander Stoep and Roggenbuck 1996):

- Information/education programs may be most effective when applied to problem behaviors that are characterized by careless, unskilled, or uninformed actions.
- Information/education programs should be designed to reach visitors at multiple stages of moral development.
- Information/education programs designed to “connect” with or modify visitor attitudes, beliefs, or



Figure 2—Southeast Alaska Discovery Center. Photo by Robert Manning.

norms are likely to be most effective in the long-term, and to require less repeated application.


- Use of multiple media to deliver messages can be more effective than use of a single medium.
- Information/education programs are generally more effective with visitors who are less experienced and who are less knowledgeable.
- Brochures, personal messages, and audiovisual programs may be more effective than signs.
- Messages may be more effective when delivered early in the visitor experience, such as during trip planning.
- Messages from sources judged highly credible may be especially effective.
- Strongly worded messages and aggressive delivery of such messages can be an effective way of enhancing the “mindfulness” of visitors, and may be warranted when applied to issues such as visitor safety and protection of critical and/or sensitive resources.
- Computer-based information systems (e.g., “touch screen” educational programs) can be an effective means of delivering information/education.
- Messages at trailheads and bulletin boards should probably be limited to a small number of issues, perhaps as few as two.
- Training of volunteers, outfitters, and commercial guides can be an effective



Figure 3—Old Faithful Visitor Center. Photo by Robert Manning.

and efficient means of communicating information/education.

- Nonagency media, such as newspapers, magazines, and guidebooks can be an effective and efficient means of communicating information/education.
- Information on the impacts, costs, and consequences of problem behaviors can be an effective information/education strategy.
- Role modeling by wilderness rangers and volunteers can be an effective information/education strategy.
- Personal contact with visitors by rangers or other employees can be effective in communicating information/education.
- Messages should be targeted to specific audiences to the extent possible. Target audiences that might be especially receptive include those who request information in advance and those who are least knowledgeable.
- Messages should be targeted at issues that are least well understood or known by visitors.

Studies on information/education suggest that this can be an effective and desirable management tool. Generally, the 18 principles outlined above are based on understanding both theoretical and empirical studies reported to date, and they recommend employing a variety of message types and media and addressing a variety of management issues and target audiences. 

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larger organization such as the Society of American Foresters Wilderness Working Group. The fundamental challenge lies in the unique composition of wilderness values. Each existing organization was developed with fairly clear missions and scope. We are unsure of where the development of a wilderness stewardship professional fits within those various missions.


## Conclusion

In welcoming readers to the first issues of *IJW* in 1995, John Hendee expressed that after 20 years of discussion about a wilderness journal that “the time is right.” Given the success of the journal and several other initiatives over the past 12 years, it is clear that he was correct. The idea of a wilderness profession has been discussed for over a decade and perhaps the time is right for that as well. We would like to envision a future in which students could get degrees in wilderness stewardship that would prepare them for

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limited travel funding, this is often not possible. Therefore, in addition to conducting site visits and giving presentations at management workshops, the Leopold Institute intends to continue synthesizing existing information on key wilderness issues. We will also continue to identify barriers to research application as well as potential solutions. While research results are interesting to inquiring minds, they are of little use to wilderness stewardship when managers are not aware of relevant results. 

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long and rich careers dedicated to the protection of our global wilderness treasures. Moreover, we would like to see an integrated and collaborative system of wilderness stewardship forged across the four wilderness management agencies in the United States. Given the institutional and disciplinary fragmentation of wilderness stewardship professionals, we see these goals as a continued uphill climb. The voice of a committed critical mass of wilderness stewards could be an important development, and a professional society for wilderness stewardship could be that voice. 

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