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# Effective Recreation Visitor Communication Strategies: Rock Climbers in the Bitterroot Valley, Montana

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# Effective Recreation Visitor Communication Strategies: Rock Climbers in the Bitterroot Valley, Montana

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**Abstract**—A four-stage model of decisionmaking was investigated in the context of low-impact practices among rock climbers in the Bitterroot Valley of Montana. Previous research has suggested that knowing what to do to minimize environmental and social impacts may not be the only factor limiting compliance with recommended visitor behaviors. Results from a sample of climbers at Kootenai Creek indicate that the way people are introduced to the sport has an important influence on attitudes toward low-impact practices. Significant differences were found between those who learned to rock climb indoors and those who learned to rock climb outdoors, as well as between those who were introduced to the sport of climbing with fixed anchors versus those introduced with removable climbing equipment. Summary recommendations for effective natural resource communications focus not just on what visitors are being asked to do, but also when, why, and how it is socially appropriate for them to do so.

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**Keywords:** recreation, low-impact behavior, leave no trace, persuasive communication

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## Introduction

Natural resource managers are faced with a continuing need to effectively communicate with, and sometimes persuade, the visiting recreation public. Efforts to inform visitors and to induce compliance with various regulations have been attempted to prevent degradation of social and environmental conditions of recreation sites. Most educational efforts have focused on the methods of dispersal of information, but it remains unclear whether it is a lack of information or other factors that are limiting behavioral compliance. We suggest that factors such as a lack of awareness of a problem, peer group pressures, presence or absence of an underlying ethic, habitual behavior, and an inability to carry out the appropriate behavior may be equally limiting. For natural resource managers to be more effective when communicating with recreationists concerning their role in managing the impacts of their visits, a clearer understanding of the factors that are influencing compliance is needed.

The purpose of this project was to experimentally examine the effectiveness of different communication messages on rock-climber behavior in the Bitterroot Valley of Montana. Different messages concerning low-impact behavior were shown to climbers, and their attitudes and reported behaviors were measured by a questionnaire survey. This project considered the influence of ethical bases for decisionmaking, perceived peer group or normative pressure, awareness of resource impacts, and climber characteristics on rock-climber behavior.

### *Low-Impact Practices*

Much of wilderness and backcountry management involves a balancing of environmental and social

concerns. Primary objectives often include the preservation of natural settings and the minimization of evidence of human activity. Clearly, these require attention to both resource and human behavior concerns. Furthermore, recreation itself involves a delicate balance between socially and environmentally acceptable behavior and the perceived freedom of the experience (Neulinger 1974). As Hendee and others (1990) suggest, backcountry and wilderness managers should emphasize indirect methods of influencing behaviors that are designed to control impact of the natural resource and to minimize the effect on recreationists' experiences. Because backcountry recreationists expect high levels of personal freedom, opportunities to make decisions throughout their recreation experiences are of critical importance.

Need to control resource impacts associated with backcountry recreation have been an impetus for research, and recreation managers have access to the results of numerous studies that have identified how different recreation behaviors contribute to the overall impact an area receives (Cole and others 1987). There has been less corresponding research, however, devoted to understanding the decisions people make that lead to these behaviors. This study seeks to gain an understanding of those decisions and how managers can influence visitor behavior to help minimize resource impacts. Through a better understanding of the motives and reasons that ultimately affect how people behave, recreation managers will be able to better structure recreation opportunities that minimize resource impacts while preserving the integrity of the experience.

The "Leave No Trace" campaign evolved from a U.S. Forest Service initiative to create a standardized, cohesive set of directions for wilderness users (Swain 1996). Currently, Leave No Trace consists of recommendations that recreationists should follow when they find themselves in backcountry situations. Leave No Trace is specifically designed to minimize the biological and social impact of visiting the backcountry and to instill an outdoor ethic of care and respect. Despite the efforts of the Federal land management agencies and the National Outdoor Leadership School, low-impact recommendations are not consistently practiced, even by those people who profess an understanding of the concepts. Since the inception of public information campaigns such as Leave No Trace, the assumption has been that providing the recreationist with information about appropriate behavior is all that is needed to achieve desired results. It has been found, however, that although recreationists can correctly answer questions about low-impact behaviors, they may not be actually carrying out those behaviors (Stubbs

1991). This suggests that visitors may be receiving the low-impact recommendations, but not consistently following them. Furthermore, recreationists have been found unable to remember the point of specific low-impact messages when they are exposed to more than two recommendations (Cole and others 1997). In this case, cognitive overload appears to be limiting recall of specific recommendations. Therefore, it would seem that while some degree of knowledge about low-impact recommendations is necessary for compliance, a lack of information about acceptable behavior may not be the only limiting factor in noncompliance.

### *Four-Stage Model of Decisionmaking*

When backcountry visitors, such as rock climbers, comply with low-impact recommendations from managers, they face a complex decision that involves more than knowing what to do. Based on a model from cognitive and social psychology described by Tourangeau and others (2000), it is suggested that the decision to comply with management policies and regulations comprises four stages. Other cognitive and social factors can intervene in each of these four stages: (1) comprehending the situation and identifying the need for low-impact practices, (2) retrieving the possible behavior options from memory, (3) judging which behaviors are most appropriate, and (4) deciding which behavior to carry out. Further details of this four-stage model can be found in Harding and others (2000) and Miller and others (2001).

**Comprehension of the Situation**—The first stage of any decision is recognizing that a decision should be made. If a visitor does not recognize that they have the opportunity to choose between alternative behaviors and that their actions make a difference to the social and environmental conditions of the recreation site, the decision to adopt low-impact practices will not deliberately be made. The visitor must be able to recognize the environmental cues indicating a low-impact decision should be made. For example, when hiking through a muddy section of trail, is the muddy patch a significant enough cue for the hiker to realize he or she faces a choice between the typical low-impact practice of walking through the muddy section or skirting the muddy section (which often exacerbates the impacts)?

**Information Retrieval**—Knowing what behaviors are recommended is only one step in deciding what to do. That knowledge must be remembered for it to be influential, and there are many cognitive processes that can prevent or bias what is remembered. All sorts of beliefs and attitudes, and the persuasiveness of the

original source of the information can moderate recollection of knowledge. In addition, humans are cognitive misers in that we seek out shortcuts to make the remembering of information quicker and easier. We have limited mental capacity and limited time and ability to perceive, interpret, and process all the information that the world presents to us. Our memory has different structures that allow us to infer meaning for a specific object or situation from familiar or similar situations. As a result, we do not need to be absolutely sure of all the specific requirements of the present event, but rather we can extrapolate with reasonable confidence from past experience or learning. Cognitively, we have categories of knowledge so that we do not have to remember every single object and event. Instead we store generic information about the category of events and objects. Stereotypes are an example whereby we infer knowledge based on a limited recognition of a person or situation.

**Judgment Formation**—Just as processes of memory can affect recognition of behavior alternatives, it can also affect the choice of alternatives. There are heuristics, or shortcuts, that are used to make fast and frugal decisions. Sometimes these choices are optimal, but sometimes the first seemingly satisfactory alternative is chosen. For example, the “availability heuristic” prioritizes the events or options that are easiest to remember. There is some validity to the “availability heuristic” in that events or options that were frequent in the past are likely to be easily remembered and are also likely to be numerous and applicable in the future. Instead of having to remember and compare all the options, the availability heuristic provides a shortcut to a decision.

Ethical frameworks represent another basis on which people determine appropriate behavior. Ethics are important foundations of human behavior and represent how the world ought to be. As a result, human behavior is guided and appraised by ethical standards. The rightness or wrongness of particular actions, the virtue or vice of motives that prompt those actions, and the praiseworthiness or blame of the actors carrying out those actions are all ethical judgments. Low-impact behavior recommendations are, themselves, ethical guidelines, and may be consistent with and suggested by either an ethic of care or a justice ethic. However, there may be times when the behavior suggested by a person’s dominant ethic runs counter to low-impact practice. In these circumstances, compliance with low-impact recommendations is unlikely, given the foundational and deeply held nature of ethics.

**Behavioral Response**—The final stage of any decision is when the individual determines which

behavior is most appropriate within the context of both social and environmental factors. They must be physically able and socially comfortable with their chosen behavior. Social pressure and social identity come into play, whereby individuals feel pressure to conform to what they perceive others would want and what image of themselves they want to project to others. For example, a rock climber may go to great efforts to project an “environmentally conscious” image in the presence of others. While a behavior might be consistent with low-impact recommendations, their behavior is not a product of information of low-impact practices nor rooted in any desire to minimize impacts of the environment. Further, if this climber believes that certain behaviors will not be accepted by other rock climbers, then there is little normative pressure to comply with low-impact recommendations.

### *Rock Climbing in the Bitterroot Valley*

Two primary sites are used for rock climbing in the Bitterroot Valley of Montana. The climbing at Kootenai Creek is quick and easily accessed, mainly top-roped or heavily bolted routes, and popular for sport climbing and as a good beginner’s area. In contrast, the climbing at Blodgett Canyon is more remote and wildernesslike, featuring multipitch, “big wall” climbs that are popular with more traditional climbers. Two other climbing locations are commonly used at Lost Horse and Mulkey Gulch, but like Blodgett Canyon they see relatively infrequent use. Data collection for this project focused on Kootenai Creek, where climbers included residents from the Bitterroot Valley as well as visitors from Missoula (20 miles north), including University of Montana faculty and students.

Three resource impact issues are apparent at Kootenai Creek: (1) erosion on approach trails to the rock-climbing sites, (2) disrespect for Native American artifacts, and (3) the placement of permanent rock-climbing bolts into the rock. It appears that some climbers are causing resource impacts by shortcutting switchback trails, scrambling up slopes, or creating social trails without regard to potential erosion. There is also concern that some visitors are climbing too close to sites of Native American artifacts, showing insufficient respect for this cultural resource. The final issue is a concern related to the placement and presence of bolts, which are used as a safety resource. Some climbers feel that indiscriminate bolt placement has occurred at Kootenai, Blodgett, and other areas in the Bitterroot National Forest. More details concerning rock-climbing issues in the Bitterroot region can be found in Harding and Borrie (2000).

## Methods

Three treatment messages and one control (or neutral) message were displayed at the main trailhead to the Kootenai Creek climbing area. These bulletin board posters were designed to be easily seen but not overly fancy. They were worded in an authoritative tone and fit in with similar Forest Service information. The text of the control and three different treatments are shown in figure 1, and the display of treatment A at the trailhead is illustrated in figure 2.

Climbers were contacted in the trailhead parking lot on 33 sample days between June 11, 2000, and October 28, 2000. Any previously uncontacted climbers were asked to participate in the study, and then were mailed a questionnaire survey the day after their visit.

Dillman's (2000) recommended techniques for followup postcards and replacement mailing was adopted.

The survey asked a variety of questions on socio-demographic characteristics of the visitor, their previous experience with rock climbing, how they were introduced to climbing, and basic trip characteristics about their visit and climbing experience at Kootenai Creek. Attitudes toward trail erosion, climbing close to the Native American artifacts, and placing a new bolted route were assessed through a series of seven-point, semantic-differential questions, as shown in figure 3. Additionally, the survey asked about the ethical principles that guide climbing behavior and where that ethic was learned. Finally, climbers were asked about their awareness of any environmental problems at and around the climbing areas, and how important it was

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**Control:** No message, just historic and administrative information of the site:

Climbers have enjoyed coming to Kootenai Creek for over 30 years. The beautiful creek and accessibility of the climbs have made this a popular spot for many types of climbers.

The rock at Kootenai is mostly good quality metamorphic gneiss. However, loose rock is always a possibility, particularly on those routes that see little use.

**Treatment A:** Information on degree of impact problem, and the role climbers have in creating impacts and the specific behavior that minimizes impact.

**Consider resource impacts:**

- **Erosion:** Access to climbing routes on these cliffs contributes to the erosion of fragile plants and soils. Please stay on established trails.
- **Cultural resources:** Historic Native American cultural sites exist in Kootenai and will be irreparably damaged by climbing activities. Please avoid climbing on or near these sites.
- **Bolting:** Placing unnecessary or suspect bolts in the rock diminishes the quality of the limited rock resource. Please refrain from any new bolting.

**Treatment B:** Information targeted toward a social norm of compliance with recommended behaviors.

**Consider your part in a climbing community:**

- **Erosion:** A majority of the climbing community cares about the climbing resource; unless you want to be perceived negatively by your community, please stay on the trails.
- **Cultural resources:** People who climb on or close to cultural sites can give all climbers a bad image. Please educate those climbers who are disrespecting a valuable cultural resource.
- **Bolting:** Placing a bolt should involve careful consideration of the local climbing tradition. If you believe a fellow climber is disrespecting this tradition, please educate him or her.

**Treatment C:** Information engendering an ethical code of behavior that includes compliance.

**Ethical considerations:**

- **Erosion:** Shortcutting trails unnecessarily degrades nature. Please respect the natural environment by staying on the trails.
- **Cultural resources:** Respect for other cultures is a minimum obligation that each of us have. Please avoid climbing on or near sacred sites.
- **Bolting:** Too many bolts detract from the outdoor climbing experience of others. Please consider how you would feel if everyone decided to place their own bolts.

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**Figure 1**—Message treatments to foster low-impact practices among rock climbers at Kootenai Creek.



**Figure 2**—Message treatment A as displayed on Kootenai Creek trailhead bulletin board.

**1. Attitudes toward own behavior**

- a. If you knew you were contributing to **unnecessary erosion**, would you feel...
- b. If you climbed within sight of a **Native American artifact**, would you feel...
- c. If you created a new **bolted route** at Kootenai, would you feel...

Answer formats:

- Uneasy (1) ..... Comfortable (7)
- Embarrassed (1) ..... Admired (7)
- Ashamed (1) ..... Proud (7)
- Guilty (1) ..... Guiltless (7)

**2. Attitudes toward others' behavior**

- a. If you witnessed someone else **shortcutting a trail**, how likely would you be to...
- b. If you saw someone else climb too close to an **artifact**, how likely would you be to...
- c. If you saw someone else place a **bolt** with a power drill, how likely would you be to...

Answer formats:

- Make sure they saw you [low-impact behavior] (1) ..... [high-impact behavior] (7)
- Make sure they saw you give them a dirty look (1) ..... a pleased look (7)
- Tell them not to [high-impact practice] (1) ..... it's OK to [high-impact practice] (7)
- Tell them you will report them to the authorities (1) ..... you won't report them to the authorities (7)

**Figure 3**—Semantic differential question formats for assessing attitudes about low-impact issues.

for them to be perceived as someone who can easily identify resource problems.

A total of 72 climbers were contacted between June and October. These numbers were considerably lower than expected because of extremely high summer temperatures and the subsequent closing of public access to the Bitterroot National Forest due to extreme fire hazard (Johnson 2000). Also, it was discovered that many climbers make repeat visits to Kootenai Creek, but they were only sampled on their first contact. Two addresses were invalid, yielding a total of 70 climbers who received questionnaires. Of these, a total of 40 questionnaires were returned, representing a response rate of 57 percent.

Because of the foreshortened climbing season, only the control and one of the treatments (treatment A, identification of resource problems) were implemented. Twenty-two respondents were sampled while the control message was displayed, and 18 respondents were sampled on days that treatment A was displayed.

## Results

### *Characteristics of the Climbers*

The average age of the climbers sampled was 27 years old, with ages ranging from 18 to 49. Ninety percent completed some college, or business or trade school, with 53 percent of all respondents having graduated college. The majority of climbers sampled were men, with 29 male respondents and 11 female respondents. Most of the respondents lived in Missoula (75 percent) or the Bitterroot Valley (10 percent), and had lived in the Missoula or Bitterroot Valley for up to 18 years (with an average of 5 years). Forty-five percent reported total individual income under \$10,000, the average income was between \$10,000 and \$19,999, and the maximum income was in the \$60,000 to \$69,999 category.

Most of the respondents had been rock climbing for 4 or more years (68 percent of sample), with an average of 7 years climbing experience. On average, they climb outdoors once or twice a week. Most of the climbers (80 percent of our sample) first learned about Kootenai Creek by word of mouth or from a friend. Of those sampled, more than half (57 percent) reported 10 or more climbing trips to Kootenai Creek, with 45 percent indicating they had been climbing 20 or more times at Kootenai.

On the day they were first contacted at Kootenai, about one-third of the climbers (35 percent) reported

mostly climbing bolted routes, about one-third (30 percent) reported climbing mostly natural-gear routes, and about one-third (35 percent) reported an equal combination of the two. For the day contacted, respondents reported climbing between one and five routes, with a median of three (mean = 3). On average, respondents spent 4 hours at Kootenai on the day they were contacted. Sixty percent were in climbing parties of two, while 30 percent were in groups of three. Respondents reported seeing an average of 4 other climbers (not in their group) on the day they were contacted. Only 10 percent reported seeing no other climbers that day.

### *Low-Impact Behavior*

The primary dependent variable for the experimental design of this study (low-impact behavior) proved difficult to measure. Two of the behaviors appeared to occur at lower levels than expected. Based on self-reporting by climbers, only 10 percent of respondents suggested they had ever placed a bolt at Kootenai, none of them mentioning that they had done so on the sampled visit. Similarly, on the day they were contacted, only 40 percent of those sampled were climbing in the general vicinity of the Native American artifacts, and none reported climbing on or near the specific site. Systematic observation of these behaviors by researchers proved logistically impossible, but casual observations throughout the sample period support the reported rare occurrence of bolting and climbing on or near the artifacts. The definition of the third behavioral variable proved problematic. That is, there is no commonly accepted or readily apparent definition of what constitutes a trail in Kootenai and, therefore, respondents and researchers found it difficult to report behavior as "hiking offtrail." Most climbers ( $n = 29$ ) identified the problem of multiple, interweaving trails approaching the rock-climbing areas, but few could say for certain if they hiked offtrail to get to the climbing routes. There was no significant difference in reported behavior between treatment and control groups ( $p < 0.05$ ).

### *Attitudes Toward Low-Impact Practices*

While the treatment message did not have significant effects on reported behavior, it would appear that attitudes toward the three low-impact practices were related to a climber's history and style of climbing. Two independent variables explained significant differences in attitudes toward low-impact behavior: (1) mode of introduction to the sport of rock climbing

**Table 1**—Correlation between scales measuring visitor attitudes toward their own low-impact behavior and their attitudes toward the low-impact behavior of others.

	Own behavior			Others' behavior	
	Trail erosion	Pictograph	Bolting	Pictograph	Bolting
<b>Own behavior</b>					
Trail erosion	1.00	0.37 <sup>a</sup>	0.49 <sup>b</sup>	0.21	0.47 <sup>b</sup>
Pictograph	—	1.00	.39 <sup>a</sup>	.29	.36 <sup>a</sup>
Bolting	—	—	1.00	.12	.66 <sup>b</sup>
<b>Others' behavior</b>					
Pictograph	—	—	—	1.00	.40 <sup>a</sup>
Bolting	—	—	—	—	1.00

<sup>a</sup> Correlation is significant ( $p < 0.05$ ).

<sup>b</sup> Correlation is significant ( $p < 0.01$ ).

and (2) level of experience with rock climbing (and, in particular, climbing at Kootenai Creek).

The scores on each set of attitude questions (shown in figure 3) were summed to give a single scale. Factor and reliability analyses confirmed five of the six resulting scales. Each of the five had a satisfactory coefficient alpha of 0.8 or above. (The unsatisfactory scale, for attitudes toward someone else shortcutting a trail, is not discussed further in this report). Analysis of the correlations between the five scales indicate they are significantly correlated (table 1).

**Treatment Effects**—Comparing the message treatment (treatment A: identification of resource impacts) against the control message showed no significant difference in responses. In particular, attitudes toward low-impact issues showed no significant difference between those sampled on days when treatment A was displayed and those sampled on days when the control was displayed. This suggests that different messages displayed at trailhead bulletin boards have little or no effect on attitudes toward low-impact behavior. This may reflect the time delay between exposure to message treatments and response to the survey items measuring attitudes, which could be up to 2 or 3 weeks later. Nevertheless, given that attitudes toward a behavior are a known precursor of intentions to perform that behavior (Fishbein and Ajzen 1975; Fishbein and Manfredo 1992), trailhead messages may not be effective at instilling new or changing behavioral intention. However, these trailhead messages may strengthen or reinforce previously held convictions, and remind or cognitively prime visitors of previously performed low-impact behaviors (Trafimow and Borrie 1999).

**Method of Introduction to Rock Climbing**—Those who were introduced to climbing indoors (as compared to those who were introduced outdoors) had

significantly more discomfort (unease, embarrassment, shame, or guilt) toward climbing within sight of a Native American artifact, as shown in table 2. Similarly, those who started indoors typically had more discomfort placing a new bolted route at Kootenai. Also, those who started learning to climb with fixed anchors (bolts) were significantly less likely to express disapproval toward someone else placing a bolt with a power drill.

Similar patterns emerge when considering how respondents were first introduced to climbing in Missoula and the Bitterroot Valley. While no one in our sample was introduced to climbing in western Montana indoors, those who started with fixed anchors are more comfortable placing a new bolted route themselves, and were more approving of someone else placing a bolt with a power drill (table 3).

**Specialization**—Respondents were clustered (using hierarchical cluster analysis) into two levels of recreation specialization based on the number of years climbing (total, in their predominant climbing style, and in western Montana) and the number of trips to Kootenai Creek. The final cluster centers are shown in table 4. Those with high specialization had more experience rock climbing and had been climbing more often at Kootenai.

The less experienced climbers in our sample were more likely to express discomfort toward creating a new bolted route at Kootenai, as shown in table 5.

## Conclusions

Due to logistical limitations, only limited knowledge has been gained from implementation of the original experimental design based on four different treatment messages. However, some insights into effective visitor communication strategies can be found in the



**Table 2**—Comparison of attitudes of visitors toward their own low-impact behavior and their attitudes toward the low-impact behavior of others between those who were introduced to the sport of rock climbing indoors with those introduced outdoors, those introduced with formal instruction with those introduced informally, those introduced with top-rope climbing with those introduced with lead climbing, and those introduced with fixed anchors with those introduced with removable equipment.

	Own behavior						Others' behavior			
	Trail erosion		Artifact		Bolting		Artifact		Bolting	
	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean
<b>Location</b>										
Indoor	5	2.2	5	2.6	5	2.8	5	2.3	5	3.5
Outdoor	34	2.8	33	4.3 <sup>a</sup>	33	4.8 <sup>a</sup>	33	2.9	31	3.9
<b>Form</b>										
Formal	6	2.8	6	3.5	6	4.4	6	2.3	6	3.8
Informal	31	2.8	30	4.2	30	4.6	30	2.9	28	3.8
<b>Style</b>										
Top rope	3	2.7	3	3.8	2	4.8	3	2.7	3	2.8
Lead	36	2.8	35	4.2	36	4.6	35	2.9	33	2.9
<b>Equipment</b>										
Fixed	22	2.9	22	4.1	22	4.9	22	2.9	21	4.3 <sup>b</sup>
Removable	15	2.5	14	4.1	14	4.1	14	2.8	13	3.0

<sup>a</sup> Average attitude is significantly higher for climbers introduced outdoors than for those introduced indoors (two-sample t-test,  $p < 0.05$ ). Low values represent unease, embarrassment, shame, and guilt toward own behavior.

<sup>b</sup> Average attitude is significantly higher for climbers introduced with fixed anchors than for those introduced with removable gear (two-sample t-test,  $p < 0.05$ ). Low values represent disapproval of others' behavior.

**Table 3**—Comparison of attitudes of visitors toward their own low-impact behavior and their attitudes toward the low-impact behavior of others between those who were introduced to rock climbing in the Missoula and Bitterroot Valley region indoors to those introduced outdoors, those introduced with formal instruction with those introduced informally, those introduced with top-rope climbing with those introduced with lead climbing, and those introduced with fixed anchors with those introduced with removable equipment.

	Own behavior						Others' behavior			
	Trail erosion		Pictograph		Bolting		Pictograph		Bolting	
	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean
<b>Location</b>										
Indoor	—	—	—	—	—	—	—	—	—	—
Outdoor	38	2.8	37	4.0	38	4.6	37	2.9	35	3.9
<b>Form</b>										
Formal	3	2.4	3	5.2	3	4.7	3	2.4	3	4.5
Informal	30	2.8	30	3.9	30	4.5	29	2.9	28	3.9
<b>Style</b>										
Top rope	19	2.9	19	4.5	19	4.7	19	2.9	19	4.0
Lead	19	2.8	18	3.8	19	4.5	18	2.9	16	3.8
<b>Equipment</b>										
Fixed	18	3.1	18	4.7 <sup>a</sup>	18	5.2	18	3.2	18	4.4 <sup>a</sup>
Removable	16	2.4	15	3.2	16	4.0	15	2.8	14	3.3

<sup>a</sup> Average attitude is significantly higher for climbers introduced with fixed anchors than for those introduced with removable gear (two-sample t-test,  $p < 0.05$ ). Low values represent unease, embarrassment, shame, and guilt toward own behavior or disapproval of others' behavior.

**Table 4**—Average number of years spent climbing and average number of visits to Kootenai for two clusters of specialization of rock climbers in the Bitterroot Valley, Montana.

Specialization cluster	Years climbing	Years in current climbing style	Years climbing in western Montana	Number of visits to Kootenai
High	9	6	7	80
Low	6	3	1	12

**Table 5**— Comparison of attitudes of visitors toward their own low-impact behavior and their attitudes toward the low-impact behavior of others between those climbers who were highly experienced and those who had less experience.

Specialization cluster	Own behavior						Others' behavior			
	Trail erosion		Pictograph		Bolting		Pictograph		Bolting	
	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean
High	12	3.2	11	4.5	12	5.7 <sup>a</sup>	12	2.9	11	4.5
Low	28	2.6	28	3.9	27	4.1	27	2.8	26	3.6

<sup>a</sup> Average attitude is significantly higher for experienced climbers than for less experienced climbers (two-sample t-test,  $p < 0.05$ ). Low values represent unease, embarrassment, shame, and guilt toward own behavior or disapproval of others' behavior.

results. It would appear that the introduction to the sport of rock climbing plays an important role in the development of attitudes toward low-impact practices. Our results indicate significant differences between those members of our sample who learned to rock climb indoors compared with those who learned to climb outdoors. We also found differences between those who were introduced to the sport of climbing, and in particular, to rock climbing in the Missoula and Bitterroot Valley region, with fixed anchors versus those who were introduced with removable gear. There were also significant differences between experienced and less experienced climbers in their attitudes toward creating a new bolted route.

All this would tend to suggest that attitudes toward low-impact practices, and, indeed, conduct of those behaviors, are a result of training and experience from long before the actual onsite visit. Ingrained and habitual behavior may be difficult to change or influence through onsite communication such as trailhead bulletin boards. Educational efforts will also need to focus on the initial learning of low-impact behaviors and the reasons for their conduct. Knowing what to do may be just as important as knowing when and why it is appropriate to do so. Recreation visitors must also be motivated and feel able to carry out appropriate behaviors. These other components of the

decision to practice low-impact behaviors are complex and perhaps best learned over long periods of time. In particular, the initial introduction to a particular outdoor pastime provides an important opportunity to instruct and motivate users regarding low-impact skills.

There is clearly a need to continue research into both how best to communicate with recreation visitors, and how visitors make decisions concerning appropriate behavior. A full test of the four-stage model proposed in this study could be implemented with other low-impact practices for which direct observation of that behavior is logistically feasible and not intrusive upon the visitor experience.

This current study has also highlighted the need for monitoring of use and user characteristics. Rock climbers at Kootenai Creek are a dedicated and relatively experienced visitor group. Their attitudes and behaviors have developed over a number of years. The frequency of visitation (with nearly half of the climbers contacted having climbed 20 or more times at Kootenai) would suggest attachment and commitment to the location. This suggests the need for recreation managers to work collaboratively with this established visitor group, and researchers can play a role in establishing trust and in the sharing of knowledge (Harding and Borrie 2000).

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### 1. Comprehension of situation

- Teach how to recognize situations where public behavior impacts natural resources.
- Instruct what the public should most be paying attention to (environmental cues to choice situations).

### 2. Information retrieval strategies

- Carefully maintain message source credibility and attractiveness.
- Emphasize face-to-face communication and direct experience with suggested behavior.
- Reinforce consistent principles of action.
- Illustrate prototypical situations and desired stereotypical behaviors.
- Match level of specificity of motivations to act, attitudes, and behaviors in all communications.
- Avoid bureaucratic, legal, and overly technical language.
- Avoid negative connotations and associations.

### 3. Judgment formation

- Emphasize planning and preparation to allow sufficient time for consideration and decisionmaking.
- Clearly illustrate a direct link between public actions and impacts on natural resources.
- Emphasize individual responsibility and accountability for actions.
- Make desired actions quick and easy by removing administrative and operational barriers.
- Utilize both care-based and justice-based ethical reasoning.

### 4. Expression of behavior

- Encourage and foster community development and adoption of codes of practice.
  - Utilize opinion leaders and well-known role models to endorse and promote behaviors.
  - Foster norm of adoption of practices.
  - Get community and educational organizations to actively adopt and train attitudes and behaviors.
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**Figure 4**—Summary recommendations for effective natural resource communications (from Miller and others 2001).

These insights and a review of relevant studies in social and cognitive psychology (Harding and others 1999; Miller and others 2001) support the notion that effective visitor communication strategies should extend beyond just the provision of recommended behaviors. Figure 4 shows summary recommendations corresponding to each of the four stages of low-impact practice decisionmaking. As natural resource managers interact with recreation visitors such as the rock climbers at Kootenai Creek, they should focus on not just what the recommended practices are, but also when, why, and how it is socially appropriate for visitors to follow those low-impact practices. These approaches will necessitate a longer term, collaborative approach to adoption of recommended behaviors.

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## References

- Cole, David N.; Hammond, Timothy P.; McCool, Stephen F. 1997. Information quantity and communication effectiveness: low-impact messages on wilderness trails bulletin boards. *Leisure Sciences*. 19(1): 59–72.
- Cole, David N.; Petersen, Margaret E.; Lucas, Robert C. 1987. Managing wilderness recreation use: common problems and potential solutions. Gen. Tech. Rep. INT-230. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 60 p.
- Dillman, Don A. 2000. *Mail and internet surveys: the Tailored Design Method*. 2d ed. New York: John Wiley & Sons. 464 p.
- Fishbein, Martin; Ajzen, Icek. 1975. *Belief, attitude, intention and behavior: an introduction to theory and research*. Reading, MA: Addison-Wesley. 578 p.
- Fishbein, Martin; Manfredo, Michael J. 1992. A theory of behavior change. In: Manfredo, Michael J., ed. *Influencing human behavior: theory and applications in recreation, tourism, and natural resources management*. Champaign, IL: Sagamore Publishing: 29–50.

- Harding, James A.; Borrie, William T. 2000. Applying participant observation to rock climbing issues in the Bitterroot Region of Montana. In: Schneider, Ingrid E.; Chavez, Deborah; Borrie, William T.; James, Katherine, eds. Proceedings: the third symposium on social aspects and recreation research: diverse challenges of our times—people, products, places; 2000 February 16–19; Tempe, AZ. Tempe: Arizona State University: 113–121.
- Harding, James A.; Borrie, William T.; Cole, David N. 2000. Factors that limit compliance with low-impact recommendations. In: McCool, Stephen F.; Cole, David N.; Borrie, William T.; O’Loughlin, Jennifer, comps. Wilderness science in a time of change conference—Volume 4: Wilderness visitors, experiences, and visitor management; 1999 May 23–27; Missoula, MT. Proc. RMRS-P-15-VOL-4. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 198–202.
- Hendee, John C.; Stankey, George H.; Lucas, Robert C. 1990. Wilderness management. 2d ed. Golden, CO: North American Press. 568 p.
- Johnson, Charles S. 2000. Racicot, feds shut down even more land—a total of 21 percent of State’s 94.1 million acres closed. The Missoulian, August 24, 2000.
- Miller, Theron A.; Borrie, William T.; Harding, James A. 2001. Basic knowledge of factors that limit the practice of low-impact behaviors. Unpublished report on file at: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Aldo Leopold Wilderness Research Institute, Missoula, MT. 182 p. [Available online]. <http://www.wilderness.net/research.cfm#library>
- Neulinger, John. 1974. The psychology of leisure: research approaches to the study of leisure. Springfield, IL: Charles C. Thomas. 216 p.
- Stubbs, Christopher J. 1991. Low-impact recreational practices: assessing and improving wilderness user knowledge, behavioral intentions, and behavior. Blacksburg: Virginia Polytechnic Institute & State University, College of Natural Resources. Thesis.
- Swain, Ralph. 1996. Leave No Trace (LNT)—Outdoor skills and ethics program. *International Journal of Wilderness*. 2(3): 24–26.
- Tourangeau, Roger; Rips, Lance J.; Rasinski, Kenneth. 2000. The psychology of survey response. New York: Cambridge University Press. 401 p.
- Trafimow, David; Borrie, William T. 1999. Influencing future behavior by priming past behavior: a test in the context of Petrified Forest National Park. *Leisure Sciences*. 21: 31–42.