

Factors That Limit Compliance With Low-Impact Recommendations

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Abstract—Despite widespread efforts to minimize resource impacts, a number of remote areas continue to suffer from poor backcountry practices. Research to evaluate the effectiveness of low-impact communication strategies as they relate to recall of messages (Cole and others 1997) measured whether or not recreationists were aware of appropriate behavior given certain scenarios; it did not measure actual compliance. Partially in response to the results of that study, it has been hypothesized that a lack of information is not necessarily the only limiting factor in complying with specific low-impact recommendations. We propose a four-stage model of factors that might help to explain some noncompliance with backcountry low-impact recommendations where information is not the limiting factor.

The study of noncompliance with low-impact recommendations may be useful on any number of fronts. Certainly, there is the issue of natural resource degradation from recreation impacts. Soil and vegetative impacts from improper camping techniques or inappropriate trail behavior are all important concerns. Similarly, inappropriate behavior during camping or hiking experiences can lead to impacts on wildlife and water resources. Of course, resource impacts are not the only issue of concern—social impacts too may result from noncompliance with low-impact recommendations. A host of visitor experience issues might arise, such as camping too close to other parties, to the trail or to water can all affect visitor experiences. Issues such as crowding and solitude can be affected by noncompliance. Additionally, improper disposal of human waste can be both a health hazard and can result in a negative recreation experience. Finally, managerial and policy issues might arise as a result of noncompliance where certain areas may be closed or restricted to use due to complaints from other users or severe resource impacts.

Overall, this proposed model should be viewed as an opportunity to understand the social and psychological processes at work within the recreational setting, particularly as they relate to choice and decision factors. This

suggests that a number of factors influence our decisions and, ultimately, our behaviors.

Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA) has been widely used to explain behavior in terms of intentions (Figure 1). However, we recognize that a host of other factors may intervene prior to intention that will subsequently affect behavior. Petty and Cacioppo's (1981) Elaboration Likelihood Model (ELM) acknowledged that certain psychological constructs, such as motivation and ability to process information, may affect an individual's attitudes, which in turn, may affect an individual's intentions toward behavior. Each of these examples can be used in the context of noncompliance with low-impact recommendations. With the TRA, we can envision a situation where one's own attitude toward some behavior outweighs a corresponding subjective norm, resulting in noncompliance with some low-impact recommendation. Similarly, under the ELM, an individual may be exposed to some low-impact recommendation through written media on a bulletin board, and, indeed the individual can be considered knowledgeable of specific low-impact recommendations; however, he or she lacks either the motivation or the ability to process that information. The end result in this situation might also be noncompliance. The four-stage model we propose uses the foundations of both the TRA and the ELM, however, we attempt to specify certain sub-categories.

While both the TRA and the ELM offer ways of examining factors that ultimately affect behavior, our proposed model focuses more on the cognitive processes and social forces that affect decision-making. This model builds on both the TRA and the ELM, however the difference lies in the specifics of focus. The first stage of our model focuses on the interpretation of the situation. At this level we are interested in perceptual abilities and familiarity with the meanings environmental stimuli. The second stage of the model examines

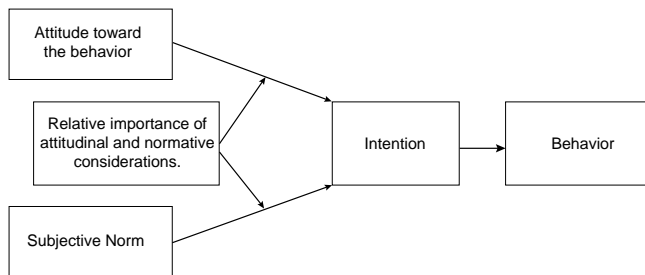


Figure 1—An adapted model of the Theory of Reasoned Action from Ajzen and Fishbein (1980).

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information retrieval strategies. At this level our concern is the accessibility of attitudes, information and beliefs about low-impact behaviors. Moving to the third stage, judgment formation, we are primarily interested in the ethics that guide behavior choice. In the final stage, expressions of behavior represent a final decision-stage with explicit social factors that link behaviors with perceptions of other people. Factors such as social identity guide behavioral decisions, in that, in some instances people perform behaviors so as to be consistent with some positive social identity.

Cognitive psychology is an approach to psychology that emphasizes the study of mental processes (Goldstein 1996); specifically it is concerned with mental processes involving perceptions, pattern recognition, memory retrieval, decision-making and judgment. Some cognitive functions that might come into play in noncompliance situations are a failure to recognize the need for a low-impact decision, misidentification of environmental cues and an inappropriate recommendation retrieved from memory. Social psychology deals with situations where the attitudes, beliefs and behaviors of other people affect our own attitudes, beliefs and behaviors. Much social psychology research “has been framed in terms of conformity” (Eagly and Chaiken 1993) and thus is well-suited to studying issues of noncompliance. In the context of following low-impact recommendations, social psychology might deal with those situations where our camping or hiking companions somehow influence our decisions, judgments and expressions of behavior leading to noncompliance.

Thus, knowledge of appropriate low-impact recommendations is not necessarily the only limiting factor in compliance. Cognitive and social factors can intervene between identifying the need for low-impact practices and, ultimately, practicing the correct behavior. Where recreationists are aware of and have a favorable attitude toward specific low-impact recommendations, other intervening factors, such as group influences, may occasionally prevent compliance.

This model identifies four distinct stages. However, each of the stages relates to at least one of the other stages. Thus, our four-part model details the interconnectedness of each of these parts, and each of these parts is outlined in the paragraphs that follow.

Interpretation of the Situation

The first stage of the model is what we have labeled Interpretation of the Situation. At this stage, recreationists must scan and interpret the physical and social conditions of an area. In this sense, they must be able to identify resource impacts and how other people may or may not affect the recreation experience. A problem occurs when people are unable or unwilling to correctly identify salient physical and social features of a site.

On the one hand, people can misinterpret certain environmental cues that are critical to identifying low-impact recommendations. For instance, when trying to select a campsite, campers might first try to determine the amount of use a site receives and thus the need for low-impact practices. How do they determine whether a site receives low, medium or high use based on visible impacts? This can be very challenging task even for moderately experienced campers.

Keep in mind that this is just the first stage in our four-stage model. Unless something in the physical or social environment triggers the need to choose and implement a low-impact practice, recreationists will not enact a low-impact behavior.

One technique that appears to have some application in the identification of salient physical or social features is the Signal Detection Theory. Signal Detection Theory was proposed as part of military training where radar technicians had to correctly identify visual stimuli on their radar screens. In low-impact scenarios, we would likely be most concerned with whether people could identify some appropriate environmental stimulus, such as fragile vegetation or presence of wildlife. The basic premise of signal detection theory assumes that there is a two-way decision with four possible results: Stimulus—Yes, Stimulus—No, Noise—Yes, Noise—No.

The stimulus in this case represents environmental cues that truly occur in reality. Noise represents the absence of a true environmental cue. People respond either with a yes or no when faced with either stimulus or noise. Thus, people can respond either correctly or incorrectly to both stimuli and noise. Typically, we are concerned with a response scenario, which can be translated into “Yes” = perceived stimulus is present and “No” = perceived stimulus is absent. Likewise, there are two possible stimuli scenarios: “Noise” = no stimuli and “Stimuli” = presence of stimuli. Figure 2 illustrates this relationship. The “Quiet” box represents a situation in which the individual correctly observes that there is no stimulus, when in reality a stimulus is absent. The “Miss” box represents a situation in which the individual incorrectly observes that there is no stimulus, when in reality a stimulus is present. A “False Alarm” represents a scenario in which the individual incorrectly observes a stimulus, when in reality a stimulus is absent. Finally, a “Correct Detection” occurs when the individual correctly observes a stimulus, when in reality a stimulus is present. Each of the incorrect assessments has negative ramifications. The “Miss” box is analogous to a Type II error where one fails to identify a true difference. The “False Alarm” box is analogous to a more serious, Type I error where one believes a difference exists when none, in fact, does. However, as we shall see, the relative severity of a negative consequence changes in a low-impact scenario.

A specific example of a low-impact behavior can illustrate the connection. Suppose our behavior is campsite selection where a host of criteria should be employed to choose an optimal campsite. One of these criteria is the likelihood of

		REALITY	
		Noise	Stimuli
PERCEPTION	NO	Quiet	Miss
	YES	False Alarm	Correct Detection

Figure 2—Standard variables explaining the Signal Detection Theory.

disturbing wildlife. This criterion might be derived by visually observing or hearing wildlife in the area or perhaps observing fresh signs of wildlife (scat, rubbings, tracks, etc.). Any one of these could serve as a stimulus or signal. For illustrative purposes, we'll choose observing animal tracks as a stimulus. Figure 3 illustrates how animal tracks might be used in a signal detection scenario. Consistent with all examples of the Signal Detection Theory, only two of the four possible outcomes result in good or correct decisions. In this example, the two correct decisions would be either correctly selecting a good campsite or correctly identifying a bad campsite. The situation when our camper correctly identified a good campsite, resulted because he/she searched for tracks, but none were present in reality.

In this situation, the camper would presumably select this site to set up camp, assuming all other variables were similarly acceptable. Under different circumstances, the camper correctly identified a bad campsite because he/she searched for tracks and actually found some. In this situation, the camper would presumably continue searching for an acceptable campsite, as the presence of animal tracks would eliminate this one from consideration. The relative severity of an incorrect decision can be seen with this example. The lower left box, which typically represents a "False Alarm" or a Type I error, would result in no additional impact to the campsite because the camper would reject it (albeit for no good reason). Similarly, the upper right box, which typically represents a "Miss" or a Type II error might result in unnecessary damage to the campsite because the camper found nothing wrong using it.

It should be noted that the Signal Detection Theory presumes a situation of high involvement, where the individual actively searches for information or a specific stimulus. Additionally, it is worth mentioning that, particular to the previously mentioned campsite-selection scenario, several different criteria or stimuli would have to be considered before a campsite would ultimately be selected for use. Thus, searching for animal tracks would represent just one of these criteria. Others that might be considered are distance from water, potential to disturb other campers, fragility of vegetation and soil, etc. As most low-impact behaviors are

similarly complex, a host of criteria or stimuli would likewise be considered for each one under the signal detection theory. So the question then arises of whether individuals would systematically process each criterion in a signal detection scenario, or would this task prove too complex? Additionally, it is not clear how effectively Signal Detection Theory would handle situations involving multiple criteria. In fact, perceiving only one criterion, in situations where many should be considered, can certainly lead to instances of noncompliance. However, despite these drawbacks, Signal Detection Theory does represent an appropriate concept for the first stage of the model in instances where decisions are relatively non-complex and limited to a singular stimulus.

Information Retrieval Strategies

Concomitant with interpreting the situation comes identifying the need for a low-impact decision, and thus occurs very early in this four-stage model. However, correctly identifying the need for a low-impact decision does not ensure that one will be made. Of paramount concern at this stage is the ability to retrieve salient information about low-impact behaviors from memory. In short, how accessible are our attitudes, information and beliefs about low-impact behavior? Even though we may assume that wildland visitors are well-informed about correct low-impact behaviors, we should not assume that knowledge is completely and accurately retrieved from memory. One way in which a failure in memory may occur is when individuals may be relying on a heuristic, or shortcut, for information retrieval.

According to Taylor and Fiske (1978), we are all "cognitive misers," meaning that we do what we can to simplify mental processes. A heuristic is one method of simplifying mental processes, and one type of a heuristic is the availability heuristic.

An example of this might occur when an individual is attempting to recall the appropriate behavior for more than one person walking across a trail-less open area. One low-impact recommendation is for the individuals to spread out,

		REALITY	
		No Tracks	Tracks
PERCEPTION	NO	Correct identification of a good campsite	Incorrect identification of a bad campsite
	YES	Incorrect identification of a good campsite	Correct identification of a bad campsite

Figure 3—Using presence/absence of animal tracks and Signal Detection Theory to identify good or bad campsites.

so as to disperse their impacts. However, an individual's most frequent (and hence most available) memory is that of hiking single file, and this becomes their chosen behavior. In this scenario, the individual correctly interprets the situation as one in which a low-impact behavior is appropriate. Further, he or she identifies the need for a low-impact behavior. However, the behavior accessed from memory is not appropriate given environmental conditions. Thus, incomplete or inaccurate retrieval of memory can result in a choice of inappropriate low-impact behavior.

Another way to look at the role of information retrieval strategies is through certain choice rules. Psychologists have distinguished two broad categories of choice rules: compensatory and non-compensatory rules. Abelson and Levi (1985) extensively detail each of these rules. Briefly though, compensatory rules are those where individuals are allowed to adjust and make trade-offs among attributes. Non-compensatory rules do not allow trade-offs between alternatives.

It is worth mentioning that a great deal of cognition research is based on consumer decision-making; the same is true for these two types of choice rules. Studies of choice rules often place individuals in situations in which they are asked to choose one product from two or more alternatives based on a number of different product criteria (for example, cost, features, functionality, etc.). It seems reasonable that many of the low-impact criteria, such as all of those associated with campsite selection, should be substitutable for product-related criteria. An additional point worth mentioning is that all choice rules serve as models only among situations with well-defined alternatives (such as, Campsite A, Campsite B, Campsite C, etc.). In this respect, recreationists must be able to identify and apply the same criteria across each campsite. Similarly, a great deal of study has been given to decision-making in situations in which the alternatives are not so clearly defined (Tversky and Kahneman 1982).

Judgment Formation

How do individuals ultimately act in response to their attitudes, memory, environmental cues and judgments? A number of factors influence our judgments. For example, cognitive (What do I remember choosing last time?) and social-psychological (What would someone important to me choose?) factors direct the decision about the correct behavior.

A critical aspect of choice of behavior is one's ethics. Different models of ethical decision-making exist, such as an ethic of justice and an ethic of care. Carol Gilligan (1982) contrasts these in great detail. For a summary of each, refer to table 1.

An individual might act according to an ethic of justice if he or she is concerned with equal treatment. An ethic of care promotes equal consideration rather than equal treatment. The distinction between these two can be illustrated with an often-cited ethical dilemma involving two injured people. In this case a doctor roaming through the rubble of an aftermath of an earthquake, comes across two injured people. Each person has a leg injury. While one person has a relatively superficial laceration requiring several stitches, the other person suffers from a compound fracture of the

Table 1—Comparison between an ethic of justice and an ethic of care.

Ethic of justice	Ethic of care
Reason	Emotion
Necessity	Contingency
Universalization	Particularity
Abstraction	Situatedness

femur. The doctor only has two doses of morphine left and he must deal with both injured people. Under equal treatment, each person would receive one dose of morphine regardless of their relative levels of pain. Under equal consideration, the needs of each injured person would be considered against the needs of the other and the amount of relief available. In this instance, the person with the compound fracture would get both doses of morphine, because his/her pain is more severe and two doses will do more for this person than one will do for each of them.

This distinction is also evident in a campsite selection example. An ethic of justice would promote the position that all campsites should be treated equally regardless of amount of use or environmental condition. Conversely, an ethic of care would promote equal consideration rather than equal treatment. Equal consideration is contextual where the particular characteristics of each campsite would be considered. Campsite selection using an ethic of care would lead the individual to consider the relative merits and impacts of each campsite and act in the best interest of all the campsites.

Ethics are not descriptive, they are prescriptive. That is to say, ethics do not tell us the way the world is—they tell us the way the world ought to be. The difference between “is” and “ought” plays a critical role in many cases where the natural world intersects with policy. It is clear the way the natural world is, but it is not always clear how we ought to behave with respect to the natural world. Low-impact recommendations, themselves, represent a certain type of environmental ethic, and these recommendations may be rooted in an ethic of justice or ethic of care depending on the individual.

Despite the fact that we may use our ethics to determine what we think we ought to do, what we think we ought to do may not always be consistent with low-impact recommendations. Thus, it may be an ethic that produces an inappropriate behavior. Specifically, if the ethic one intends to follow is rooted in equal treatment rather than equal consideration some areas may suffer needless resource damage.

Expressions of Behavior

At this stage of the model, an individual attempts to determine which behavior is most appropriate within the context of both social and environmental factors. Social pressure and social identity come into play, whereby the individual weighs the appropriateness of his or her decision with the image he or she will project to others. This harks back to the Theory of Reasoned Action, in which a subjective norm is one factor that influences behavioral intentions. An example of the Theory of Reasoned Action at work in a questionnaire item might be using a Likert scale to respond to the following statement: “Most people who are important

to me think that I should follow low-impact recommendations at all times.”

A specific example of the phenomenon of social identity might be a rock climber who wants to be seen by other climbers as environmentally conscious. His or her behavior is adjusted to be consistent with that image. This climber might go to great efforts to project an “environmentally conscious” image in the presence of other climbers. While the ultimate result of this climber’s efforts might be consistent with low-impact recommendations, his/her motivations for following these recommendations are not rooted in any desire to protect the environment. This is important, because in situations where there exists no motivation to project an “environmentally conscious” image, no intention to behave appropriately will be there either.

Specifically, if a recreationist believes that certain behaviors will not be sanctioned by the rock climbing community, there is little normative pressure to comply with a recommendation. Immanuel Kant noted the delicate balance involved in doing what is expected of us. If we do either more or less than is required of us, we can be held accountable for the consequences, but not otherwise. So the burden then shifts to communicating clear and precise low-impact recommendations to minimize any ambiguity about what is expected of recreationists.

Finally, there undoubtedly are situations in which an individual correctly interprets the situation, correctly recalls a recommendation from memory, and the appropriate course of action is clear, yet, this individual still fails to put into practice the appropriate behavior. At this last stage of the model, a range of factors might make compliance with low-impact recommendations difficult or impossible to follow. It is easy to imagine a backpacker who, faced with fatigue or bad weather, decides to set up camp in a less than ideal spot, even though he or she knows better. It also may not be physically possible to carry out “correct behavior”—such as when the only reasonably flat area for camping is within 100 feet of an alpine lake.

So What?

Over 2,000 years ago, Plato developed the term *akrasia* to describe a weakness of will that causes people to do what they know is not right. This concept applies to some situations of noncompliance where people correctly identify appropriate low-impact behavior but fail to carry out this behavior due to convenience or expedience. However, this only represents some instances of noncompliance that occur after cognitive and social psychological evaluations have been made. As illustrated by the first three stages in the model, there are a host of factors, such as situation interpretation, information retrieval, and judgment formation that might limit compliance with low-impact recommendations.

A better understanding of the factors that may limit noncompliance will lead to more effective strategies in behavior modification. Depending on which of the four factors is limiting compliance, managers or community groups might apply different persuasive strategies. For example, if correct interpretation of the situation seems to be problematic, perhaps managers could pursue educational efforts that very clearly illustrate techniques in reading the environment. In those scenarios where individuals seem to have a problem

correctly retrieving information from memory, managers could take steps to clarify recommendations and perhaps make sure that these recommendations are introduced through the central route. Where ethics are somehow inconsistent with a proper judgment, perhaps the groups responsible for communicating these messages should redouble efforts at consolidating a cohesive set of outdoor ethics. Finally, where appropriate behavior somehow falls short, even where judgments are successfully interpreted, retrieved and formed, perhaps managers should clarify and emphasize the importance of following low-impact recommendations 100% of the time.

It should be noted that this model remains theoretical at this point. What remains to be done is to evaluate the validity of the model. Indeed, decisions about what exactly qualifies as noncompliance must be made prior to any evaluations of the model. In this respect, it must be very clear what constitutes noncompliance. Is noncompliance a gross disregard for all low-impact recommendations? Or, rather, does noncompliance result when just one recommendation is not followed? Or, perhaps, true noncompliance can only be examined in terms of intention? Answers to these questions must be obtained before any model testing can proceed. However, we suspect a combination of observed behavior coupled with self-reporting will either support or refute the model. The idea is to emphasize different aspects of the model and measure changes in behavior and self-reports. Ultimately, it is hoped that this model will help to clarify subtle distinctions in the reasons for some people failing to practice low-impact behaviors when knowledge of those behaviors is not the limiting factor.

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