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Factors affecting attention to and retention of low-impact messages on trailside bulletin boards

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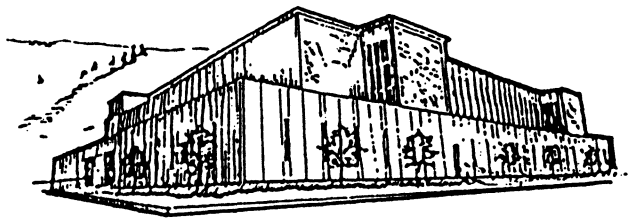

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FACTORS AFFECTING ATTENTION TO AND RETENTION OF LOW-IMPACT MESSAGES ON TRAILSIDE BULLETIN BOARDS

By

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Management agencies often make use of bulletin boards to present low-impact messages. These messages make up education and information campaigns that are designed to influence visitor behavior. The effectiveness of these education and information campaigns depends in part on the capability of the messages presented to be attended to and retained by visitors.

Visitors were filmed as they passed a bulletin board on Big Creek trail in the Selway-Bitterroot Wilderness. The film was used to measure visitors' attention to the bulletin board. As they exited the trail, visitors (n = 217) were asked to complete a brief questionnaire. The questionnaire was used to measure retention and recall of specific low-impact messages presented on the bulletin board. Other information collected included social demographic information, information about trip characteristics, levels of experience, low-impact wilderness knowledge, habituation to messages, and information about trip characteristics. This data was used to test for possible influences on attention and retention.

A model of information processing was tested. Support for the model was mixed. Attention was affected by the number of messages on the bulletin board but not in the predicted direction. Message attention actually increased as the number of messages increased. A map was found to be effective in increasing attention to the bulletin board. However, increased attention to the map did not result in increased attention to the messages. Horse users were much less likely to stop and read messages on the bulletin board than hikers. Retention of messages was positively correlated with attention.

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CHAPTER ONE

INTRODUCTION

Information and education to influence or manipulate visitor behavior have been used by most recreation and park management agencies over the past three decades. Programs using information and education have ranged from interpretive methods such as films, slide shows and naturalist-led activities, to brochures, to signs on bulletin boards. Television and news media have also been used to contact and educate visitors. One very notable example of an information campaign to educate the public about the dangers of forest fires is the use of Smokey Bear by the U.S. Forest Service.

Information and education as a management tool is advocated by most federal agencies that provide recreation experiences to the public. Information and education are seen as unobtrusive ways to encourage visitors to behave in a manner that will reduce impacts to the resources managers protect (Hendee, Stankey and Lucas 1990). Information provided to the public is legally mandated in the Wilderness Act (Public Law 88-577). This act states that "wilderness areas ... shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness".

The Forest Service Manual, Section 2320.12, explicitly states that policy will be to "use information, interpretation, and education as the primary tools for management of wilderness visitors." The manual also provides guidelines for information facilities. Some of these guidelines are that signs and posters be installed where necessary and

helpful to visitors, but that this information should be keep to a minimum. Rules, regulations, and related information are to be provided on bulletin boards that are centrally located.

Managers frequently employ education and information campaigns as a primary strategy when attempting to reduce bio-physical and social impacts caused by recreation visitors to backcountry and wilderness settings. Braithwaite (1989b) emphasizes that specific management objectives be targeted for these information campaigns. Other principles suggested for education and information campaigns are that messages be clear and concise, and that emotional appeals be limited (Braithwaite 1989b). Clear and concise messages that target specific information and education objectives fit the type of material needed for the limited space on bulletin boards.

Bulletin boards are often used as a principal way for displaying educational materials. Research has noted the varying effectiveness of bulletin boards in increasing visitor registration (Lucas 1983, Petersen 1985), but there has been little or no research on their effectiveness for educating visitors in specific low-impact practices. The proposed research is designed to address this issue in part.

PROBLEM STATEMENT AND OBJECTIVES

Managers must make decisions about how many and what kind of messages are displayed on bulletin boards. Few guidelines for such decisions are available. Decisions about how many and what kinds of messages are important because signs are one of the most common techniques used to communicate with wilderness visitors (Douchette and Cole 1993). Bulletin boards can display messages at times when management personnel are not available for personal contact with visitors. Guidelines from the Forest Service Manual require that information presented on trailhead bulletin boards be simple, accurate, current, and of a positive nature. Information of a positive nature informs

visitors what to do rather than what not to do, and provides visitors a choice of opportunities (Forest Service Manual, Section 2320).

Messages presented on bulletin boards range from those concerning low-impact practices recommended for backcountry users, to campsite or trail closures, to wildlife sightings, to regulations concerning stock use. Rules and regulations about visitor behavior or management actions that visitors must be made aware of are also posted on bulletin boards. The manner in which bulletin boards are organized can be as diverse as the types of information on the bulletin boards. While research has suggested that bulletin board layouts be designed with distinct and specific categories (Machlis and Machlis 1974), messages are often placed on the boards with no apparent order. An abundance of messages presented with no specific order can cause a perception of clutter.

A study dealing with television commercials and how clutter, or noise, and placement affect attention and recall suggests that the higher the noise or clutter level, the less attention and retention will be given to specific messages (Webb 1979). This study indicates that the number of messages presented can adversely affect message attention and retention. The position of the commercial, whether internal or external in a string of commercials, also influenced the attention and retention of the commercial messages (Webb 1979). A similar circumstance might occur when messages are presented at the bottom of a bulletin board or at the end of a number of other messages. The lack of sound bulletin board design might cause visitors to ignore an individual message or to lose it among the noise created by a large number of competing or unattractive messages. If this happens, attention to messages presented could drop. Less attention to messages presented could then lead to less retention of information and reduce the effectiveness of messages to educate and inform visitors.

Therefore, the problem to be studied in this research can be stated as "How does the number of low-impact behavior messages simultaneously presented on a bulletin board influence message attention and retention?"

The overall objective of the research project, then, is to increase the effectiveness of bulletin boards as a means of educating wilderness visitors in low-impact techniques. The desire is to understand how the attention that visitors give to messages on bulletin boards and their retention of low-impact messages presented on bulletin boards varies with (1) the number of messages presented, (2) the content of the bulletin board and (3) personal characteristics of the visitors. More specifically, the objectives of this study are to measure the effect of:

1. The number of low-impact messages on message attention and retention.
2. An attractor (map) on attention to bulletin boards.
3. Personal characteristics (experience, type of use, knowledge, and habituation to messages) on message attention and retention.

CHAPTER TWO

LITERATURE REVIEW

This chapter consists of three sections. Section one provides an overview of literature on direct and indirect management. These two methods, used by managers to deal with recreation visitors, are defined. Strengths and weaknesses of each method are presented. Indirect management using education and information to change visitor use patterns and reduce visitor impacts is explored. Education programs aimed at school children and other methods of providing information to visitors, such as brochures and brochures combined with personal contact, are examined. The use of education and information to reduce impacts and change visitor behavior is also described.

Section two presents the conceptual framework used for this research. The fields of marketing and advertising have conducted consumer research on attention and retention of advertising messages for all media (Engel, Blackwell, and Miniard 1990). The information processing model that provides the basis for examining visitor behavior is diagrammed. Information processing has been explored in the field of consumer behavior and advertising for a number of years. The field of social psychology has also studied the way information is processed. One example is from Weick (1979) who examines how organizations process information to ensure their continuity in a changing world. This view of organizing to process information can be helpful in understanding how and why individuals organize and select information to process or to ignore

The third section of consists of the study hypotheses that address the objectives of this research. Individual hypotheses are listed along with the rationale that underlies each one.

Direct and Indirect Visitor Management

Managers can make use of either direct or indirect methods of management when dealing with impacts from visitor use, informing visitors of current or pending management actions, or making known their preferences for visitor behavior. Direct methods regulate, restrict, and in some cases provide punishment for certain visitor behaviors (Hendee, Stankey and Lucas 1990, McCool and Christensen 1993). Indirect methods use a more light-handed approach such as informing and educating visitors in order to achieve the desired behavior. Both approaches have been successful in certain situations and research has shown that visitors support both types of management actions in certain situations. A study by Anderson and Manfredo (1986) found that visitors preferred direct management actions when the problem was overuse of the area, but indirect actions for other management problems. Direct management, with sanctions, was found to be more effective in reducing depreciative behavior in a study of hiking behaviors in Mount Rainier National Park (Johnson and Swearingen 1992).

Management has used direct methods to obtain desired behaviors in backcountry or wilderness areas but this method has several inherent problems. Direct management techniques, such as regulating party size, length of stay, use intensity, and specific recreation activities, require onsite personnel to regulate and enforce (Hendee, Stankey, and Lucas 1990). This requirement of personnel to regulate and punish violators is costly in time and money.

Direct management is also perceived to limit freedom of choice of wilderness visitors (Hendee, Stankey, and Lucas 1990). Limiting freedom is in direct conflict with Forest Service policy to maximize visitor freedom within wilderness (Forest Service Manual, Section 2320.12). Direct management actions infer sanctions or punishments for visitors that violate the rules or regulations (Hendee, Stankey and Lucas 1990). Such punishments are often not possible or practical due to the lack of staff available for

enforcement. The Forest Service Manual (Section 2320.12), also states that policy is to "minimize use of direct controls and restrictions" and to "apply controls only when they are essential for protection of the wilderness resource and after indirect measures have failed."

Managers often use indirect methods to encourage specific low-impact behaviors for backcountry or wilderness visitors. Indirect methods influence factors used by recreationists to make decisions about appropriate behavior (Petersen and Lime 1979). Research indicates indirect methods are preferred by managers and visitors (Hendee, Stankey and Lucas 1990) and are thought to be more consistent with backcountry recreation values than regulations (Vander Stoep and Roggenbuck 1993). Indirect methods can be effective in some situations when properly designed. Effective design includes using such techniques as targeting specific audiences, proper design of messages, and on-site and off-site education efforts (Vander Stoep and Roggenbuck 1993).

A hierarchical model of indirect management strategies is suggested by Gramann and Vander Stoep (1987). This model uses differing levels of severity in the intentionality of depreciative behavior to dictate the management strategy used to correct or change the behavior. A similar model uses insufficient skills, uninformed behavior, and unavoidable behavior as categories to dictate management (Hendee and others 1990).

As mentioned earlier, having visitors cooperate by voluntarily engaging in low-impact behavior is preferable to regulations that are often difficult and costly to enforce. This cooperation is often sought by managing agencies through messages delivered either by direct personal contact or indirect contact. A study of visitors to the Bob Marshall Wilderness Complex (Lucas 1985) indicated that 22 percent of visitors had contact with Forest Service personnel in person or by telephone or mail either before or during their visit. Only 13 percent of visitors in this study had direct face to face contact with Forest

Service personnel during the trip or at a Forest Service office prior to the trip. Lucas (1985) also reported that 39 percent of Bob Marshall visitors carried Forest Service maps on their trip. These results indicate the majority of visitors had no contact of any kind with the Forest Service, and suggest that additional methods to contact and inform visitors are needed. Bulletin boards provide another method of contacting visitors if visitors can be persuaded to read the information presented on the bulletin boards.

Education to Influence Use Patterns

Early efforts to use information and education were directed toward redistributing visitor use to reduce congestion. These efforts varied in their success (Lucas 1981). A study by Brown and Hunt (1969) tested the effectiveness of redistributing use with road signs. This study examined use patterns at two roadside rest stops located relatively close to each other. One of the rest stops was advertised by highway signs informing travelers of its existence and the other did not have signs. When signs were provided to inform travelers of the existence of the rest stop that was not previously advertised, use of that rest stop increased. At the same time, use decreased at the rest stop that had signs to begin with. This suggests that use was more evenly distributed due to the information provided by the signs (Brown and Hunt 1969).

Lime and Lucas (1977) assessed the effectiveness of brochures sent to potential visitors to redistribute use in a study in the Boundary Waters Canoe Area The results from this study indicated that the brochures were somewhat successful in redistributing use. Previous experience in the Boundary Waters was also important to the effectiveness of the redistribution effort in that less experienced visitors found the brochure "particularly useful" (Lime and Lucas 1977). Contacting visitors early in the trip planning process was another important factor in redistributing use.

In the mid-1970's, a study in the Selway-Bitterroot Wilderness attempted to redistribute visitors by providing them with information about relative use levels on

specific trails (Lucas 1981). This effort at redistributing use was essentially unsuccessful. A suggestion from this study was that previous experience and knowledge of the area could have conflicted with information on the brochure, and this conflict might account for some of the lack of success of the redistribution effort. The study also found that contacting visitors at trailheads did not allow sufficient time to change plans. Brochures and brochures plus personal contact were shown to be equally effective in distributing use in the Shining Rocks Wilderness (Roggenbuck and Berrier, 1982). A study by Krumpe and Brown (1982) found visitors more likely to select a lesser used trail if those visitors had received a brochure.

Conclusions of these studies indicate that information can be effective in changing visitor use patterns but there are certain conditions that must be met (Brown, McCool and Manfredo 1987). Experience levels of visitors must be considered when deciding what type of information to provide. Information must reach visitors early enough in the trip planning process to allow time for alteration of plans. Also, alternative locations must be described in terms of area characteristics other than just use levels.

Education to Reduce Visitor Impacts or Change Visitor Behavior

A number of studies have evaluated the use of information to educate visitors in low-impact behavior. Oliver, Roggenbuck and Watson (1985) found that educating visitors successfully reduced tree damage and litter in campgrounds. Other studies have tested a variety of methods of educating and informing visitors. Dowell and McCool (1986) examined the effectiveness of three methods of communication (slides, booklet with discussion, and a combination of slides and a booklet) with Boy Scouts. All three communication methods were shown to produce an increase in wilderness knowledge, skills, and behavioral intentions. The booklet alone and booklet plus the slide presentation produced more positive attitudes and beliefs, with regards to the Leave No Trace ethic, than the slide show alone. One reason postulated for this result was that the

booklet included written and oral discussion of the individuals thoughts while the slide show did not include these activities. Actual behavioral change was not measured in this study.

Oye (1984) also tested the effectiveness of an education program in increasing low-impact knowledge and knowledge of wilderness skills. Sixth graders scored significantly higher on a wilderness knowledge test after they were exposed to a one hour wilderness education program than they scored on the test when it was taken before the education program. However, this study did not indicate that students' attitudes about wilderness were changed because of the program.

Interpretative strategies were the educational methods used in a study of visitors to four nature preserves in Ohio (Olson, Bowman, and Roth 1984). This study found the largest gains in visitors' level of knowledge came when brochures along with personal services were used to impart the information. McAvoy and Hamborg (1984) tested the effectiveness of different visitor contact methods. Results from this study indicate that Forest Service methods, such as ranger stations and visitor centers, and brochures were slightly more effective in making contact with visitors than other methods such as news media, outfitters and organizations, and friends. An important finding from this research was that previous experience was related to knowledge of regulations. More experienced visitors were more knowledgeable about regulations. However, this knowledge did not necessarily translate into appropriate behavior (McAvoy and Hamborg 1984).

An assessment of low-impact wilderness knowledge found a fairly low level of knowledge in visitors to the Shining Rocks Wilderness Area (Stubbs 1990). Experience levels of visitors did not affect the receptivity of visitors to the information provided but bulletin boards were not shown to increase knowledge of low-impact practices (Stubbs 1990).

Molitor and McCool (1992) tested the effectiveness of three different messages in influencing visitor behavior while hiking and camping in occupied grizzly bear habitat. Groups receiving any of the three different types of messages (emphasizing fear, easiness or ecologistic values) about appropriate trail behavior (making noise) were significantly different from those who did not receive a message. The type of message however did not affect behavior. Another finding from the study was that intended behavior was not necessarily actual behavior; visitors may have intended to behave in a certain way but did not necessarily do so.

Education of visitors cannot address all the problems resulting from depreciative behaviors that visitors inflict on recreation sites and facilities (Oliver, Roggenbuck, and Watson 1985, and Vander Stoep and Roggenbuck 1993). However, identification of specific problems and the methods to deal with those problems can help management better protect the resource (Vander Stoep and Roggenbuck 1993).

In summary, direct and indirect methods are used by management but managers and visitors prefer the indirect methods. Indirect methods are more in line with Forest Service policy that mandates maximizing freedom for wilderness users and indirect management techniques provide more freedom than direct methods.

Efforts that use education and information as indirect management tools have been both successful and unsuccessful. Information, in the form of signs and brochures, has been successfully used to redistribute use in certain circumstance but in other instances use was not redistributed. To be successful in redistributing use, information must be given to visitors in the trip planning stage. Experience levels of visitors should also be considered when determining the type of information provided and information provided must give visitors a choice of alternatives.

Education and information can be effective in reducing certain visitor impacts but the evidence is not overwhelmingly supportive. Impacts were reduced in some cases but

were not reduced in other cases. Different methods of educating and informing visitors also achieved varying levels of success in increasing wilderness knowledge.

CONCEPTUAL FRAMEWORK

Roggenbuck and Manfredo (1989) describe three routes management can use to design wilderness education programs. The three routes are applied behavioral analysis, the central route to persuasion, and the peripheral route to persuasion.

Applied behavioral analysis focuses on changing behavior without dealing with knowledge or attitudes. Three methods used to change behavior in this approach include manipulating the environment, rewarding appropriate behavior, and punishing inappropriate behavior (Geller 1987). Rewarding appropriate behavior and punishing inappropriate behavior, can require agency personnel on site to implement and therefore are more costly. Manipulating the environment can also be labor and personnel intensive and difficult to accomplish due to the relatively large size of some wilderness areas.

The central route to persuasion requires high recipient attention to the persuasive message content, careful elaboration of message content, and integration of message content into existing belief systems. Merits of the information presented must be thoughtfully and carefully considered by the receiver when persuasion takes the central route (Petty and Cacioppo 1986). Behavioral changes result from newly acquired beliefs or changes in previously held beliefs due to the elaboration and integration of message content (Petty and Cacioppo 1986).

The peripheral route to persuasion requires minimal attention to message content, little thought or elaboration about message content, and little integration of the message into the existing belief system (Roggenbuck and Manfredo 1989). The peripheral route suggests that not all the information people receive can be processed and they therefore develop strategies to cope with this information overload (Petty and Cacioppo 1986).

These coping strategies include ignoring the message and using simple decision rules. Characteristics of the source, message, and communication channels are some of the factors people use to determine processing routes and whether the information will cause changes in attitude and behavior (Engel and others 1990).

All three routes can be effective in certain aspects of wilderness education (Roggenbuck and Manfredo 1989). However, there has been little research on which decision making route should be used in specific situations and for what actions. A different persuasive communication strategy is used depending on the route the message takes when the visitor is processing information (Vander Stoep and Roggenbuck 1993). The decision of which route managers should try to access depends on the specific problem or issue and the management agency involved (Vander Stoep and Roggenbuck 1993). Specific objectives of this research suggest that the central and peripheral routes will be the more applicable routes to access in educating visitors about low-impact practices through the use of signs on bulletin boards.

Because the central route is considered the more effective in affecting behavioral changes (Petty and Cacioppo 1986), it is thought messages that are successful will access this route. Since the central route emphasizes elaboration and integration of new information into existing beliefs (Petty and Cacioppo 1986), educational efforts that successfully access the central route could be more effective in facilitating more lasting behavioral changes. An integral part of the concept of the central route to persuasion is information processing. The messages to be used in this study include a rationale, specific or implied, for engaging in the desired behavior and are designed to access the central route to persuasion by enhancing the chances for elaboration.

Information Processing

Information processing is defined by Engel, Blackwell, and Miniard (1990) as the "process by which a stimulus is received, interpreted, stored in memory, and later

retrieved." This process is complex and depends on several variables that the individual possesses. There are also those variables that are contained in or inherent to the stimulus or message itself. Not all messages get through the selection process and receive attention. The principle of selectivity states that only that which is pertinent to the receiver will be attended to or received (Engel and others 1990).

Information processing for individuals involves five stages (McGuire 1976): Exposure, Attention, Comprehension, Acceptance and Retention. For a message or stimulus to be stored in long term memory, or retained, it must pass through all five stages. This suggests that the effectiveness of the message to be retained or remembered will depend on its ability to survive all five stages. The Information Processing model (Figure 1) indicates how information provided by the stimuli passes through the five stages and is then stored in memory.

Information Processing Model

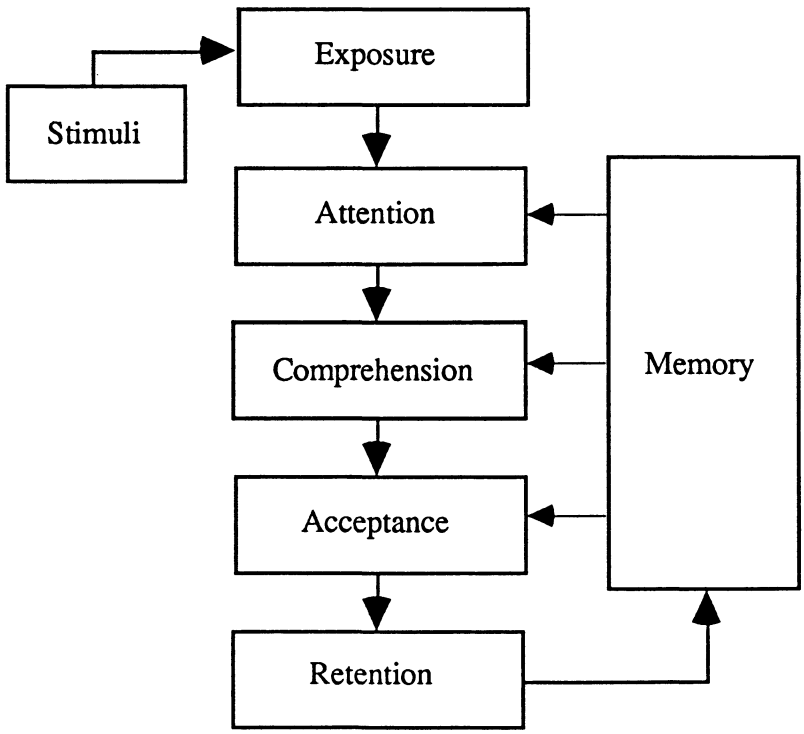


Figure 1. Stages of Information Processing

Exposure

The first step in information processing is exposure to the stimuli. Exposure happens when one of the senses is activated by the stimulus or message (McGuire 1976, Engel and others 1990). Exposure is achieved by a number of different methods, but for messages on the bulletin boards used by land management agencies some specific methods have been identified by previous research. Past studies concerning voluntary trail registration have shown that locating the registration station up the trail from the parking area was far more effective in gaining visitor compliance (Petersen 1985; Lucas and Kovalicky 1982). Placement of bulletin boards up the trail from the actual trailhead has also been shown to be effective in communication of specific low-impact messages (Stubbs 1990). One reason suggested for the success gained by this placement is that often information or signs at a parking area get lost in the clutter or "noise". This noise is not only visual, as in signs, but at relatively busy sites can be auditory as well. Such placement is thought to keep the messages from being lost in the visual "noise" of the parking area.

Attention

After exposure, the next step of information processing is attention. Attention deals with the allocation of the visitor's processing capacity to the incoming stimulus or message (McGuire 1976, Engel and others 1990). This stage is very important to management. Placing a bulletin board up the trail will probably get it noticed or exposed. But if the visitor walks by the board without attending to the messages presented, there is no contact or chance for the other stages of information processing to occur. An individual's capacity to process information is limited and people are selective in their allocation of attention (Engel and others 1990, Petty and Cacioppo 1986). For this reason, messages need to attract attention and present information in such a way that it is easy to read and understand or comprehend, (the third stage of information processing).

Factors that determine attention to a stimulus/message can be divided into two major categories. These categories are personal determinants and stimulus/message determinants (Engel and others 1990). It is important to distinguish between personal and stimulus determinants because managing agencies can control stimulus determinants by varying the number, type, content, and context of messages presented but cannot control personal determinants.

Personal determinants are the characteristics individuals possess that influence attention (Engel and others 1990). Some of these characteristics include attitudes, knowledge, needs, adaptation level or habituation to stimuli and span of attention. Experience level of visitors has also been shown to relate to the amount of information sought by visitors (Roggenbuck and Berrier 1982). Attitude or personal point of view of experienced and inexperienced visitors to wilderness areas could thus influence the amount of attention given to messages presented on bulletin boards.

The need or desire for information concerning appropriate behavior while in the backcountry/wilderness has been shown to be associated with experience levels of the visitor (Roggenbuck and Berrier 1982). The lack of a felt need for information is a problem for managers when attempting to communicate new or different behaviors to experienced visitors. The motivation or need for information is important to be aware of when designing messages or information campaigns (Engel and others 1990). It is important to determine the visitor's base knowledge level in order to determine what information to provide (Olson, Bowman and Roth 1984)

Adaptation level deals with the tendency for visitors to become habituated to the messages presented by management (Engel and others 1990). This adaptation or habituation to the messages occurs when the message has been seen so often by the visitor that it is no longer attended to or noticed. Messages used by the Forest Service to promote low-impact behavior are often seen forest wide, regionally, and nationally. This

practice, while saving costs of developing messages for specific areas, could conceivably lead to visitors being habituated and ignoring bulletin boards and/or thinking there is no new or different information to be gained from the bulletin board.

An individual's span of attention is another important characteristic to consider in education and information campaigns that use bulletin boards to convey information. It is generally thought to be limited in these types of situations (Engel and others 1990). Since an individual's span of attention varies, the use of short, concise messages is suggested to deal with this problem (Engel and others 1990, Ham 1984).

Stimulus determinants are those that are contained in the message or stimulus itself (Engel and others 1990). Characteristics that lend themselves to manipulation for written messages include, size, color, intensity, contrast, position, directionality, isolation, novelty and source credibility (Engel and others 1990). These are the factors that the Forest Service or other land management agencies can control and use to gain attention for the specific low-impact message being presented.

Supportive information from a highly credible source is suggested as reducing cognitive dissonance and produces a strong desire to read the information (Frey 1986). On the other hand, supportive information from a low credibility source may be rejected as not useful to the reader. Not only will source credibility influence acceptance of the statements in the message, it will also affect the receivers intentions to perform the desired behavior (Fishbein and Ajzen 1975).

There is evidence that the Forest Service is seen as a credible source. Fazio (1979) reports that the Forest Service was the most recalled source of correct information about management topics in a survey of visitors to the Selway-Bitterroot Wilderness. However, there are some concerns noted in this study. Information about management topics was recalled the most by visitors, but information provided by the Forest Service actually emphasized safety/equipment and biophysical information. Safety/equipment

and biophysical information was the least recalled by visitors. This is evidence that information provided by the Forest Service was not very effective in communicating the emphasized topics to wilderness visitors (Fazio 1979).

Source credibility has also been of some concern in other aspects of the Forest Service's information and education campaigns. The reliability of information in a Forest Service brochure concerning use levels on trails in the Selway-Bitterroot was questioned by visitors to the area (Lucas 1981). Results from the study indicated visitors were correct in their assumption that use level data from registration stations was not very accurate due to low compliance rates at those stations (Lucas 1981). It is important that managers realize the need visitors have for accurate information that can be trusted (Braithwaite 1989).

The use of maps to attract attention to bulletin boards and provide information to visitors is a technique often used by land management agencies. Maps have been found to be a source of information often used by wilderness visitors (Lucas 1990, Lucas 1985). Maps can provide novelty to messages presented on bulletin boards and novelty is a stimulus determinant that influences attention (Engel and others 1990). Maps also provide a contrast to messages and contrast is also a stimulus determinant that influences attention (Engel and others 1990).

Comprehension

The third step in information processing is comprehension. Comprehension is defined as the way incoming stimuli are organized and interpreted by the receiver (McGuire 1976, Engel and others 1990). Like attention, comprehension is influenced by characteristics of the stimulus and the receiver.

Factors dealing with the stimulus portion of comprehension include stimulus categorization, elaboration, and organization. Also included are variables that deal with the actual message or stimulus itself such as linguistics, size, and context. Context of

messages presented by management agencies was considered a problem in the past. An early study of interpretive and public information publications from the Forest Service, Park Service, and Bureau of Land Management found this information to be difficult to read and thus to be of limited effectiveness to the audience (Hunt and Brown, 1971).

Personal determinants of comprehension include motivation, knowledge, and expectation or conceptions. Knowledge stored in memory is a major determinant in comprehension. Previous knowledge defines how categorization takes place in the mind. Manfredo and Bright (1991) suggest that the more experienced visitor has different informational needs compared to the less experienced visitor because of the knowledge gained from greater experience. Expectations or conceptions of the information presented could also differ according to experience levels of visitors and be related to the knowledge gained through experience.

Acceptance

The willingness of the consumer to accept the message or argument presented is acceptance (McGuire 1976, Engel and others 1990). Two types of responses, cognitive and affective, influence acceptance (Engel and others 1990). Cognitive, sometimes referred to as cold responses, are either favorable or supportive in nature or they are unfavorable counter arguments. The strength of these arguments will have much to do with whether the message/information is accepted or rejected.

Affective responses deal with the emotions or feelings the message/information produces in the person receiving the information (Engel and others 1990). Affective responses are also called 'hot' responses due to the emotions or feelings they elicit. While management agencies cannot control these types of responses in the visitors, they can try to influence the activation of these responses through message design (Engel and others 1990).

Retention

Retention is the phase of information processing that deals with storing or entrance of new information into long term memory (Engel and others 1990). Several factors come into play with retention and memory.

One factor or variable to consider about retention or memory is the type or stage of memory accessed by the information. The multiple-store model of memory proposes three stages of memory. These stages are sensory, short-term memory, and long term memory (Bourne and others 1979).

Sensory memory is activated in the first fractions of a second after exposure to the stimulus (Bourne and others 1979). Audio and visual characteristics of the stimuli are processed in this stage. After initial processing into sensory memory, the information passes into short term memory (Bourne and others 1979). If the information is interpreted as important and stimulates elaboration, it will then be rehearsed. In the context of persuasion, elaboration is defined as "the extent a person thinks about the relevant issue-arguments contained in a message" (Petty and Cacioppo 1986). Rehearsal in this sense is part of elaboration in that the information contained in the message is processed or repeated a number of times so it will not be forgotten (Engel and others 1990).

The amount of elaboration or rehearsal can affect the persuasive impact of the message. The more elaboration given to the message information, the more persuasive the impact of the message (Petty and Cacioppo 1986). The more elaboration given to a message, the more likely the message will be learned or integrated with previous knowledge (Engel and others 1990). So an increase in the persuasive impact of the message could mean a greater chance of storage of the information in long term memory.

Rehearsal allows for storage or passing of the information into long term memory. Long term memory is the storage place or data base for the knowledge and information

we possess (Bourne and others 1979). The information is encoded into long term memory for retrieval or remembering when needed (Engel and others 1990).

Since retention is the stage of information processing that can affect future behavior by storing knowledge for future reference, it is important to understand something of how we learn and/or retain information (Engel and others 1990). Also important are factors that can increase retention.

A number of methods are available for enhancing the retention of information. Pictures or visual imagery may be used in educational messages to impart knowledge and activate past knowledge for reinforcement of the desired message (MacInnis and Price 1987). Words that are easily visualized or that evoke visual imagery are also used to improve or raise retention (Klatzky 1975).

Another factor believed to increase learning is self-referencing. Self-referencing is the relation of previous knowledge and experience to newly acquired information (Engel and others 1990). Self-referencing is an important concept to consider in this project. The level of knowledge visitors hold is important in deciding what information to provide (Olson and others 1984), and could help management understand what visitors need what type of information. Most or many of the visitors to the Selway-Bitterroot will have previous experience in backcountry use and also knowledge of low-impact techniques. Messages used for this research are designed to enhance self referencing. This is accomplished by presenting information that many users will have knowledge of from previous visits or from other information sources such as contact with Forest Service personnel, contact with other wilderness users, books, brochures etc.

The stages of information processing are complex and involve many variables. Some, such as those concerning the stimulus or message, are under the control of management agencies. Others, such as those that deal with characteristics of the person receiving the message, are not under agency control. Agencies need to account for the

variables they cannot control when designing messages. This can be done by providing a variety of information that will attract visitors with differing personal characteristics.

To undertake a study of the complete information processing model would be extremely complicated and far beyond the scope of this research project. Thus for this research, two stages of information processing, Attention and Retention, will be the focus of study. Along with retention of messages, recall of the information presented will also be measured.

Figure 2 provides a more complete information processing model. Personal and stimulus determinants along with cognitive and affective responses and the three stage memory model are added to the model in Figure 1. The additions give the Information Processing model more complexity and suggests the relationships to be investigated in this study. The model shown in Figure 2 is adapted from the Information Processing model developed by McGuire (1976) and the multiple-store model of memory storage (Bourne and others 1979).

Adapted Model of Information Processing

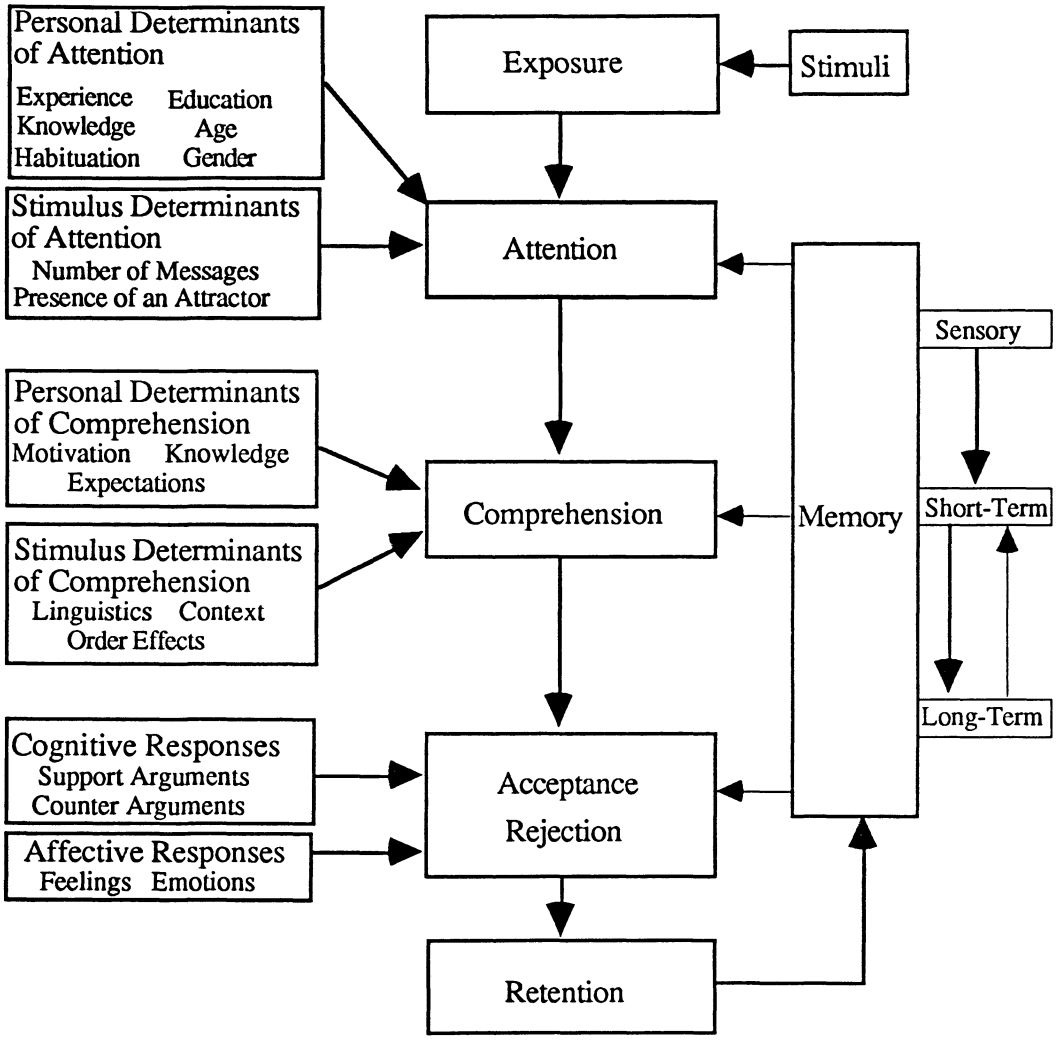


Figure 2. Stages of Information Processing, Related Determinants, and Memory

The model in Figure 2 shows the complexity of information processing and how some of the variables that intervene and confound or complicate information processing interact. Some of the variables that deal with messages can be influenced or controlled by the managing agency. As the model suggests, each stage of information processing has several factors that influence the strength of the movement of the stimuli to the next stage.

The process is similar to the way organizations operate (Weick 1979). The steps proposed by Weick (1979), enactment, selection, and retention, can be viewed as almost parallel to those of individual information processing. Enactment for an individual would be exposure and attention to the information, selection would be the stages of comprehension and acceptance, and retention would follow for both individuals and organizations.

As mentioned earlier, the two stages of the model to be investigated by this research are attention and retention. Recall of messages will also be examined as a sub component of retention. Recall was measured as aided recall and unaided recall in a study of television viewers of a Montana advertising campaign (Reilly, Muhs and Snepenger 1988). This study found that both aided and unaided recall were significantly greater after viewers had seen the advertisement on television.

A study of the effectiveness of brochures used to promote charter boat trip opportunities on the Oregon coast defined recall as the ability of the person to remember receiving a brochure (Baas, Manfredo, Lee and Allen 1989). The research reported here will expand on this definition. For this research, recall is defined as being different from retention in the following way. Retention is measured by correct visitor response to questions about suggested low-impact practices from messages presented on the bulletin board. Recall is measured by simple identification of the low-impact messages that were presented.

There are certain assumptions that need to be addressed with regard to the three stages not specifically examined in this research. The first stage, exposure, is held constant for each treatment in that visitors were exposed to specific messages and the retention and recall scores were computed only as they related to the specific messages on the bulletin board. While it is impossible to completely control how much visitors made

use of their previous knowledge as they completed the questionnaire, visitors were instructed to answer the questions as they related to messages seen on that visit.

Comprehension of messages is also assumed to have been constant for all visitors. The design and content of each individual low-impact message was such that reading and understanding of the message should not have presented a problem if attention was sufficient to allow the visitor to read the messages.

Knowledge of low-impact information could possibly affect comprehension of the low-impact messages presented. Visitors who had previous or conflicting information about low-impact practices might assume that the information presented was already known and not make the effort to comprehend the information presented. Previous knowledge was also a possible factor in the amount of attention given to the messages.

Acceptance or rejection of messages are components of the model that could influence retention of low-impact messages. The model implies that acceptance of the messages leads to retention (Engel and others 1990). It might also be argued that rejection of the message due to prior held beliefs could cause the messages to be retained. Visitors who are presented with messages that contradict strongly held attitudes and beliefs might retain the conflicting messages but not accept it as being the correct information or behavior (Fishbein and Ajzen 1975). This rejection could thus cause retention of the messages but not lead to adoption of the suggested visitor behavior. The research reported here is not designed to measure visitor acceptance of or practice of the suggested low-impact techniques.

Attention to low-impact messages by visitors is a major focus of this study. This stage of information processing is very important to managing agencies attempting to inform and educate visitors since it is the first stage which accesses memory. The model suggests that the influence of personal determinants and stimulus determinants could cause differences in the attention given to the low-impact messages presented on the

bulletin boards (Engel and others 1990). These personal and stimulus determinants are also proposed to affect retention and recall of messages by affecting attention (Engel and others 1990). These suggested differences form the basis for the study hypotheses.

STUDY HYPOTHESES

The primary objective of this study, as stated earlier, is to test if the number of low-impact messages on a bulletin board affects attention and retention. The limited nature of personal span of attention should be of concern to management agencies wishing to present several messages. Research indicates that short concise messages are more effective than long messages filled with an abundance of information (Engel and others 1990). Short concise messages, the suggested method of presenting information (Engel and others 1990), allow for an increased number of messages to be presented in the same amount of space. However, an abundance of messages can result in noise that can cause specific messages to become lost (Engel and others 1990). The Forest Service often posts a number of messages on bulletin boards and this might result in important messages being ignored. It would be of value to know if there is a threshold to the number of messages visitors will pay attention to before they perceive the number is too many and decide to ignore the information. Thus,

Hypothesis 1: *Attention to the bulletin board will decrease as the number of messages presented on the bulletin board increases.*

Stimulus or message determinants are, as previously stated, characteristics of the stimulus/message that are controlled by the agency presenting the message (Engel and others 1990). One of the important message determinants that management agencies can vary to attract attention is position. Positioning bulletin boards and registration stations by placing them up the trail from the trailhead has been shown to increase attention to

messages and compliance with requests for voluntary registration (Petersen 1985, Lucas and Kovalicky 1982, Stubbs 1990). This research will apply the technique of placing the bulletin boards up the trail.

The second objective of this study is to measure the effect that attractors have on attention to bulletin boards. An attractor is a stimulus factor used by management or advertising agencies to gain attention. This attractor for the Forest Service has very often been in the form of a map of the area. Research has shown (Lucas 1990, Lucas 1985) that maps are the source of information most used by wilderness visitors. Maps are currently used on many existing Forest Service bulletin boards. Thus,

Hypothesis 2: *Attention to the bulletin board will be greater with the presence of an attractor (map) than without an attractor.*

Factors that influence attention can be broken into personal and stimulus/message determinants (Engel and others 1990). One important personal determinant is knowledge as it relates to previous experience. The need or desire for information of experienced visitors has been shown to be less than that of inexperienced visitors (Krumpe and Brown 1982, Roggenbuck and Berrier 1982, Williams and Huffman 1986). Since visitor wilderness experience levels can be related to the amount of information sought (Krumpe and Brown 1982, Roggenbuck and Berrier 1982, Williams and Huffman 1986), attention to information could be influenced by experience levels. Attitudes of visitors can also influence attention (Engel and others 1990). Experienced visitors' attitudes about information can differ from inexperienced visitors and lead to less information seeking by experienced visitors. Thus,

Hypothesis 3: *Attention to the bulletin board will decrease as the experience level of visitors increases.*

An important visitor characteristic to consider when providing information is visitor knowledge about the specific topic the information is communicating (Olson and others 1984, Fazio 1979). Visitor knowledge about low-impact practices can be measured in a number of ways. Two of these used in this research include testing visitors' knowledge about low-impacts practices through written or oral questioning, and allowing visitors to rate their knowledge level through a self assessment. Roggenbuck and Berrier (1982), and Williams and Huffman (1986) suggest that visitors who consider themselves knowledgeable about low-impact practices have less motivation to read bulletin boards that present information about such practices. Thus,

Hypothesis 4: *Attention to the bulletin board will be less for visitors who consider themselves knowledgeable about low-impact practices than for visitors who do not consider themselves knowledgeable.*

Habituation, another personal determinant of attention, could also be directly related to attention (Engel and others 1990, Cacioppo and Petty 1979). Some messages used by the Forest Service are designed for specific geographic areas. Others, designed for problems or needs found in a number of different places, are used system wide. This type of message distribution can result in visitors viewing the same message at a number of geographically different areas. Another point to consider is the fact that many visitors might have been exposed to low-impact messages by land management agencies other than the Forest Service or by other sources (Fazio 1979). This study will use new messages or variations on previously used messages to attempt to alleviate this problem. While visitors might spend less time giving attention to commonly exposed messages, new messages or messages presented in new variations might receive greater attention. Thus,

Hypothesis 5: *Attention to the bulletin board will be greater for visitors who have not been frequently exposed to low-impact messages than for visitors who have been frequently exposed to low-impact messages.*

Previous research has suggested differences in information seeking between day hikers and backpackers (Lucas 1981). Differences in length of stay for day hikers versus overnight backpackers was also suggested to influence compliance rates for voluntary trail registration in a similar study (Lucas 1983). These differences might result from less felt need or motivation to seek information for day users than for overnight users. Overnight visitors could view the information presented as being more salient or important for their trip and activities. If these differences show up in the way information is viewed and the amount of attention given to information presented on bulletin boards, managing agencies might be more successful in designing different messages for the specific visitor segments. Thus,

Hypothesis 6: *Attention to the bulletin board will be greater for backpackers than for day hikers.*

Differences in visitors who travel by foot versus horseback have been documented in several studies of wilderness users. Hikers were shown to have higher educational levels that horse users in several studies (Lucas 1985, Lucas 1980). Horse users have been shown to be less likely than hikers to have contact with the Forest Service and also to be less likely to have Forest Service or other types of maps (Lucas 1985, Lucas 1980). These differences might suggest that management use a different approach to contact and inform horse users than that used for hikers (Lucas 1985). A study of visitors to the Selway-Bitterroot Wilderness found that horse users were less likely to have picked up an informational brochure than hikers, however the difference was not significant (Lucas

1981). Another study of wilderness users in the Bob Marshall Wilderness (Lucas 1983) found that horse users were much less likely to register when entering the area than hikers. One reason postulated for this was that many of the horse users were visiting the area for hunting trips with outfitters and the outfitters might not have instructed their clients to register. The outfitters might not have seen the registration as necessary or useful. Since horse users seem different from hikers in the way they comply with registration requests and make use of agency provided information, they could also differ in the time they spend reading messages on agency bulletin boards. Thus,

Hypothesis 7: *Attention to the bulletin board will be greater for hikers than for horse users.*

Retention, the second major stage of information processing to be investigated in this project, involves storage of information into long term memory (Engel and others 1990). Retention is often related to the amount of attention given to the information presented in the message (Engel and others 1990). Direct measurement of retention of specific low-impact information is difficult due to the confounding effect of previous knowledge regarding low-impact practices. Visitors' ability to correctly answer questions about specific low-impact messages, and recall of specific messages presented will be used as surrogate measures of retention. While this project will not directly measure the stages of information processing that come between attention and retention/recall, it will attempt to measure the relationship between attention to messages and retention of information presented in the messages. This measurement dictates the assumption that if the message is retained/recalled, it has first been comprehended and accepted. Thus,

Hypothesis 8: *Retention/recall will be positively correlated with attention to the bulletin board.*

A primary objective of this study deals with how attention and ultimately retention/recall are affected by the number of low-impact messages presented on bulletin boards. Noise or clutter have been shown to relate to the amount of attention and retention/recall given to television commercial messages (Webb 1979). The number and complexity of messages also influences the amount of elaboration a single message is given and influences whether the message information is stored in long term memory (Engel and others 1990). Thus,

Hypothesis 9: *Retention/recall of low-impact messages will decrease as the number of messages presented on the bulletin board increases.*

As previous research has shown, there are differences in the amount and levels of information sought by visitors. These differences can be related to the experience level of visitors (Roggenbuck and Berrier 1982, Williams and Huffman 1986), and are hypothesized to relate to the amount of attention given to messages presented on bulletin boards. Experienced visitors have been shown to seek less information than inexperienced visitors (Roggenbuck and Berrier 1982, Williams and Huffman 1986) and these differences in information seeking could also have implications in information retention/recall. Thus,

Hypothesis 10: *Retention/recall of low-impact messages will decrease as the experience levels of visitors increases.*

Other visitor characteristics have also been shown to affect the information seeking behavior of visitors. User types, day users and overnight users and hikers and horse users, have been found to have different information seeking behavior (Lucas 1981, Lucas 1983). Length of stay for day versus overnight use is one suggested reason for this difference in information sought. Another reason for this difference might be the amount

of salience given the information by day users versus overnight users. An earlier hypothesis is that attention will be greater for overnight users than for day users. It follows that if attention is greater, retention might also be greater. Thus,

Hypothesis 11: *Retention/recall of low-impact messages will be greater for overnight users than for day users.*

Habituation to messages can affect the amount of attention that is given to them if visitors have been exposed to the information so often that they do not pay attention to the information (Engel and others 1990, Cacioppo and Petty 1979). It also follows that habituation can affect retention/recall levels by influencing the amount of attention and elaboration given to the messages. Visitors who have frequently seen low-impact messages might be likely to pay less attention to messages on the bulletin boards thinking there is no new information presented. They might also think they have sufficient knowledge with regard to low-impact techniques. Habituation to all messages could cause attention to new or redesigned messages presented on the bulletin board to be low and retention/recall of such new messages could be effected. These visitors could be less likely to elaborate on the new information presented in these messages thinking they already know what is being presented. Thus,

Hypothesis 12: *Retention/recall of low-impact messages will be greater for visitors who have not been frequently exposed to low-impact messages than for visitors who have been frequently exposed to low-impact messages.*

CHAPTER THREE

METHODOLOGY

Study Area

The study area for this research project was one trail in the Selway-Bitterroot Wilderness. Located in Montana and Idaho, the Selway-Bitterroot contains 1,340,681 acres with approximately 250,000 acres in Montana and the remainder in Idaho. This research focused on visitors accessing the wilderness through the Bitterroot National Forest in Montana. Big Creek trail, on the Stevensville Ranger District, was selected as the location for the study. Selection of this trail was based on the level and type of use. A detailed map of the study area is found in Appendix E.

Big Creek trail is located in the east front of the Bitterroot Mountain range about 5 1/2 miles south of Stevensville, Montana. It is one of the wider drainages in the east front of the Bitterroots. The trail grade is relatively easy and gains little elevation until the last mile before reaching Big Creek lake. Big Creek lake is approximately 10 miles from the trail head. Big Creek trail also provides access for several other lakes in the area around Big Creek lake. Pack Box Pass, one access to the Idaho portion of the Selway-Bitterroot Wilderness, is also accessed from Big Creek trail (Morrison 1982).

Study Population

Visitors to the area include day hikers, fishermen, horseback riders, backpackers, and occasionally mountain bikers. The study population consists of those visitors who used Big Creek trail during the sampling period. Visitors asked to complete the questionnaire were further limited to those visitors to Big Creek trail who were 18 years of age or older.

Experimental Design

This research used a bulletin board to present low-impact messages and an attractor (map) to visitors. Forest Service specifications were followed in the design and construction of the bulletin board.

Eight messages about low-impact practices were identified for use in the study. These messages are listed in Appendix A. Messages were designed to be similar in length, approach, and appearance. Design of the actual message posters was done by the graphic arts supervisor from printing services at The University of Montana.

Messages consisted of low-impact techniques suggested for day and/or overnight use. Some techniques were specific to overnight use such as campsite selection, campsite behavior, and fire building techniques. Others, such as trail behavior, human waste disposal, and fish entrails disposal, were applicable for both day and overnight use . Since a past study found that the majority of use on Bitterroot trails was day use (Lucas 1981), messages were combined in treatments so that information presented in each treatment was pertinent to both day and overnight users.

Treatments were randomly assigned to specific weeks for sampling. Since there was no practical way to randomize subjects to treatments, it is assumed that random assignment of treatments to weeks is equivalent to random assignment of subjects to treatments.

The research experiment was designed to measure attention and retention/recall of visitors to varying numbers of low-impact messages and a map of the area displayed on a bulletin board. Data was collected from visitors to the Selway-Bitterroot Wilderness who accessed the area at Big Creek trailhead. Attention of visitors to low-impact messages or a map displayed on a trail bulletin board was recorded by camera and personal observation and was measured by the amount of time spent reading or viewing the messages and/or the map. Retention and recall of low-impact messages presented on the

bulletin board were measured through the use of a survey questionnaire administered to visitors as they exited the trail.

The bulletin board was located just inside the wilderness boundary, approximately 1 and 1/2 miles up the trail from the trailhead parking area. This location was chosen to minimize sampling of casual visitors. The sampling period was June 21 to September 19, 1993. Originally the sampling schedule was to end September 12, but a trail closure caused sampling to be extended for one additional week. A complete outline of the sampling schedule is found in Appendix B.

As visitors entered and exited the trail, they were observed for identifying characteristics such as group size, gender, type and color of backpacks, hats, and other equipment. These characteristics were recorded and this information was later used to match questionnaire responses with attention data from the camera. Visitors were approached as they exited the trail and asked to cooperate in the study.

Individuals or groups that were in the area for a short time (defined as casual use) were not interviewed. To determine whether a specific individual or group's use was casual or not, they were asked whether or not they reached the first bridge that crosses Big Creek. The bulletin board was located just before the bridge. Visitors passed the bulletin board to reach the bridge and so were considered exposed to the bulletin board. If visitors did not reach the bridge, their use was classified as casual and they were thanked for their time but were not asked to complete the questionnaire.

After determining if visitors reached the bridge, the researcher then asked each member of the group to complete a short questionnaire. The researcher was present during completion of the questionnaire to assist those visitors who had questions. Estimated time required for completion of the questionnaire was five minutes.

The questionnaire was designed to gather data concerning visitor, group and trip characteristics along with knowledge and experience levels of visitors. Data was also

gathered on retention, aided recall, and unaided recall of messages presented on the bulletin board, and habituation of visitors to messages, and knowledge of specific low-impact techniques suggested by messages on the bulletin board. After the questionnaire was completed, the researcher thanked the visitors for their cooperation and the contact was concluded.

The design used in this research called for six treatments. Treatments were placed on the bulletin board for a one week period. This was done twice during the sampling season giving each treatment a total of two weeks exposure.

Treatments one through four consisted of increasing numbers of messages plus a map of the area displayed on the bulletin board. Treatment one displayed two messages, treatment two had four messages, treatment three had six messages, and treatment four had eight messages posted on the bulletin board. Treatment five was the control treatment for the experiment. During treatment five, only the map was displayed on the bulletin board. Treatment six was designed to test the effectiveness of messages on the bulletin board without the map and also to provide data about the strength of the map as an attractor. For this treatment, four messages were displayed. A schedule of when treatments were displayed at Big Creek is shown in Table 1.

Table 1. Schedule of Treatments and Week of Placement

Treatment	Week of Placement
1	6, 9
2	4, 10
3	5, 11
4	2, 8
5	3, 12
6	1, 7

The bulletin board at Big Creek consisted of two panels. Each panel was four feet by four feet. The map was posted on the left panel for those treatments that required the presence of the map. When the treatment did not call for the map to be displayed, the left panel was empty. The right panel was used for the low-impact messages. Messages were displayed beginning in the top left hand corner and going toward the right corner. Four messages were placed in a row. If more than four messages were present on the bulletin board a new row was started. When the treatment called for no messages to be presented, the right hand panel was empty. A diagram of the bulletin board with eight messages and the map is represented by Figure 3.

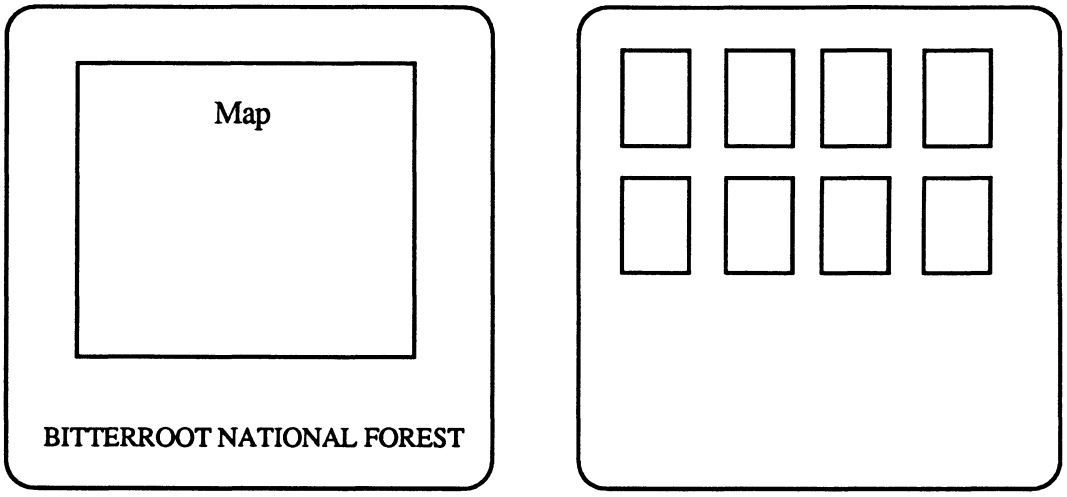


Figure 3. Big Creek Bulletin Board with Map and Eight Messages

Dependent variables tested in this research are attention and retention/recall of messages presented on the bulletin board. The experiment was designed to measure visitors' attention to the bulletin board using camera and personal observation. The camera angle and position at Big Creek made it possible to determine whether visitors were looking at either the map or messages on the bulletin board. This allows for attention to be broken into three parts. The first of these is total attention and is defined

as the total time spent looking at the bulletin board. Total attention includes time spent looking at the messages and the map. The second part, message attention, is defined as only the time spent looking at messages presented on the bulletin board. The third type of attention, map attention, is defined as only the time spent looking at the map.

Retention, aided recall, and unaided recall were measured using data from the questionnaire administered at Big Creek. Retention was operationalized as the percentage of correct answers to questions about specific messages presented on the bulletin board in relation to the number of messages displayed during the treatment. For example, if the treatment displayed 4 messages and the respondent correctly answered 2 of the questions about those messages, the retention score would be 50%.

Aided recall was operationalized as the percentage of messages correctly identified as being displayed during the treatment in relation to the actual number of messages displayed during the treatment. For example, if the treatment displayed 4 messages and visitors correctly selected 2 of those messages from the list of messages in the questionnaire, the aided recall score would be 50%.

Unaided recall was operationalized as the percentage of messages correctly listed by visitors as being seen during their visit in relation to the actual number of messages displayed during the treatment. For example, if the treatment displayed 4 messages and the respondent listed 2 of those 4 messages, the unaided recall score would be 50%.

Independent variables include the treatments, and personal characteristics of visitors such as experience level, travel methods, knowledge levels concerning low-impact practices, type of use engaged in while at the site, and level of habituation to low-impact messages.

CHAPTER FOUR

VISITOR CHARACTERISTICS

The experimental design called for unobtrusive observation of visitors at the bulletin board and use of a questionnaire administered at the trailhead to visitors returning from a trip. A total of 222 visitors were contacted at Big Creek; five people refused to complete the questionnaire, resulting in a net sample of 217. Median age for males in this sample was 34, for females it was 39. Gender proportions for this sample are 61 percent male (n = 133) and 39 percent female (n = 84).

A total of 289 camera observations were made of visitors who were not contacted at the trailhead or asked to complete the questionnaire. Gender proportions for the observed sample, are 73 percent male (n = 211) and 27 percent female (n = 78).

Tables 3 through 19 present specific visitor characteristics for visitors to Big Creek. The questionnaire sample (visitors who completed the questionnaire), the observation sample (visitors who did not complete the questionnaire but were observed at the bulletin board), or the combination of these two samples were used to generate data for tables. The specific sample corresponding to the data is so noted in the table title.

Information in Table 2 was obtained from the questionnaire completed by visitors and documents the level of educational attainment of these visitors. The vast majority of visitors, over 90 percent, completed high school and a large proportion, over 70 percent, completed at least some college. More than 40 percent of visitors were college graduates and over 20 percent had worked on post graduate degrees. Females were more likely to have at least some college education (84 percent) than males (69 percent).

Table 2. Level of Educational Attainment by Sex, in percent, for Questionnaire Sample Big Creek Trail, Selway-Bitterroot Wilderness

	Sex		
Level	Male (n=133)	Female (n=84)	Total (n=217)
8th Grade or Less	7%	4%	6%
High School	25	12	20
Some College	25	32	28
College Graduate	22	31	25
Post Graduate	22	21	22

The majority of visitors to Big Creek, 63 percent, were day users. Questionnaire sample data (Table 3) shows that day users were equally split between males and females while overnight users were much more likely to be males. Visitors in the observation sample were more like to be male for both day and overnight users. Overnight visitors from the observation sample were much more likely to be male than female, 90 percent male to 10 percent female.

Table 3. Type of Use by Sex, in percent, for Questionnaire and Observation Samples Big Creek Trail, Selway-Bitterroot Wilderness

	Type of Use			
	Questionnaire Sample		Observation Sample	
Sex	Day (n=131)	Overnight (n=86)	Day (n=187)	Overnight (n=102)
Male	50%	79%	64%	90%
Female	50	21	36	10

Travel methods for visitors to Big Creek are reported in Table 4. Hikers were more numerous than horse users among visitors who completed the questionnaire, 76 percent to 24 percent. This was also true for visitors who were observed but did not complete a questionnaire, 57 percent to 43 percent. Males made up the majority of both samples for hikers and horse users. Hikers made up 59 percent of day users at Big Creek and 74 percent of overnight users.

Table 4. Method of Travel by Sex, in percent, for Questionnaire and Observation Samples Big Creek Trail, Selway-Bitterroot Wilderness

	Method			
	Questionnaire Sample		Observation Sample	
Sex	Hiker (n=163)	Horse (n=52)	Hiker (n=165)	Horse (n=124)
Male	64%	69%	71%	76%
Female	36	31	29	24

Habituation to low-impact information and the possible influence of habituation on attention are investigated by this study. Visitors were asked to choose a response that best described how frequently they had seen low-impact information (Table 5). A large majority of all visitors sampled indicated that they had at least been exposed to low-impact information. Most visitors responded "not very frequently" or "frequently". These results indicate that moderate levels of habituation to low-impact information are most common.

Table 5. Frequency of Low-Impact Information Seen by Method of Travel, in percent, for Questionnaire Sample, Big Creek, Selway-Bitterroot Wilderness

	Method	
Frequency	Hiker (n=161)	Horse (n=51)
Never	7%	4%
Not Very Frequently	45	49
Frequently	44	37
Very Frequently	4	10

Another visitor characteristic suggested to possibly affect attention is knowledge of low-impact information. Visitors were asked to make a self assessment of their knowledge about low-impact practices. Results of this self assessment are shown in Table 6. Very few visitors thought they were not very knowledgeable about low-impact practices. Most visitors considered themselves at least somewhat knowledgeable and over half thought they were at least very knowledgeable about low-impact practices.

Table 6. Knowledge of Low-Impact Practices by Method of Travel, in percent, for Questionnaire Sample, Big Creek, Selway-Bitterroot Wilderness

	Method	
Knowledge	Hiker (n=162)	Horse (n=51)
Not Very	10%	18%
Somewhat	35	33
Very	37	37
Extremely	19	12

Experience was measured by six variables in this study. Three of the variables used to measure experience were categorical in nature. These are shown in Tables 7 through 9. Table 7 shows visitors' assessment of their experience with wilderness travel. Few visitors felt they were inexperienced with wilderness travel. The majority felt they were either somewhat or very experienced.

Visitors were asked to quantify their wilderness visitation with the response that best represented the average number of times per year they visited designated wilderness (Table 8). Horse users seemed to make more visits per year than hikers. Most visitors reported making two or more visits per year to designated wilderness areas. These results are not surprising given the high percentage of local visitors and the relatively close proximity of a number of designated wilderness areas to Big Creek.

The length of respondents' typical wilderness visit is reported in Table 9. Most visitors reported that they typically spent at least a full day. More than half of visitors to Big Creek report that their typical visit was overnight. Horse users seemed to have longer typical visits than hikers.

Table 7. Experience With Wilderness Travel by Method of Travel, in percent, for Questionnaire Sample, Big Creek, Selway-Bitterroot Wilderness

	Method	
Experience	Hiker (n=162)	Horse (n=51)
Not At All	5%	6%
A Little	17	14
Somewhat	47	53
Very	31	28

Table 8. Average Visits Per Year to Designated Wilderness by Method of Travel, in percent, for Questionnaire Sample, Big Creek, Selway-Bitterroot Wilderness

	Method	
Average Visits	Hiker (n=162)	Horse (n=51)
1 or Less	21%	6%
2 to 5	40	39
6 to 10	19	21
More Than 10	20	35

Table 9. Length of Typical Wilderness Visit by Method of Travel, in percent, for Questionnaire Sample, Big Creek, Selway-Bitterroot Wilderness

	Method	
Length	Hiker (n=158)	Horse (n=49)
A Few Hours	17%	6%
A Full Day	34	33
1 to 2 Nights	32	37
More Than 2 Nights	18	25

Experience was also measured with three interval level variables. Visitors were asked to describe their level of experience in the Selway-Bitterroot Wilderness. Specifically, they were asked to report the number of visits made to the Bitterroot Canyons located on the Montana side of the Bitterroot Mountains. Results in Table 10

display data for hikers and horse users. Horse uses report more visits to Bitterroot Canyons than hikers and large standard deviations indicate a wide variation in responses.

The average number of different designated wilderness areas visited for hikers and horse users is reported in Table 11. Horse users report visiting more designated wilderness areas than hikers. Standard deviations are also large indicating a large variation in the number of wilderness areas visited.

Total visits to designated wilderness areas were averaged for hikers and horse users and reported in Table 12. Horse users report more total visits to designated wilderness areas than hikers. Again standard deviations are large indicating a great degree of variability in total visits to wilderness areas.

Table 10. Mean Visits to Bitterroot Canyons by Method of Travel, for Questionnaire Sample, Big Creek Trail, Selway-Bitterroot Wilderness

	Method	
	Hiker (n=159)	Horse (n=51)
Mean	18	34
Standard Deviation	28	38

Table 11. Mean of Different Wilderness Areas Visited by Method of Travel, for Questionnaire Sample, Big Creek Trail, Selway-Bitterroot Wilderness

	Method	
	Hiker (n=157)	Horse (n=52)
Mean	9	12
Standard Deviation	15	23

Table 12. Mean Total Visits to Wilderness Areas by Method of Travel, for Questionnaire Sample, Big Creek Trail, Selway-Bitterroot Wilderness

	Method	
	Hiker (n=154)	Horse (n=50)
Mean	28	40
Standard Deviation	32	40

Tables 13, 14, and 15 report mean attention scores (in seconds) by method of travel for total attention, message attention, and map attention. As stated earlier total attention is the total time spent looking at the bulletin board, message attention is the time spent looking only at messages, and map attention is the time spent looking only at the map. Total attention, message attention, and map attention were significantly higher for hikers than for horse users. Standard deviations are large indicating much variation in attention to the bulletin board. Note that when examined separately, map attention for hikers was much greater than message attention.

Table 13. Mean Total Attention (in seconds) by Method of Travel, Big Creek Trail Selway-Bitterroot Wilderness

	Method	
	Hiker (n=152)	Horse (n=48)
Mean	66	4
Standard Deviation	69	10

Table 14. Mean Message Attention (in seconds) by Method of Travel, Big Creek Trail, Selway-Bitterroot Wilderness

	Method	
	Hiker (n=152)	Horse (n=48)
Mean	16	3
Standard Deviation	18	6

Table 15. Mean Map Attention (in seconds) by Method of Travel, Big Creek Trail, Selway-Bitterroot Wilderness

	Method	
	Hiker (n=152)	Horse (n=48)
Mean	43	1
Standard Deviation	63	5

Retention of low-impact messages presented on the bulletin board was computed for visitors who completed the questionnaire. Retention was measured by visitor's ability to answer questions concerning specific behaviors recommended by the low-impact messages on the bulletin board (see Appendix C, questions 11 - 18). Correct responses to the questions were given a score of 1 and incorrect responses 0. There was only one correct response for each question according to the messages presented. Responses were then totaled and divided by the number of messages displayed during the treatment to obtain the retention score in percent. For example, if a visitor sampled during treatment 2

(four messages on the bulletin board) correctly answered three of the questions pertaining to the specific messages presented during treatment 2, their retention score would be 75 percent. Retention of low-impact messages for hikers and horse users is presented in Table 16. Hikers' scores were significantly higher than horse users for retention (Table 16).

Table 16. Retention, in percent, by Method of Travel, Big Creek Trail, Selway-Bitterroot Wilderness

	Method	
	Hiker (n=163)	Horse (n=52)
Percentage Correct	43%[a]	22%[a]
Standard Deviation	32	23

[a] Percentages are significantly different at the alpha = .05 level using a one tail t-test.
* Retention, as measured here, is the percent of correct responses in relation to the actual number of messages presented on the bulletin board.

Recall of messages presented was measured in two ways, aided recall and unaided recall. Aided recall was measured by visitors ability to correctly check the specific types of information they had seen on their visit from a list on the questionnaire. The list contained all messages presented on the bulletin board along with other types of information commonly given to wilderness visitors. The number of correct responses corresponding to the treatment were totaled and divided by the number of possible correct responses to yield the aided recall score in percent. For example, if a visitor correctly identified two of the four messages presented during treatment 2, the aided recall score would be 50 percent. Aided recall for hikers and horse users in shown in Table 17.

Hikers scored significantly higher than horse users for aided recall (Table 17). While scores were not reduced when visitors responded that they had seen messages that were not really there, visitors did not often indicate that they had seen messages that were not present.

Table 17. Aided Recall, in percent, by Method of Travel, Big Creek Trail, Selway-Bitterroot Wilderness

	Method	
	Hiker (n=163)	Horse (n=52)
Percentage Correct	45%[a]	29%[a]
Standard Deviation	40	31

[a] Percentages are significantly different at the alpha = .05 level using a one tail t-test.
* Aided recall, as measured here, is the percent of correct responses in relation to the actual number of messages presented on the bulletin board.

Unaided recall was measured by simply asking visitors to list the information they had seen about wilderness travel during their visit. The number of messages listed by visitors and present during the treatment was divided by the number of messages displayed during the treatment to give the unaided recall score in percent. For example, a visitor who listed the map and three of the four messages present during treatment 2 would receive an unaided recall score of 80 percent. Although the map was not considered a low-impact message, it was included in the measurement of unaided recall. Unaided recall for hikers and horse users in presented in Table 18. Unaided recall scores were not significantly higher for hikers than horse users (Table 18).

Table 18. Unaided Recall, in percent, by Method of Travel, Big Creek Trail, Selway-Bitterroot Wilderness

	Method	
	Hiker (n=163)	Horse (n=52)
Percentage Correct	21%	14%
Standard Deviation	33	27

* Unaided recall, as measured here, is the percent of correct responses in relation to the actual number of messages plus the map presented on the bulletin board.

Along with retention of specific messages, it is possible to calculate a total knowledge score for visitors. This score is a measure of knowledge about low-impact techniques regardless of the messages on the bulletin board. The method used to calculate the total knowledge score was to sum the number of correct responses to eight low-impact items in the questionnaire. Hikers scored significantly higher than horse users for this measure of low-impact wilderness knowledge (Table 19).

Table 19. Mean Total Knowledge Score by Method of Travel, Big Creek Trail, Selway-Bitterroot Wilderness

	Method	
	Hiker (n=163)	Horse (n=52)
Mean	2.9[a]	1.7[a]
Standard Deviation	1.8	1.2

[a] Means are significantly different at the alpha < .001 level using independent samples t-tests.
* Total Knowledge, as measured here, is the average of correct responses regardless of the number of messages presented on the bulletin board.

In summary, visitors to Big Creek who were sampled were predominantly male, day users with at least a high school education. There were more hikers than horse users. Most had seen low-impact information although a rather large proportion reported not having seen it very frequently. The majority considered themselves at least somewhat knowledgeable about low-impact practices and at least a little experienced with wilderness travel.

Most visitors took more than one trip to wilderness per year and spent at least a full day on their visit. There was much variation in the amount of previous experience respondents had with Bitterroot Canyons. Horse users reported more visits on average than hikers. This is not surprising since many of the horse users at Big Creek were from the immediate area.

The number of different wilderness areas visited was about even but again there was large variation indicating that some had visited a large number of different areas and others had not visited as many. Horse users made more total visits to wilderness areas on average but the large variance indicates the same pattern as above with some making many visits and others not so many.

Attention to the bulletin board showed marked differences between hikers and horse users. While there was again large variation, the average attention for hikers was much larger that than for horse users. This was also true when attention was separated into map and message attention.

Retention of messages showed a similar pattern as attention with hikers having higher retention scores that horse users. Aided and unaided recall of messages also showed that hikers scored higher that horse users.

The relationship between attention and retention is important for management agencies such as the Forest Service to consider when designing information and education programs. If it holds that attention and retention are correlated positively,

techniques that increase attention could be very useful in determining the success of such information and education programs.

Visitors' knowledge of low-impact practices is very low. Overall, hikers could correctly answer less than 3 of 8 questions. Ever those presented with information on the bulletin board only answered 43% correctly. Horse users were even less knowledgeable and less able to answer questions correctly despite being presented with information on the bulletin board. These findings suggest that by themselves messages presented on bulletin boards might not be effective as a management tool to educate and inform visitors about low-impact practices.

CHAPTER FIVE

TESTS OF HYPOTHESES

Analysis Procedures

Analysis of variance procedures were used to assess the statistical significance of differences between means related to hypotheses 1, 3, 4, 5, 9, 10, and 12. T-tests were used to assess the statistical differences between group means for hypotheses 2, 6, 7, and 11. Pearson's correlations were used to analyze Hypotheses 8 and 10.

The use of analysis of variance procedures to test for differences in group means assumes normal distribution of data and equal variances. Preliminary data analysis indicated that attention means were not normally distributed, were positively skewed, and that variances were not equal.

Transformation of data can sometimes satisfy the assumptions of normality and equal variances. Data were examined to determine if transformation might normalize the distribution. The log transformation is used to normalize positively skewed distributions and the attention data were positively skewed (Kleinbaum, Kupper and Muller 1988). The data were transformed using the natural log transformation.

Another assumption for using ANOVA is that of equal variance. Since formal tests for equal standard deviations in several groups are not considered robust against non-normality, Moore and McCabe (1989) suggest that if the ratio of the largest standard deviation to the smallest is less than 2, the assumption of equal variation is satisfied. The log transformation of data satisfied the equal variance assumption.

Although the analyses were conducted using transformed data, reporting results for transformed means does not yield information that is useful for management, examination, or decision-making. Thus, the ANOVA tables are shown with figures for

the transformed data but actual means are reported in the multiple comparison test tables and descriptive statistics.

Hypotheses in this research imply a linear relationship. ANOVA is ordinarily a non-directional test but does measure differences in means. SPSS Windows includes a test for linearity and this test was conducted along with ANOVA to determine if the linear relationships predicted by the hypotheses are supported.

The analysis procedure used to examine the hypotheses that compare two group means was an independent T-test. This procedure is robust against non-normality except when the data is strongly skewed or outliers are present (Moore and McCabe 1989). Attention scores are strongly skewed but there are conditions that allow for use of T-tests with skewed data. Having sufficiently large sample sizes (n>=40) and transformation of data are ways that can allow the use of T-tests for distributions that exhibit non-normality (Moore and McCabe 1989).

Sample sizes for most T-tests are greater than 40 and all analysis of attention is performed on data that has been transformed. The sample sizes that do not exceed n>=40 are noted in the text. As with the ANOVA tables, T-values will be reported for transformed data but actual attention means will be reported.

Output from the SPSS Windows independent T-tests provides statistics for pooled and separate-variances (Norusis 1992). The decision to use pooled-variance or separate-variance is based on the Levene's test of equal variance. If Levene's test indicates the population variances are not equal, the separate-variance t value and significance level is used. If the results of Levene's test indicates the population variances are equal, the pooled-variance t value and significance level is used.

The correlation coefficient provides a measure of association (Kleinbaum, Kupper and Muller 1988). The relationship between attention and retention/recall will be investigated by computing Pearson's correlation coefficients. Pearson's correlation is

used to describe association between two variables that are at the least interval level measurement (Moore and McCabe 1989).

The first two Hypotheses deal with attention and how it might be affected by the number of messages presented on the bulletin board. A question to consider is whether visitors who decided to stop and look at the bulletin board are different from those who decided not to stop. For the analyses of Hypotheses 1 and 2, attention will be operationalized first for all visitors who were observed, second for only those visitors who stopped and looked at the bulletin board, and third for those visitors who stopped and looked at the messages and visitors who stopped and looked at the map. For example, visitors who did not stop have attention scores of zero, visitors who stopped have total attention scores greater than zero but can have either message attention or map attention scores of zero, and visitors who stopped and looked at the messages have messages attention scores greater that zero. If visitors stopped and looked at the map their map attention scores are greater than zero.

To determine whether those who stopped were different from those who did not stop, cross tabulation with Chi square statistics was performed to check for differences. Fifty eight percent of visitors sampled during treatment 1 stopped at the bulletin board compared to 64 percent in treatment 2, 80 percent in treatment 3, 65 percent in treatment 4, 52 percent in treatment 5, and 58 percent in treatment 6. As might be expected, horse users were significantly less likely to stop at the bulletin board than hikers.

Hypotheses 1 and 2 will be analyzed for each of three types of attention: total attention or the total time visitors spent looking at the bulletin board, message attention or the time visitors spent looking only at messages, and map attention or the time visitors spent looking only at the map. The rest of the hypotheses will be analyzed for total attention first. If there are significant differences in total attention or if there is evidence to warrant separate analysis of message and map attention it will be performed.

Tests of Hypotheses

Hypothesis 1: *Attention to the bulletin board will decrease as the number of messages presented on the bulletin board increases.*

The first hypothesis was designed to test for differences in the amount of attention visitors give to messages presented on bulletin boards as the number of messages is increased. For the first test of hypothesis 1, attention was measured as total attention to the bulletin board. An explanation of how total attention was computed is found in Appendix F. Data used in the analysis of hypothesis 1 are from the combined questionnaire and observation samples.

As visitors approached the bulletin board they made decisions about whether to stop, and also decisions about whether to look at the messages, the map, or both. These decisions provide three ways to operationalize attention. The three ways of operationalizing attention are (1) for all visitors who passed the bulletin board, (2) for visitors who stopped at the bulletin board, and (3) for visitors who stopped at the bulletin board and looked at the messages or the map. The first analysis of Hypothesis 1 was conducted on all visitors who passed the bulletin board (Tables 20 - 25).

A simple factorial ANOVA was performed with total attention as the dependent variable and treatment as the independent variable. The treatments increase the number of low-impact messages presented on the bulletin board in increments of two as the treatment number increases by one (treatment 1 had two messages, treatment 2 had four messages, treatment 3 had six messages, and treatment 4 had eight messages). Each of these four treatments also displayed a map of the area. The results of the ANOVA (Table 20) indicate that statistically significant differences exist among some of the total attention means. The test for linearity is significant at the .05 level.

Table 20. ANOVA of Total Attention, in seconds, by Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	107.226	3	35.742	9.240	<.001
Residual	1237.852	320	3.868		
Total	1345.077	323	4.164		

Since the ANOVA indicates that differences exist among some of the treatment means for total attention, a post hoc test was conducted to determine which treatments differed in mean total attention. Scheffe's multiple comparison test was selected for use because it is designed for unequal sample sizes in cells and because it is robust (Kleinbaum, Kupper and Muller 1988). Results from Scheffe's test (Table 21) indicate total attention for treatment 3 is greater than it was for treatments 1 and 2.

Table 21. Mean Total Attention, in seconds, by Treatment

	Treatment [1,2]			
	1 (n=86)	2 (n=87)	3 (n=96)	4 (n=55)
Mean	29.7[b]	38.1[b]	77.2[a]	64.0[ab]
Standard Deviation	45.3	47.9	79.3	66.4
95% Confidence Interval	(20.0-39.4)	(27.9-48.3)	(46.1-82.0)	(61.2-93.3)

[1] Means with similar superscripts are not significantly different, using Scheffe's test.

[2] Treatment 1 = 2 messages plus map, Treatment 2 = 4 messages plus map, Treatment 3 = 6 messages plus map, Treatment 4 = 8 messages plus map.

To further investigate this hypothesis, total attention was separated into map and message attention and both were examined. The sample size for treatment 4 was reduced for reasons explained in Appendix F. Results from ANOVA also indicate significant differences among treatment means for message attention (Table 22) but the test for linearity was not significant in this analysis.

Scheffe's test (Table 23) shows that message attention is significantly greater for treatment 3 than for treatments 1, 2 and 4.

Table 22. ANOVA of Message Attention, in seconds, by Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	77.833	3	25.944	13.110	<.001
Residual	633.283	320	1.979		
Total	711.116	323	2.202		

Table 23. Mean Message Attention, in seconds, by Treatment

	Treatment [1,2]			
	1 (n=86)	2 (n=87)	3 (n=96)	4 (n=36)
Mean	3.7[b]	9.9[b]	16.9[a]	8.2[b]
Standard Deviation	5.4	16.1	15.6	15.1
95% Confidence Interval	(2.6-4.9)	(6.7-13.1)	(13.7-20.1)	(4.0-12.4)

[1] Means with similar superscripts are not significantly different, using Scheffe's test.
[2] Treatment 1 = 2 messages plus map, Treatment 2 = 4 messages plus map, Treatment 3 = 6 messages plus map, Treatment 4 = 8 messages plus map.

The ANOVA for map attention by treatment also indicates there are significant differences among means (Table 24). Results of Scheffe's tests (Table 25) show that map attention for treatment 3 is significantly greater than map attention for treatments 1, 2 and 4, but the test for linearity was not significant.

Table 24. ANOVA of Map Attention, in seconds, by Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	132.684	3	44.228	11.152	<.001
Residual	1269.047	320	3.966		
Total	1401.731	323	4.340		

Table 25. Mean Map Attention, in seconds, by Treatment

	Treatment [1, 2]			
	1 (n=86)	2 (n=87)	3 (n=96)	4 (n=36)
Mean	26.0[b]	28.1[b]	60.3[a]	24.1[b]
Standard Deviation	42.2	40.1	75.5	42.1
95% Confidence Interval	(17.0-35.0)	(20.0-36.7)	(45.0-75.6)	(12.7-35.5)

[1] Means with similar superscripts are not significantly different, using Scheffe's test.
[2] Treatment 1 = 2 messages plus map, Treatment 2 = 4 messages plus map, Treatment 3 = 6 messages plus map, Treatment 4 = 8 messages plus map.

As visitors approached the bulletin board they made several decisions. One of these decisions was whether to stop at the bulletin board. This decision is important in the operationalization of attention since visitors who did not stop have total attention scores of zero and visitors who decided to stop have total attention scores that are greater than zero. The decision to stop also has implications about the effectiveness of the bulletin board in attracting attention. It is important to investigate whether the differences in attention found by the analysis of all visitors who passed the bulletin board remain when those who did not stop at the bulletin board are removed.

For this analysis of hypothesis 1 (Tables 26 - 31), attention is operationalized as those visitors who stopped at the bulletin board and looked at either the messages, the map, or both. Analysis of those who stopped was performed in a similar manner to that performed on all visitors who passed the bulletin board. ANOVA, shown in Table 26, indicates differences in total attention means for those visitors who stopped at the bulletin board. The test for linearity was significant at the .05 level.

Scheffe's test shows that total attention means for treatments 3 and 4 are significantly greater than for treatments 1 and 2 (Table 27).

Table 26. ANOVA of Total Attention, in seconds, by Treatment (Those Who Stopped and Looked)

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	32.881	3	10.960	10.206	<.001
Residual	230.896	215	1.074		
Total	263.776	218	1.210		

Table 27. Mean Total Attention, in seconds, by Treatment (Those Who Stopped and Looked)

	Treatment [1,2]			
	1 (n=50)	2 (n=56)	3 (n=77)	4 (n=36)
Mean	51.0[b]	59.1[b]	96.3[a]	97.8[a]
Standard Deviation	49.5	48.2	77.5	58.3
95% Confidence Interval	(37.0-65.1)	(46.3-72.1)	(78.0-113.9)	(78.1-117.5)

[1] Means with similar superscripts are not significantly different, using Scheffe's test.
[2] Treatment 1 = 2 messages plus map, Treatment 2 = 4 messages plus map, Treatment 3 = 6 messages plus map, Treatment 4 = 8 messages plus map.

An examination of message attention for those visitors who stopped at the bulletin board also indicates significant differences among group means (Table 28) but the test for linearity was not significant in this case. Results from Scheffe's test (Table 29) indicate message attention for treatment 3 is significantly greater than for treatments 1 and 4.

Table 28. ANOVA of Message Attention, in seconds, by Treatment (Those Who Stopped and Looked)

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	47.684	3	15.895	9.621	<.001
Residual	355.210	215	1.652		
Total	402.894	218	1.848		

Table 29. Mean Message Attention, in seconds, by Treatment (Those Who Stopped and Looked)

	Treatment [1, 2]			
	1 (n=50)	2 (n=56)	3 (n=77)	4 (n=36)
Mean	6.4[b]	15.4[ab]	21.1[a]	12.6[b]
Standard Deviation	5.8	16.4	15.3	17.9
95% Confidence Interval	(4.7-8.1)	(11.0-19.8)	(17.6-24.6)	(6.5-18.6)

[1] Means with similar superscripts are not significantly different, using Scheffe's test.
[2] Treatment 1 = 2 messages plus map, Treatment 2 = 4 messages plus map, Treatment 3 = 6 messages plus map, Treatment 4 = 8 messages plus map.

Similar to results from analysis of all visitors who passed the bulletin board, ANOVA of mean map attention for visitors who stopped at the bulletin board indicates differences among group means (Table 30) but the relationship was not found to be linear. Scheffe's test shows map attention for treatment 3 is significantly greater than for treatments 2 and 4 (Table 31).

Table 30. ANOVA of Map Attention, in seconds, by Treatment (Those Who Stopped and Looked)

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	82.275	3	27.425	8.407	<.001
Residual	701.338	215	3.262		
Total	783.613	218	3.595		

Table 31. Mean Map Attention, in seconds, by Treatment (Those Who Stopped and Looked)

	Treatment [1, 2]			
	1 (n=50)	2 (n=56)	3 (n=77)	4 (n=36)
Mean	44.6[ab]	43.7[b]	75.2[a]	36.8[b]
Standard Deviation	47.2	42.7	77.4	47.5
95% Confidence Interval	(31.2-58.1)	(32.3-55.1)	(57.6-92.8)	(20.7,52.9)

[1] Means with similar superscripts are not significantly different, using Scheffe's test.
[2] Treatment 1 = 2 messages plus map, Treatment 2 = 4 messages plus map, Treatment 3 = 6 messages plus map, Treatment 4 = 8 messages plus map.

Once visitors decide to stop at the bulletin board, other decisions are made. These decisions include whether to look at the messages, the map, or both, and how long to look. The design of the bulletin board at Big Creek allowed visitors to look at the either the messages or the map without looking at both. The operationalization of attention in this instance is defined by conducting analysis of message attention for those who actually looked at the messages (Tables 32 - 33). In other words, message attention for this operationalization of attention, by definition, has to be greater that zero. This also applies in analysis of map attention for visitors who actually looked at the map (Tables 34 - 35). Analysis of total attention for those who stopped and looked at the bulletin board was reported previously, (Tables 26 and 27) and is not repeated here.

The ANOVA of message attention by treatment again indicates that there are significant differences in means (Table 32). The test for linearity was significant at the .05 level indicating that the relationship is linear. Scheffe's test shows that message

attention means for treatments 2, 3, and 4 are significantly greater than treatment 1 and that treatment 3 is also significantly greater than treatment 2 (Table 33).

Table 32. ANOVA of Message Attention, in seconds, by Treatment (Those Who Stopped and Looked at Messages)

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	28.988	3	9.663	17.641	<.001
Residual	88.988	162	.548		
Total	117.721	165	.713		

Table 33. Mean Message Attention, in seconds, by Treatment (Those Who Stopped and Looked at Messages)

	Treatment [1, 2]			
	1 (n=38)	2 (n=44)	3 (n=66)	4 (n=18)
Mean	8.4[c]	19.6[a]	24.6[b]	25.1[ab]
Standard Deviation	5.2	16.1	13.7	18.0
95% Confidence Interval	(6.7-10.1)	(14.8-24.5)	(21.2-28.0)	(16.2-34.1)

[1] Means with similar superscripts are not significantly different, using Scheffe's test.

[2] Treatment 1 = 2 messages plus map, Treatment 2 = 4 messages plus map, Treatment 3 = 6 messages plus map, Treatment 4 = 8 messages plus map.

Unlike previous analyses that included values of zero for map attention, when only those visitors who stopped and looked at the map are included in the analysis, the ANOVA of mean map attention indicates no significant differences among group means (Table 34). The test for linearity is not significant. Means for map attention for those visitors who stopped and looked at the map are shown in Table 35.

These results seem to indicate that map attention does not differ for those who stopped and actually looked at the map and that the number of messages did not affect how long those who stopped actually looked at the map.

Table 34. ANOVA of Map Attention, in seconds, by Treatment (Those Who Stopped and Looked at the Map)

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	4.701	3	1.567	1.854	<.15
Residual	134.416	159	.845		
Total	139.117	162	.859		

Table 35. Mean Map Attention, in seconds, by Treatment (Those Who Stopped and Looked at the Map)

	Treatment [1, 2]			
	1 (n=39)	2 (n=37)	3 (n=70)	4 (n=17)
Mean	57.2	66.2	82.7	77.9
Standard Deviation	46.2	35.4	77.3	39.2
95% Confidence Interval	(42.2-72.2)	(54.4-78.0)	(64.3-101.0)	(57.7-98.1)

[1] Means with similar superscripts are not significantly different, using Scheffe's test.

[2] Treatment 1 = 2 messages plus map, Treatment 2 = 4 messages plus map, Treatment 3 = 6 messages plus map, Treatment 4 = 8 messages plus map.

A summary of results from analysis of Hypothesis 1 is shown in Table 36. Results differ somewhat for each operationalization of attention but not drastically. An interesting finding is when only those who looked at the map are compared, there are no significant differences between treatment means of map attention. A possible reason for this is that the messages did not influence how much time visitors spent looking at the map.

Table 36. Summary of Results from Analyses of Hypothesis 1.

	Treatments[1]		
	Total Attention	Message Attention	Map Attention
All Visitors Who Passed the Bulletin Board	3 > 1 & 2	3 > 1, 2, & 4	3 > 1, 2, & 4
Those Who Stopped and Looked at the Bulletin Board	3 & 4 > 1 & 2	3 > 1 & 4	3 > 2 & 4
Those Who Stopped and Looked at Map or Messages	3 & 4 > 1 & 2	2, 3, & 4 > 1 3 > 2	No differences

[1] Treatment 1 = 2 messages plus map, Treatment 2 = 4 messages plus map, Treatment 3 = 6 messages plus map, Treatment 4 = 8 messages plus map.

While the analysis results indicate differences in attention means, these differences were not in the way predicted by the hypothesis. There is evidence that attention increases as the number of messages increases. Attention decreased only after the number of messages was increased to eight. Hypothesis 1 is rejected. If a management goal in to increase attention to the bulletin board, increasing the number of messages might be one way to accomplish this goal.

Hypothesis 2: *Attention to the bulletin board will be greater with the presence of an attractor (map) than without an attractor.*

Hypothesis 2 suggests that differences will occur in the amount of attention to the bulletin board if an attractor, in this case a map, is present along with the low-impact messages. The analysis for this hypothesis was conducted on attention data from treatment 2 (four messages and the map) and treatment 6 (four messages only). Data used for the analysis of hypothesis 2 are from the combined questionnaire and observation samples. Analysis for hypothesis 2 was conducted using the same rationale used for hypothesis 1 with regards to the operationalization of attention. For the first analysis of hypothesis 2, attention is operationalized as all visitors who passed the bulletin board (Tables 37 - 38).

Independent T-tests were performed to test for differences in treatment means for all visitors who passed the bulletin board (Table 37). Results suggest that the presence of an attractor made a significant difference in the amount of total time spent looking at the bulletin board.

To test whether the map had an influence on message attention, map attention was removed from treatment 2. T-tests were then conducted on message attention (Table 38). The analysis indicates that means for message attention were not significantly different in this case. This suggests that the map had an effect on total attention but not on the time spent looking at messages on the bulletin board.

Table 37. T-tests of Mean Total Attention, in seconds, by Treatment[1]

Variable	t-value	DF	1-Tail Significance Level
Total Attention	-2.17	148	<.016

	Number of Cases	Mean	Standard Deviation	Standard Error of the Mean
Treatment 2	87	38.1	47.9	5.1
Treatment 6	64	13.8	19.1	2.4

[1] Treatment 2 = 4 messages plus map, Treatment 6 = 4 messages but no map.
Separate-variance statistics used.

Table 38. T-tests of Mean Message Attention, in seconds, by Treatment[1]

Variable	t-value	DF	1-Tail Significance Level
Message Attention	1.26	149	<.105

	Number of Cases	Mean	Standard Deviation	Standard Error of the Mean
Treatment 2	87	9.9	15.1	1.6
Treatment 6	64	13.8	19.1	2.4

[1] Treatment 2 = 4 messages plus map, Treatment 6 = 4 messages but no map.
Pooled-variance statistics used.

The second operationalization of attention uses only those visitors who stopped at the bulletin board. Analysis of total attention for only those who stopped at the bulletin board is shown in Table 39. Results from this analysis indicate that mean total attention is again significantly different for treatments 2 and 6. This is consistent with the analysis of all visitors who passed the bulletin board.

Map attention was removed from treatment 2 to test whether the map had an influence on message attention for those who actually stopped at the bulletin board. T-tests were then conducted on message attention for the two treatments (Table 40). Unlike previous findings, analysis of only those who stopped indicates that message attention means were significantly different. This suggests that the presence of the map significantly reduced attention to messages for those who stopped at the bulletin board.

Table 39. T-tests of Mean Total Attention, in seconds, by Treatment[1] (Those Who Stopped and Looked)

Variable	t-value	DF	1-Tail Significance Level
Total Attention	-3.28	91	<.001

	Number of Cases	Mean	Standard Deviation	Standard Error of the Mean
Treatment 2	56	59.1	48.2	6.4
Treatment 6	37	23.9	19.8	3.3

[1] Treatment 2 = 4 messages plus map, Treatment 6 = 4 messages but no map.
Separate-variance statistics used.

Table 40. T-tests of Mean Message Attention, in seconds, by Treatment[1] (Those Who Stopped and Looked)

Variable	t-value	DF	1-Tail Significance Level
Message Attention	3.53	90	<.001

	Number of Cases	Mean	Standard Deviation	Standard Error of the Mean
Treatment 2	56	15.4	16.4	2.2
Treatment 6	37	23.9	19.8	3.3

[1] Treatment 2 = 4 messages plus map, Treatment 6 = 4 messages but no map.
Separate-variance statistics used.

The third way to operationalize attention is to use visitors who actually looked at the messages or the map in analysis of message and map attention respectively. Again this means that attention is greater than zero for these analyses. Examination of those who stopped and looked at the bulletin board was conducted for Hypothesis 2. As in the two previous analyses of mean total attention, treatment 2 was significantly greater than treatment 6 (Table 41).

However, when message attention is operationalized as those who stopped and actually looked at the messages, the means for message attention were not significantly different (Table 42). This finding indicates that the presence of the map did not influence the amount of time spent looking at the messages for those who stopped at the bulletin board and actually looked at the messages.

Table 41. T-tests of Mean Total Attention, in seconds, by Treatment[1] (Those Who Stopped and Looked)

Variable	t-value	DF	1-Tail Significance Level	
Total Attention	-3.15	91	<.001	
	Number of Cases	Mean	Standard Deviation	Standard Error of the Mean
Treatment 2	56	59.5	50.2	7.6
Treatment 6	37	23.9	19.8	3.3

[1] Treatment 2 = 4 messages plus map, Treatment 6 = 4 messages but no map.
Separate-variance statistics used.

Table 42. T-tests of Mean Message Attention, in seconds, by Treatment [1] (Those Who Stopped and Looked at the Messages)

Variable	t-value	DF	1-Tail Significance Level
Message Attention	1.15	79	<.127

	Number of Cases	Mean	Standard Deviation	Standard Error of the Mean
Treatment 2	44	19.6	16.1	2.4
Treatment 6	37	23.9	19.8	3.3

[1] Treatment 2 = 4 messages plus map, Treatment 6 = 4 messages but no map.
Pooled-variance statistics used.

Table 43 summarizes the analyses of the different operationalizations of attention for hypothesis 2. Total attention was significantly different for each operationalization of attention. Message attention was greater when the map was not present for visitors who stopped at the bulletin board but not for all visitors who passed the bulletin board or for visitors who actually stopped and looked at the messages. This seems to indicates that the map did not affect attention to the messages.

Table 43. Summary of Results from Analysis of Hypothesis 2.

	Treatments [1]	
	Total Attention	Message Attention
All Visitors Who Passed the Bulletin Board	2 > 6	2 = 6
Those Who Stopped and Looked at the Bulletin Board	2 > 6	2 < 6
Those Who Stopped and Looked at Messages	2 > 6	2 = 6

[1] Treatment 2 = 4 messages plus map, Treatment 6 = 4 messages but no map.

Analysis of the first two hypotheses was conducted with three operationalizations of attention. The basic difference in these three operationalizations of attention is the exclusion of zero values for total attention, message attention, and map attention. For the remainder of the hypotheses, everyone who passed the bulletin board whether they stopped or not will be used in the analysis.

Hypothesis 3: *Attention to the bulletin board will decrease as the experience level of visitors increases.*

In Hypothesis 3, experience levels of visitors are postulated to have an influence on the amount of attention visitors give to messages. Levels of visitor experience were measured by six variables. Three of these, average visits per year to designated wilderness areas, length of typical wilderness visit, and experience with wilderness travel are categorical in nature. The other three, total visits to Bitterroot canyons, total visits to wilderness areas, and total number of wilderness areas visited are interval level variables. Data used in analysis of Hypothesis 3 are from treatments 1 through 4 of the questionnaire sample.

The difference in the level of measurement requires that Hypothesis 3 be analyzed with several different statistical tests (Kleinbaum, Kupper and Muller 1988). The first method of analysis, used for categorical measures of experience, was to enter the categorical variables as factors along with the treatments. This two way analysis of variance was used to explore the possibility of interactions between the treatments and the levels of experience. The second form of analysis used to test Hypothesis 3 is analysis of covariance (ACOVA).

The first experience variable examined was the average number of visits per year visitors make to designated wilderness areas (Table 44). The average number of visits

per year to wilderness was not shown to significantly influence total attention to the bulletin board. Table 45 showing total attention means for average visits per year by treatment is included for comparison. The standard deviations indicate a large variance in attention for groups and cell sizes are small in many cases. Hypothesis 3 should be rejected for this measure of experience.

Table 44. ANOVA of Total Attention, in seconds, by Average Visits Per Year and Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	48.906	6	8.151	2.276	.040
Treatment	43.421	3	14.474	4.041	.009
Visits/Year	6.393	3	2.131	.595	.619
2-Way Interactions					
Treatment Visits	30.487	9	3.387	.946	.488
Explained	74.057	15	4.937	1.378	.168
Residual	454.893	127	3.582		
Total	528.950	142	3.725		

Table 45. Mean Total Attention, in seconds, for Average Visits Per Year by Treatment

Average Visits Per Year	Treatment 1	2	3	4	All Treatments
1 or Less Visits					
Mean	9.0	4.0	51.5	63.4	47.3
Standard Deviation	6.8	.	41.7	66.7	49.1
	(n=4)	(n=1)	(n=16)	(n=8)	(n=29)
2 - 5 Visits					
Mean	45.5	53.8	58.7	71.1	57.4
Standard Deviation	58.5	58.0	53.8	70.8	57.8
	(n=8)	(n=20)	(n=22)	(n=3)	(n=60)
6 - 10 Visits					
Mean	24.0	17.3	168.0	9.3	55.8
Standard Deviation	36.6	16.9	137.6	16.2	94.3
	(n=6)	(n=6)	(n=5)	(n=3)	(n=20)
10 or More Visits					
Mean	12.5	45.1	121.3	132.5	73.0
Standard Deviation	23.9	52.5	123.2	83.5	90.0
	(n=8)	(n=11)	(n=9)	(n=6)	(n=34)

Length of typical wilderness visit was not shown to influence attention (Table 46). Table 47, which shows total attention means for length of typical wilderness visit by treatment, is included for comparison. Variance is again large and many cells are small. Including length of typical wilderness visit in the two way ANOVA caused the treatment effect to not be significant.

Table 46. ANOVA of Total Attention, in seconds, by Length of Typical Wilderness Visit and Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	34.681	6	5.780	1.696	.127
Treatment	21.101	3	7.034	2.064	.109
Length/Visit	10.086	3	3.362	.987	.402
2-Way Interactions					
Treatment Length	30.038	9	3.338	.979	.461
Explained	82.614	15	5.508	1.616	.079
Residual	415.744	122	3.408		
Total	498.358	137	3.638		

Table 47. Mean Total Attention, in seconds, for Length of Typical Wilderness Visit by Treatment

	Treatment				
Length of Typical Visit	1	2	3	4	All Treatments
A Few Hours					
Mean	4.0	11.0	32.0	76.0	77.5
Standard Deviation	.	67.9	.	62.4	63.8
	(n=1)	(n=4)	(n=1)	(n=8)	(n=13)
A Full Day					
Mean	33.6	45.1	149.4	71.8	71.6
Standard Deviation	37.0	51.7	136.5	77.8	90.0
	(n=10)	(n=18)	(n=11)	(n=12)	(n=51)
1 - 2 Nights					
Mean	23.1	34.2	72.7	41.5	51.4
Standard Deviation	54.8	31.2	58.5	55.5	55.7
	(n=9)	(n=9)	(n=22)	(n=6)	(n=46)
More Than 2 Nights					
Mean	19.2	13.0	45.4	199.0	47.1
Standard Deviation	23.0	20.1	34.9	43.8	54.3
	(n=5)	(n=4)	(n=17)	(n=2)	(n=28)

Visitor assessment of experience with wilderness travel was not shown to significantly influence attention (Table 48). Table 49, total attention means for experience with wilderness travel by treatment, is included for comparison. The more experienced visitors seemed to pay more attention to the bulletin board for some treatments but not for others and the pattern was not consistent. Variances for attention were again large and cell sizes small for most cases.

Table 48. ANOVA of Total Attention, in seconds, by Experience With Wilderness Travel and Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	53.105	6	8.851	2.581	.022
Treatment	40.577	3	13.526	3.945	.010
Experience	7.170	3	2.390	.697	.555
2-Way Interactions					
Treatment Exper	37.517	9	4.169	1.216	.291
Explained	86.407	15	5.760	1.680	.063
Residual	435.438	127	3.429		
Total	521.845	142	3.675		

Table 49. Mean Total Attention, in seconds, for Experience With Wilderness Travel by Treatment

	Treatment				
Experience	1	2	3	4	All Treatments
Not At All					
Mean	2.0	22.7	194.0	3.5	51.9
Standard Deviation	2.8	35.9	161.2	4.9	100.8
	(n=2)	(n=3)	(n=2)	(n=2)	(n=9)
A Little					
Mean	21.1	49.1	69.0	32.5	40.1
Standard Deviation	34.4	58.5	65.1	48.5	50.6
	(n=7)	(n=7)	(n=4)	(n=6)	(n=24)
Somewhat					
Mean	38.0	44.8	63.7	94.3	61.7
Standard Deviation	57.2	52.3	73.3	80.8	69.4
	(n=8)	(n=19)	(n=26)	(n=14)	(n=67)
Very					
Mean	20.9	48.0	90.9	103.8	67.8
Standard Deviation	31.2	52.9	90.0	66.7	75.1
	(n=9)	(n=10)	(n=19)	(n=5)	(n=43)

Analysis of covariance, ACOVA, was used to analyze the interval level variables with treatments as the main effects. The method of entering the covariates for this analysis was to have all effects entered at the same time. In this method "each effect is adjusted for all the other covariates, main effects, and interaction terms in the model" (Norusis, 1992). Results from the ACOVA (Table 50-52) indicate that none of the interval level experience variables analyzed significantly influence attention. Therefore, Hypothesis 3 is rejected.

Table 50. ACOVA of Mean Total Attention, in seconds, by Treatment with Total Visits to Wilderness Areas

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Covariates					
Wilderness Visits	.507	1	.507	.145	.704
Main Effects					
Treatment	40.013	3	13.338	3.804	.012
Explained	44.208	4	11.052	3.152	.016
Residual	459.347	131	3.506		
Total	503.555	135	3.730		

Table 51. ACOVA of Mean Total Attention, in seconds, by Treatment with Number of Wilderness Areas Visited

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Covariates					
Wilderness Areas	1.509	1	1.509	.425	.516
Main Effects					
Treatment	33.781	3	11.260	3.169	.027
Explained	35.538	4	8.885	2.501	.045
Residual	476.075	134	3.553		
Total	511.613	138	3.707		

Table 52. ACOVA of Mean Total Attention, in seconds, by Treatment with Total Visits to Bitterroot Canyons

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Covariates					
Bitterroot Visits	.127	1	.127	.037	.848
Main Effects					
Treatment	37.987	3	12.662	3.658	.014
Explained	42.460	4	10.615	3.067	.019
Residual	474.207	137	3.461		
Total	516.667	141	3.664		

Hypothesis 4: *Attention to the bulletin board will be less for visitors who consider themselves knowledgeable about low-impact practices than for visitors who do not consider themselves knowledgeable.*

Hypothesis 4 postulates that visitors who consider themselves knowledgeable about low-impact practices will have less attention than those who do not consider themselves knowledgeable. Data used in this analysis are from the questionnaire sample for treatments 1 through 4. Knowledge of low-impact practices was not shown to make a significant difference in attention although the significance of the F statistic is very close to the .05 level (Table 53). Also, this analysis shows treatment as not being significant where it has been in most past analyses. Attention for different levels of knowledge by treatment shows no definite pattern and many cells are small (Table 54).

Table 53. ANOVA of Mean Total Attention, in seconds, by Knowledge of Low-Impact Practices and Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	47.212	6	7.869	2.385	.032
Treatment	16.075	3	5.358	1.624	.187
Knowledge	25.782	3	8.594	2.605	.055
2-Way Interactions					
Treatment Know	48.218	9	5.358	1.624	.115
Explained	114.514	15	7.634	2.314	.006
Residual	415.656	126	3.299		
Total	530.170	141	3.760		

Table 54. Mean Total Attention, in seconds, for Knowledge of Low-Impact Practices by Treatment

	Treatment				
Knowledge	1	2	3	4	All Treatments
Not Very					
Mean	50.0	55.3	85.6	0	53.0
Standard Deviation	65.1	56.5	128.7	0	81.7
	(n=2)	(n=6)	(n=5)	(n=3)	(n=16)
Somewhat					
Mean	7.3	37.1	43.1	61.5	38.3
Standard Deviation	11.8	52.5	33.4	72.9	51.5
	(n=11)	(n=18)	(n=13)	(n=13)	(n=55)
Very					
Mean	46.7	45.8	103.3	121.3	86.3
Standard Deviation	55.7	62.0	103.7	65.2	86.6
	(n=9)	(n=9)	(n=22)	(n=10)	(n=50)
Extremely					
Mean	11.0	57.3	73.6	28.0	54.9
Standard Deviation	10.0	32.3	46.5	.	43.0
	(n=4)	(n=6)	(n=10)	(n=1)	(n=21)

Further examination of the relationship between the self assessed knowledge of low-impact wilderness practices and attention was done by conducting ANOVA on message and map attention separately. Message attention was not shown to differ significantly for the four levels of low-impact knowledge. However, there is a significant difference between knowledge categories in map attention (Table 55) but the interaction is insignificant. Map attention means exhibit the same inconsistent pattern as total attention. Variances are again large and many cells are small. A Scheffe's test was conducted on map attention by knowledge categories and results indicate that map attention for the knowledge categories of very and extremely knowledgeable were significantly greater than for the category of somewhat knowledgeable. Because only map attention was found to significantly differ for levels of knowledge, Hypothesis 4 is rejected.

Table 55. ANOVA of Mean Map Attention, in seconds, by Knowledge of Low-Impact Practices and Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	85.244	6	14.207	3.718	.002
Treatment	26.846	3	8.949	2.342	.076
Knowledge	33.359	3	11.120	2.910	.037
2-Way Interactions					
Treatment Know	26.280	9	2.920	.764	.650
Explained	124.662	15	8.311	2.175	.010
Residual	481.498	126	3.821		
Total	606.161	141	4.299		

Table 56. Mean Map Attention, in seconds, for Knowledge of Low-Impact Practices by Treatment

	Treatment				
Knowledge	1	2	3	4	All Treatments
Not Very					
Mean	40.0	43.3	72.8	0	44.0
Standard Deviation	56.6	45.0	123.9	.	75.1
	(n=2)	(n=6)	(n=5)	(n=3)	(n=16)
Somewhat					
Mean	3.6	22.4	26.8	14.2	17.7
Standard Deviation	8.8	39.6	20.1	34.7	30.7
	(n=11)	(n=18)	(n=13)	(n=13)	(n=55)
Very					
Mean	37.8	38.2	83.6	44.0	59.3
Standard Deviation	49.9	57.7	100.6	55.9	79.6
	(n=9)	(n=9)	(n=22)	(n=10)	(n=50)
Extremely					
Mean	9.0	36.0	44.4	8.0	33.5
Standard Deviation	10.5	24.8	42.1	.	34.4
	(n=4)	(n=6)	(n=10)	(n=1)	(n=21)

Hypothesis 5: *Attention to the bulletin board will be greater for visitors who have not been frequently exposed to low-impact messages than for visitors who have been frequently exposed to low-impact messages.*

Hypothesis 5 deals with habituation of visitors to low-impact messages. Habituation, as used in this case, is defined as the frequency of exposure to low-impact messages or information. Analysis for Hypothesis 5 was performed on data from the questionnaire sample using treatments 1 through 4.

To analyze the possible relationship between habituation to messages and attention to messages a simple factorial ANOVA was conducted with habituation levels as the independent variable. The ANOVA indicates that habituation to low-impact messages seen did not influence the amount of attention given to the bulletin board (Table 57). There is no consistent pattern for total attention means of habituation levels by treatment (Table 58).

Message and map attention for the levels of habituation to low-impact messages were also analyzed and neither was shown to have significant differences in means. The ANOVA tables from these analyses are not included. Therefore Hypothesis 5 is rejected.

Table 57. ANOVA of Mean Total Attention, in seconds, by Frequency of Seeing Low-Impact Messages and Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	46.757	6	7.793	2.222	.045
Treatment	37.060	3	12.353	3.523	.017
Frequency	8.464	3	2.821	.805	.493
Explained	46.757	6	7.793	2.222	.045
Residual	469.872	134	3.507		
Total	516.630	140	3.690		

* Due to empty cells or a singular matrix, higher order interactions were not calculated.

Table 58. Mean Map Attention, in seconds, for Frequency of Seeing Low-Impact Information by Treatment

	Treatment			
	1	2	3	4
Frequency				
Never				
Mean	54.0	25.0	53.3	0
Standard Deviation	59.4	26.6	46.2	.
	(n=2)	(n=4)	(n=3)	(n=1)
Not Very Frequently				
Mean	6.8	46.7	81.8	58.2
Standard Deviation	9.0	52.7	85.4	70.9
	(n=13)	(n=21)	(n=25)	(n=15)
Frequently				
Mean	40.7	36.9	82.1	116.1
Standard Deviation	52.2	52.3	92.8	69.3
	(n=11)	(n=9)	(n=21)	(n=10)
Very Frequently				
Mean	0	58.7	38.0	7.0
Standard Deviation	.	47.4	48.1	.
	(n=0)	(n=3)	(n=2)	(n=1)

Hypothesis 6: *Attention to the bulletin board will be greater for backpackers than for day hikers.*

In Hypothesis 6, day hikers and backpackers are postulated to have different attention means. The measure of attention used in this analysis is total attention to the bulletin board averaged across treatments 1 through 4. Analysis for Hypothesis 6 was conducted on data from the questionnaire and observation samples combined for treatments 1 through 4. Results of the T-tests indicate that the total attention means are not significantly different at the .05 level (Table 59). Mean total attention was actually

greater for the sample of day hikers than for the sample of backpackers because the day hikers spent more time looking at the map. Therefore, Hypothesis 6 is rejected.

Table 59. T-tests of Mean Total Attention, in seconds, for Day Hikers and Backpackers

Variable	t-value	DF		1-Tail Significance Level
Total Attention	1.01	216		<.157
	Number of Cases	Mean	Standard Deviation	Standard Error of the Mean
Day Hikers	124	86.9	76.6	6.9
Backpackers	94	59.6	46.9	4.8

Pooled-variance statistics used.

Further investigation of the differences between day hikers and backpackers was conducted by separating map and message attention for analysis. Analysis of message attention for day hikers and backpackers indicates no significant difference between message attention means (Table 60). Analysis of map attention for day hikers and backpackers (Table 61) also shows no significant difference in map attention means.

Table 60. T-tests of Mean Message Attention, in seconds, for Day Hikers and Backpackers

Variable	t-value	DF		1-Tail Significance Level
Message Attention	-.96	216		<.169
	Number of Cases	Mean	Standard Deviation	Standard Error of the Mean
Day Hikers	124	12.8	15.0	1.3
Backpackers	94	15.2	17.0	1.8

Pooled-variance statistics used.

Table 61. T-tests of Mean Map Attention, in seconds, for Day Hikers and Backpackers

Variable	t-value	DF	1 Tail Significance Level	
Map Attention	-.29	215	<.386	
	Number of Cases	Mean	Standard Deviation	Standard Error of the Mean
Day Hikers	124	62.3	72.8	6.5
Backpackers	94	41.2	38.1	3.9

Separate-variance statistics used.

Hypothesis 7: *Attention to the bulletin board will be greater for hikers than for horse users.*

Differences in attention means between foot and horse travel are postulated in Hypothesis 7. Data used in the analysis of Hypothesis 7 are from the combined questionnaire and observation samples and include treatments 1 through 4. Results indicate significant difference in attention means for foot and horse travel (Table 62). The difference is in the direction predicted, therefore Hypothesis 7 is supported.

Table 62. T-tests of Mean Total Attention, in seconds, for Hikers and Horse Users

Variable	t-value	DF	1 Tail Significance Level	
Total Attention	18.55	274	<.001	
	Number of Cases	Mean	Standard Deviation	Standard Error of the Mean
Hikers	218	75.1	66.7	4.5
Horse Users	104	4.2	10.3	1.0

Separate-variance statistics used.

Hypothesis 7 is further examined by separating map and message attention for individual analysis. T- tests of message attention means for foot and horse travelers indicate a significant difference (Tables 63). Results of T-tests on map attention means for foot and horse travelers also indicate a significant difference (Table 64).

Table 63. T-tests of Mean Message Attention, in seconds, for Hikers and Horse Users

Variable	t-value	DF		1 Tail Significance Level
Message Attention	9.73	292		<.001
	Number of Cases	Mean	Standard Deviation	Standard Error of the Mean
Hikers	218	13.8	15.9	1.1
Horse Users	104	2.3	6.0	.6

Separate-variance statistics used.

Table 64. T-tests of Mean Map Attention, in seconds, for Hikers and Horse Users

Variable	t-value	DF		1 Tail Significance Level
Map Attention	16.02	316		<.001
	Number of Cases	Mean	Standard Deviation	Standard Error of the Mean
Hikers	218	53.2	61.1	4.1
Horse Users	104	1.8	6.9	.7

Separate-variance statistics used.

Hypothesis 8: *Retention/recall of low-impact messages will be positively correlated with increased attention to the bulletin board*

Hypothesis 8 postulates a relationship between attention and retention/recall. This relationship was examined using Pearson's product moment correlation. Measures of retention, aided recall, and unaided recall are percentage scores. The method of calculating these percentage scores is described in Chapter 4. Data used in this analysis are from treatments 1 through 4 of the questionnaire sample. Correlation coefficients for total attention, message attention, and map attention with retention, aided recall, and unaided recall scores are reported in Table 65. The correlation coefficients are all positive and significant at the .05 level with the exception of unaided recall and total attention. Correlations with message attention exceed those with total attention or map attention. Therefore, Hypothesis 8 is accepted.

Table 65. Pearson's Correlation Coefficients for Retention, Aided Recall, and Unaided Recall with Attention Scores

	Total Attention	Message Attention	Map Attention
Retention	.4677 P< .001	.4931 P< .001	.3199 P< .001
Aided Recall	.5034 P< .001	.5956 P< .001	.3018 P< .005
Unaided Recall	.1293 P< .065	.2299 P< .005	.1594 P< .030

* Retention, aided and unaided recall, as measured here, are the percent of correct visitors responses on the questionnaire, in relation to the actual number of messages presented on the bulletin board.

Hypothesis 9: *Retention /recall of low-impact messages will decrease as the number of messages presented on the bulletin boards increases.*

The relationship between retention, aided recall, and unaided recall and the number of messages presented on the bulletin board is explored in Hypothesis 9. Analysis for this hypothesis was conducted on data from treatments 1 through 4 of the questionnaire sample. Retention and aided recall were not significantly affected by the increasing number of messages on the bulletin board despite the fact that those exposed to more messages had more questions to answer (Tables 66-69). The test for linearity was not significant for retention and aided recall. However, unaided recall was shown to be significantly less for visitors exposed to eight messages than for those exposed to only two messages (Tables 70 and 71) and the test for linearity was significant. Therefore Hypothesis 9 is rejected with one exception.

Table 66. ANOVA of Retention of Specific Messages by Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.025	3	.008	.081	<.975
Residual	15.213	146	.104		
Total	15.238	149	.102		

Table 67. Retention, in percent, by Treatment

	Treatment [1]			
	1 (n=27)	2 (n=44)	3 (n=52)	4 (n=27)
Percentage Correct	39%	40%	41%	37%
Standard Deviation	42	33	26	30
95% Confidence Interval	(22-56)	(30-50)	(33-48)	(25-49)

[1] Treatment 1 = 2 messages plus map, Treatment 2 = 4 messages plus map, Treatment 3 = 6 messages plus map, Treatment 4 = 8 messages plus map.

Table 68. ANOVA of Aided Recall by Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.365	3	.122	.838	<.480
Residual	21.207	146	.145		
Total	21.573	149	.145		

Table 69. Aided Recall, in percent, by Treatment

	Treatment [1]			
	1 (n=27)	2 (n=44)	3 (n=52)	4 (n=27)
Percentage Correct	48%	45%	50%	36%
Standard Deviation	40	40	38	33
95% Confidence Interval	(32-64)	(33-57)	(40-61)	(23-49)

[1] Treatment 1 = 2 messages plus map, Treatment 2 = 4 messages plus map, Treatment 3 = 6 messages plus map, Treatment 4 = 8 messages plus map.

Table 70. ANOVA of Unaided Recall by Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.871	3	.290	4.608	<.005
Residual	9.198	146	.063		
Total	10.069	149	.068		

Table 71. Unaided Recall, in percent, by Treatment

	Treatment [1,2]			
	1 (n=27)	2 (n=44)	3 (n=52)	4 (n=27)
Percentage Correct	30% [a]	17% [ab]	14% [ab]	5% [b]
Standard Deviation	34	28	23	9
95% Confidence Interval	(16-43)	(8-25)	(8-20)	(1-8)

[1] Means with similar superscripts are not significantly different, using Scheffe's test.
[2] Treatment 1 = 2 messages plus map, Treatment 2 = 4 messages plus map, Treatment 3 = 6 messages plus map, Treatment 4 = 8 messages plus map.

Hypothesis 10: *Retention/recall of low-impact messages will decrease as the experience levels of visitors increases.*

In Hypothesis 10, the experience level of visitors is postulated to influence retention/recall of messages. Because findings from the analysis of Hypothesis 9 indicate that retention and aided recall did not differ significantly across treatments, one way analysis of variance was used to examine retention and aided recall for the three

categorical variables that measure experience. However, since unaided recall was found to differ significantly for treatments in Hypothesis 9, two way analysis of variance was used to examine unaided recall for the three categorical variables. Results are presented in Tables 72 - 89.

The three interval level experience variables were analyzed using Pearson's correlation. Correlation coefficients for retention with these three experience variables are shown in Table 90. Hypothesis 10 was analyzed using data from treatments 1 through 4 of the questionnaire sample.

Retention and aided recall were not found to significantly differ for any of the three categorical experience variables. Results of the two way ANOVA suggest that unaided recall differed by the length of typical wilderness visit. However, differences in unaided recall scores were not found for different lengths of typical wilderness visits. Linearity tests were not significant with the exceptions of those for unaided recall by length of typical wilderness visit (Table 83) and retention with average visits per year (Table 85).

Correlation coefficients, however, show that retention is negatively correlated with visits to Bitterroot Canyons and total wilderness visits (Table 90). These correlations indicate that more experienced visitors, as measured by visits to Bitterroot Canyons and total wilderness visits, did not retain the information presented on the bulletin boards. However, the correlations are weak. Therefore, Hypothesis 10 is only partially supported.

Table 72. ANOVA of Retention, in percent, by Average Visits Per Year

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.670	3	.223	2.224	<.090
Residual	14.557	145	.100		
Total	14.227	148	.103		

Table 73. Retention, in percent, by Average Visits Per Year

	Average Visits Per Year			
	1 or Less (n=29)	2 to 5 (n=63)	6 to 10 (n=23)	More Than 10 (n=34)
Percentage Correct	46%	44%	31%	31%
Standard Deviation	27	34	29	32
95% Confidence Interval	(36-57)	(35-52)	(19-44)	(19-42)

Table 74. ANOVA of Aided Recall, in percent, by Average Visits Per Year

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.581	3	.194	1.344	<.265
Residual	20.906	145	.144		
Total	21.487	148	.145		

Table 75. Aided Recall, in percent, by Average Visits Per Year

	Average Visits Per Year			
	1 or Less (n=29)	2 to 5 (n=63)	6 to 10 (n=23)	More Than 10 (n=34)
Percentage Correct	39%	49%	35%	52%
Standard Deviation	37	39	36	38
95% Confidence Interval	(25-53)	(39-59)	(20-51)	(39-65)

Table 76. ANOVA of Unaided Recall, in percent, by Average Visits Per Year and Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.946	6	.158	2.461	.027
Treatment	.749	3	.250	3.900	.010
Visits	.108	3	.036	.560	.642
2-Way Interactions Treatment Visits	.546	9	.061	.947	.487
Explained	1.525	15	.102	1.587	.085
Residual	8.518	133	.064		
Total	10.044	148	.068		

Table 77. Unaided Recall, in percent, for Average Visits Per Year by Treatment

	Treatment				
Visits Per Year	1	2	3	4	All Treatments
1 or Less Visits					
Mean	25%	0	20%	5%	16%
Standard Deviation	32	.	32	7	27
	(n=4)	(n=1)	(n=16)	(n=8)	(n=29)
2 to 5 Visits					
Mean	19%	18%	10%	4%	13%
Standard Deviation	24	24	16	10	20
	(n=9)	(n=22)	(n=22)	(n=10)	(n=63)
6 to 10 Visits					
Mean	39%	4%	20%	10%	17%
Standard Deviation	39	9	22	17	26
	(n=6)	(n=9)	(n=5)	(n=3)	(n=23)
More Than 10 Visits					
Mean	38%	27%	9%	2%	21%
Standard Deviation	42	43	17	6	34
	(n=8)	(n=11)	(n=9)	(n=6)	(n=34)

Table 78. ANOVA of Retention, in percent, by Length of Typical Wilderness Visit

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.393	3	.131	1.291	<.290
Residual	14.215	140	.102		
Total	14.608	143	.102		

Table 79. Retention, in percent, by Length of Typical Wilderness Visit

	Length of Typical Wilderness Visit			
	A Few Hours (n=13)	A Full Day (n=51)	1 to 2 Nights (n=52)	More Than 2 Nights (n=28)
Percentage Correct	55%	41%	38%	36%
Standard Deviation	31	31	35	29
95% Confidence Interval	(37-74)	(33-50)	(28-47)	(24-47)

Table 80. ANOVA of Aided Recall, in percent, by Length of Typical Wilderness Visit

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.074	3	.025	.167	<.920
Residual	20.692	140	.148		
Total	20.766	143	.145		

Table 81. Aided Recall, in percent, by Length of Typical Wilderness Visit

	Length of Typical Wilderness Visit			
	A Few Hours (n=13)	A Full Day (n=51)	1 to 2 Nights (n=52)	More Than 2 Nights (n=28)
Percentage Correct	53%	46%	45%	47%
Standard Deviation	42	38	38	40
95% Confidence Interval	(28-78)	(35-56)	(34-55)	(32-62)

Table 82. ANOVA of Unaided Recall, in percent, by Length of Typical Wilderness Visit and Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	1.518	6	.253	4.714	.000
Treatment	1.266	3	.422	7.866	.000
Length	.629	3	.210	3.905	.010
2-Way Interactions					
Treatment Length	.860	9	.096	1.780	.078
Explained	2.390	15	.159	2.970	.000
Residual	6.868	128	.054		
Total	9.259	143	.065		

Table 83. Unaided Recall, in percent, for Length of Typical Wilderness Visit by Treatment

	Treatment				
Length of Typical Visit	1	2	3	4	All Treatments
A Few Hours					
Mean	100%	55%	17%	6%	29%
Standard Deviation	.	41	.	11	38
	(n=1)	(n=4)	(n=1)	(n=7)	(n=13)
A Full Day					
Mean	37%	12%	11%	5%	15%
Standard Deviation	37	21	17	9	24
	(n=10)	(n=18)	(n=11)	(n=12)	(n=51)
1 to 2 Nights					
Mean	20%	13%	18%	5%	16%
Standard Deviation	23	23	25	7	23
	(n=10)	(n=14)	(n=22)	(n=6)	(n=52)
More Than 2 Nights					
Mean	27%	0%	11%	0	11%
Standard Deviation	37	0	24	0	25
	(n=5)	(n=4)	(n=17)	(n=2)	(n=28)

Table 84. ANOVA of Retention, in percent, by Experience with Wilderness Travel

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.235	3	.078	.766	<.520
Residual	14.846	145	.102		
Total	15.082	148	.102		

Table 85. Retention, in percent, by Experience with Wilderness Travel

	Level of Experience			
	Not At All (n=47)	A Little (n=69)	Somewhat (n=24)	Very (n=9)
Percentage Correct	38%	40%	47%	30%
Standard Deviation	32	32	34	25
95% Confidence Interval	(28-47)	(32-47)	(33-61)	(10-49)

Table 86. ANOVA of Aided Recall, in percent, by Experience with Wilderness Travel

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.310	3	.103	.712	<.550
Residual	21.051	145	.145		
Total	21.361	148	.144		

Table 87. Aided Recall, in percent, Experience with Wilderness Travel

	Level of Experience			
	Not At All (n=47)	A Little (n=69)	Somewhat (n=24)	Very (n=9)
Percentage Correct	47%	48%	47%	28%
Standard Deviation	40	38	37	30
95% Confidence Interval	(35-59)	(39-57)	(31-62)	(5-52)

Table 88. ANOVA of Unaided Recall, in percent, by Experience With Wilderness Travel and Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.955	6	.159	2.580	.021
Treatment	.897	3	.299	4.843	.003
Experience	.103	3	.034	.559	.643
2-Way Interactions					
Treatment Exper	.891	9	.099	1.604	.120
Explained	1.834	15	.122	1.981	.021
Residual	8.210	133	.062		
Total	10.044	148	.068		

Table 89. Mean Unaided Recall, in percent, for Experience With Wilderness Travel by Treatment

	Treatment				
Experience	1	2	3	4	All Treatments
Not At All					
Mean	67%	0	17%	7%	16%
Standard Deviation	47	0	0	10	25
	(n=2)	(n=3)	(n=2)	(n=2)	(n=47)
A Little					
Mean	5%	26%	17%	5%	17%
Standard Deviation	13	27	24	7	28
	(n=7)	(n=7)	(n=4)	(n=6)	(n=69)
Somewhat					
Mean	41%	17%	14%	5%	13%
Standard Deviation	36	31	26	11	20
	(n=9)	(n=20)	(n=26)	(n=14)	(n=24)
Very					
Mean	30%	16%	13%	3%	20%
Standard Deviation	31	28	20	6	32
	(n=9)	(n=14)	(n=19)	(n=5)	(n=9)

Table 90. Pearson's Correlation Coefficients of Retention, Aided Recall, and Unaided Recall With Experience Levels

	Total Wilderness Visits	Wilderness Areas Visited	Visits to Bitterroot Canyons
Retention	-.1842 P< .03	-.1466 P< .08	-.2491 P< .002
Aided Recall	-.0657 P< .45	-.0321 P< .75	-.0402 P< .65
Unaided Recall	.0367 P< .7	.0202 P< .85	.1368 P< .1

* Retention, aided and unaided recall, as measured here, are the percent of correct visitors responses on the questionnaire, in relation to the actual number of messages presented on the bulletin board.

Hypothesis 11: *Retention/recall of low-impact messages will be greater for overnight users than for day users.*

Hypothesis 11 suggests a relationship between the type of use (day versus overnight use) and retention, aided recall, and unaided recall of messages. Data used in this analysis are from treatments 1 through 4 of the questionnaire sample. Results of the T-tests are presented in Tables 91 - 93.

Retention was significantly higher for overnight users than for day users (Table 91). This was in the direction predicted by the Hypothesis 11. However, neither aided or unaided recall were found significantly different for day and overnight users. Therefore, Hypothesis 11 is partially supported.

Table 91. T-tests of Day Use Versus Overnight Use and Retention

Variable	t-value	DF	1-Tail Significance Level	
Retention	-2.14	148	<.017	
	Number of Cases	Percent	Standard Deviation	Standard Error of the Mean
Day Use	78	34%	31	.04
Overnight Use	72	45%	33	.04

* Retention ,as measured here, is the percent of correct visitors responses on the questionnaire in relation to the actual number of messages presented on the bulletin board.
Pooled-variance statistics used.

Table 92. T-tests of Day Use Versus Overnight Use and Aided Recall

Variable	t-value	DF	1-Tail Significance Level	
Aided Recall	-1.16	140	<.124	
	Number of Cases	Percent	Standard Deviation	Standard Error of the Mean
Day Use	78	42%	35	.04
Overnight Use	72	50%	41	.05

* Aided recall, as measured here, is the percent of correct visitors responses on the questionnaire in relation to the actual number of messages presented on the bulletin board.
Separate-variance statistics used.

Table 93. T-tests of Day Use Versus Overnight Use and Unaided Recall

Variable	t-value	DF	1-Tail Significance Level	
Unaided Recall	-.51	148	<.305	
	Number of Cases	Percent	Standard Deviation	Standard Error of the Mean
Day Use	78	15%	26	.03
Overnight Use	72	17%	26	.03

* Unaided recall, as measured here, is the percent of correct visitors responses on the questionnaire in relation to the actual number of messages presented on the bulletin board.
Pooled-variance statistics used.

Further investigation of this hypothesis is accomplished by analyzing mean retention, aided recall, and unaided recall scores of day and overnight users for foot travelers only. The results of this analysis indicate that there are no significant differences in retention, aided and unaided recall scores for day and overnight users who travel on foot. When horse users are excluded, the difference between retention scores for day and overnight users disappears. Because the results did not show significant differences, tables are not included in the text.

Hypothesis 12: *Retention/recall of low-impact messages will be greater for visitors who have not been frequently exposed to low-impact messages than for visitors who have been frequently exposed to low-impact messages.*

In Hypothesis 12, habituation or frequency of exposure to low-impact messages is postulated to influence the retention/recall of messages presented on the bulletin board. Data used in the analysis of Hypothesis 12 are from treatments 1 through 4 of the questionnaire sample.

Analysis used for this hypothesis was a simple factorial ANOVA comparing the retention/recall score means for the four levels of habituation (Table 94) and the test for linearity was not significant. The ANOVA did not indicate differences in the group means. While not significantly different, the actual retention means shown in Table 95 do suggest that those visitors who "never" saw low-impact information before were able to retain a higher percentage of the information.

Table 94. ANOVA of Retention by Level of Habituation

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.327	3	.109	1.056	.370
Residual	14.760	143	.103		
Total	15.087	146	.103		

* Retention, as measured here, is the percent of correct visitors responses on the questionnaire in relation to the actual number of messages presented on the bulletin board.

Table 95. Retention, in percent, for Level of Habituation

	Level of Habituation			
Retention	Never (n=10)	Not Very Frequently (n=75)	Frequently (n=55)	Very Frequently (n=7)
Percent Correct	53%	36%	42%	41%
Standard Deviation	32	32	32	30
95% Confidence Interval	(.30-.76)	(.28-.43)	(.33-.50)	(.13-.70)

* Retention, as measured here, is the percent of correct visitors responses on the questionnaire in relation to the actual number of messages presented on the bulletin board.

The same analysis procedure was conducted comparing aided recall and habituation levels. The ANOVA (Table 96) did not indicate significant differences in group means and the linearity test was again not significant. The pattern of aided recall for habituation levels in Table 97 does show that aided recall increased as the level of habituation increased.

Table 96. ANOVA of Aided Recall by Level of Habituation

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	.435	3	.145	.997	.396
Residual	20.797	143	.145		
Total	21.232	146	.145		

* Retention, as measured here, is the percent of correct visitors responses on the questionnaire in relation to the actual number of messages presented on the bulletin board.

Table 97. Aided Recall, in percent, for Level of Habituation

	Level of Habituation			
Aided Recall	Never (n=10)	Not Very Frequently (n=75)	Frequently (n=55)	Very Frequently (n=7)
Percent Correct	34%	42%	51%	53%
Standard Deviation	39	38	38	45
95% Confidence Interval	(.06-.62)	(.34-.51)	(.41-.62)	(.11-.94)

* Aided recall, as measured here, is the percent of correct visitors responses on the questionnaire in relation to the actual number of messages presented on the bulletin board.

Unaided recall and habituation levels were analyzed using ANOVA procedures and the results (Table 98) do not indicate a significant difference in group means. The test for linearity was also not significant. Although there are rather large differences in unaided recall scores for different habituation levels, the pattern is not consistent (Table 99). Variation is large for the two levels of habituation with small sample sizes.

Table 98. ANOVA of Unaided Recall, in percent, by Level of Habituation and Treatment

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	1.205	6	.201	3.338	.004
Treatment	.946	3	.315	5.242	.002
Level	.344	3	.115	1.904	.132
Explained	1.205	6	.201	3.338	.004
Residual	8.424	140	.060		
Total	9.629	146	.066		

Due to empty cells of a singular matrix, higher order interactions have been suppressed.

Table 99. Mean Unaided Recall, in percent, for Level of Habituation by Treatment

Level of Habituation	Treatment 1	2	3	4	All Treatments
Never					
Mean	0%	0%	11%	0%	3%
Standard Deviation	0	0	10	.	7
	(n=2)	(n=4)	(n=3)	(n=1)	(n=10)
Not Very Frequently					
Mean	44%	15%	12%	7%	17%
Standard Deviation	39	26	22	11	28
	(n=13)	(n=22)	(n=25)	(n=15)	(n=75)
Frequently					
Mean	19%	12%	18%	1%	14%
Standard Deviation	22	16	26	5	21
	(n=12)	(n=12)	(n=21)	(n=10)	(n=55)
Very Frequently					
Mean	0	45%	0%	0	26%
Standard Deviation	0	53	0	.	44
	(n=)	(n=4)	(n=2)	(n=1)	(n=7)

Summary of Hypotheses Testing

The number of messages presented on the bulletin board did not cause attention to drop as the number of messages increased in the way hypothesized. There was a drop in attention between treatment 3 and 4 but the hypothesis was that attention would decrease from the first treatment to the fourth.

Similarly, the number of messages did not make a significant difference in retention/recall of messages presented in the way hypothesized. However, there was evidence, although not particularly strong evidence, that as the number of messages

increased, it was harder for visitors to recall the specific messages without an aid provided.

The presence of a map made attention to the bulletin board increase. However, it did not cause attention to messages to increase.

Most visitor characteristics tested were not found to significantly affect attention. Those that did not affect attention were experience, knowledge of low-impact practices, and frequency of seeing low-impact messages or habituation, and type of use. Method of travel did affect attention.

There are some instances where the results were rather unusual. For instance, when treatment and length of typical wilderness visit were entered in the ANOVA model as main effects, neither was found to be significant (Table 46). A similar result occurred in Hypothesis 4 where knowledge of low impact practices seemed to nullify the effect of the treatment variable (Tables 53 and 55). Variables that did not affect attention also did not significantly affect retention or recall of messages.

There was a significant difference in retention for all day and overnight users. However, aided and unaided recall did not differ for all day and overnight users.

As mentioned earlier, method of travel was a visitor characteristic that did significantly affect attention in that hikers had significantly higher total attention, message attention, and map attention. Also, the amount of attention was shown to be correlated with retention/recall. It seems that if attention can be increased, retention/recall might also be increased. Support or rejection of hypotheses is reported in Table 100.

Table 100. Results of Hypothesis Testing

Hypothesis	Results of Test
1. Attention to the bulletin board will decrease as the number of messages presented on the bulletin board increases.	Rejected
2. Attention to the bulletin board will be greater with the presence of an attractor (map) than without an attractor.	Supported
3. Attention to the bulletin board will decrease as the experience level of visitors increases.	Rejected
4. Attention to the bulletin board will be less for visitors who consider themselves knowledgeable about low-impact practices than for visitors who do not consider themselves knowledgeable.	Rejected
5. Attention to the bulletin board will be greater for visitors who have not been frequently exposed to low-impact messages than for visitors who have been frequently exposed to low-impact messages.	Rejected
6. Attention to the bulletin board will be greater for backpackers than for day hikers.	Rejected
7. Attention to the bulletin board will be greater for hikers than for horse users.	Supported
8. Retention/recall will be positively correlated with attention to the bulletin board.	Supported
9. Retention/recall of low-impact messages will decrease as the number of messages presented on the bulletin board increases.	Partially Supported
10. Retention/recall of low-impact messages will decrease as the experience levels of visitors increase.	Partially Supported
11. Retention/recall of low-impact messages will be greater for overnight users than for day users.	Partially Supported
12. Retention/recall of low-impact messages will be greater for visitors who have not been frequently exposed to low-impact messages than for visitors who have been frequently exposed to low-impact messages.	Rejected

CHAPTER SIX

DISCUSSION

This chapter will present discussion of results from the tests of hypotheses. For this discussion, hypotheses will be grouped as follows. Group 1 contains hypotheses 1, 2, 8, and 9. These hypotheses investigate if the number of messages on the bulletin board influences attention and retention/recall, how the presence of an attractor might affect attention, and if there is a relationship between attention and retention/recall of messages. The second group, hypotheses 3, 4, 5, 10, and 12, examines possible relationships between attention and retention/recall and visitor characteristics such as experience, habituation, and knowledge. Group 3, hypotheses 6, 7, and 11, looks at whether method of travel or type of use influence attention or retention/recall.

Implications and recommendations for bulletin board design, message design and content, and management actions will be discussed. Future research to help improve bulletin board and message design will also be proposed.

Group 1.

As mentioned earlier, the first group of hypotheses investigate whether attention is influenced by the number of messages on the bulletin board, how the presence of an attractor might influence attention, and the possible relationship between attention and retention/recall. Engel and others (1990) and Webb (1979) suggest that multiple messages can result in excessive noise that might result in loss of attention to specific messages. The limited span of attention that individuals possess could also influence attention if messages are numerous and complex (Engel and others 1990).

In contrast to the relationship suggested by Hypothesis 1, total attention to the bulletin board was found to increase as the number of messages went up from 2 to 4 to 6. Total attention then decreased when 8 messages were on the board. Results for message attention were similar in that attention increased for the first three treatments and then decreased for the fourth treatment. The relationship predicted by Hypothesis 1 is not supported.

These findings are important because they suggest adding more messages does not cause a reduction in attention, at least up to a point, in contrast to Engel and others (1990) and Webb (1979). Another implication from these findings is that a threshold might exist to the number of messages visitors will read. When this threshold is reached, attention then begins to drop. Further research could help determine if this threshold really exists and help determine the optimum number of messages to display on bulletin boards.

It takes from 6 to 8 seconds to read each message. When these times are compared with the actual message attention means for visitors, it becomes evident that visitors on average did not spend enough time to thoroughly read the messages. These findings suggest that either shorter more concise messages are needed, or a way to increase per message attention is needed.

The influence of a map on attention was addressed by Hypothesis 2. Total attention was significantly greater when the map was present than when the map was not present. So Hypothesis 2 is supported by the analysis. These results confirm the assertion of Engel and others (1990) that people will be drawn to attractors that catch their attention. Also supported are the findings of Lucas (1985, 1990) that maps are an important source of information for wilderness visitors. However, while the map was responsible for greater total attention to the bulletin board, it's presence did not increase attention to messages.

To further investigate the ability of the map to attract attention, map attention for all five treatments that displayed the map was compared. Results from this analysis reveal that map attention for treatment 5, the treatment with the map only, was greater than all other treatments except treatment 3.

One possible way to increase attention to the messages might be to use different placement of messages and the map on the bulletin board. Since visitors will look at the bulletin board longer with a map present, integration of messages and map so visitors simultaneously viewed both is a technique to investigate.

Hypothesis 9 suggests a decrease in retention and recall as the number of messages increases. This hypothesis builds on the assumption that attention decreases as the number of messages increases due to the clutter or noise associated with more messages (Engel and others 1990, Webb 1979). This decrease in attention could result in a decrease in retention and recall (Webb 1979).

Results suggest that the number of messages is not detrimental to retention and aided recall of specific low-impact messages. Analysis of this hypothesis found that only unaided recall decreased with the increase in the number of messages. A possible reason for the decline in unaided recall, even though attention increased somewhat as the number of messages increased, could be that the test of unaided recall increases in difficulty as the number of messages increases. The hypothesis was only partially supported and Webb's (1979) suggestion that decreasing attention leads to decreasing retention is also not fully supported.

The method used to measure retention and aided recall provided respondents with correct answers from which to choose. It might be argued that a better measure of what visitors actually remember about the information presented is through unaided recall. There is however, the indication that when visitors were asked to list the specific messages, the number of messages on the bulletin board affected the ability to recall

specific messages. This suggests that unaided recall was a harder test for visitors than were retention and aided recall.

The focus of Hypothesis 8 is on the possible relationship between attention and retention/recall. The literature suggests (Engel and others 1990, Webb 1979, McGuire 1976) that an increase in attention will result in an increase in retention/recall. Results show that total attention and message attention were positively correlated with retention and aided recall. Map attention was also weakly correlated with retention and aided recall. Results for attention and unaided recall were mixed.

These findings suggest that if the information campaign is successful in increasing attention to the bulletin board and messages on it, visitors will retain more of the specific information presented on the board. The information processing model (McGuire 1976, Engel and others 1990) is supported by these results.

It should be noted that the length of retention of specific low-impact information was not measured by this study. Inference as to how long specific information is remembered cannot be made.

The research design for this study focused on attention and retention and did not measure comprehension or acceptance/rejection. Omission of these two parts of the model could have affected the results of the analysis for the association between attention and retention, aided recall, and unaided recall. The model states that retention is associated with comprehension and acceptance/rejection as well as with attention. If the association between retention and comprehension and acceptance/rejection is strong, omitting these two variables could actually be suppressing the strength of the association between attention and retention (Lutz 1983). Future research should include comprehension and acceptance/rejection in analysis to examine the strength of the entire model and the association between all components of the model.

Group 2.

The second group of hypotheses suggest possible relationships between certain visitor characteristics and attention and retention/recall. Visitor characteristics examined by these hypotheses are experience levels, habituation to low-impact messages, and knowledge of low-impact practices.

The premise of Hypothesis 3 is the more experience visitors have, the less attention they will give to information (Krumpe and Brown 1982, Roggenbuck and Berrier 1982, Williams and Huffman 1986). The rationale behind this hypothesis is that visitors who consider themselves experienced with wilderness travel might think they have nothing to gain from information on the bulletin board. Experienced visitors might also feel that information offered is knowledge they already possess.

Findings indicate that none of the three categorical variables had significant influence on the attention visitors gave to the bulletin board. Thus the hypothesis is not supported for these three measures of experience. Results from Roggenbuck and Berrier (1982) and Williams and Huffman (1986) are not supported in that the need or desire for information was not found to be influenced by experience levels of visitors. An important implication from these findings is that even though visitors vary greatly in their wilderness experience levels, they still want information equally. This is important to management in planning information and education programs.

Results of analysis for the three interval level variables is similar to that of analysis for the three categorical variables. None were found to significantly influence attention. So the relationship proposed in Hypothesis 3 is not supported. Experience might be useful in tailoring messages to visitors, but for this study experience did not affect attention or retention.

Hypothesis 4 suggests that self assessed knowledge about low-impact wilderness practices will influence attention. Two way ANOVA results indicate that knowledge

levels did not significantly influence total or message attention. However, the two way ANOVA of treatment and knowledge with map attention did indicate that knowledge influenced attention to the map. The hypothesis is rejected with the exception of map attention. These results lend support to earlier research (Roggenbuck and Berrier 1982, Williams and Huffman 1986) that suggests knowledge levels can help predict visitors' need for information.

One implication from these findings is that including a map in the information and education campaigns might influence less knowledgeable visitors to look at the bulletin board longer. The challenge is to translate increased attention to the bulletin board into increased attention to the messages. Bulletin boards might not be the best way to reach visitors who consider themselves knowledgeable. Another approach, such as personal contact, might be a more effective way to inform those visitors who consider themselves knowledgeable.

Hypothesis 5 explores the possible relationship between how frequently visitors have been exposed to low-impact information, defined as habituation to messages, and attention to the bulletin board. Results indicate the level of habituation did not affect attention so the relationship suggested by Hypothesis 5 is not supported. Habituation to messages, as a predictor of attention, was not found to be effective by this research.

It is important for management to know that habituation was not an influential factor with regards to attention. This suggests that it might not be counter productive not to expose visitors to information at a higher levels. Webb (1979) suggests that a high level of exposure to information could cause people to tune information out, but that was not indicated here.

The relationship between retention and recall of messages and experience levels, suggested by in Hypothesis 10, was not found to be significant so the hypothesis is

rejected. These findings are consistent with earlier findings in that experience did not affect attention given to messages.

The suggested relationship between habituation and retention/recall, Hypothesis 12, was not found by the analysis. Hypothesis 12 is rejected. These results are also consistent with earlier findings concerning habituation and attention to low-impact messages presented on the bulletin board. Models from the literature used to formulate the hypothesis (Engel and others 1990, Cacioppo and Petty 1979) are not supported by these results.

Group 3.

The third group contains hypotheses that suggest visitors on different types of trips and visitors using different methods of travel might have differences in their attention, retention and recall. Hypothesis 6, which suggests a difference in total attention for day hikers and backpackers is not supported by the analysis. When message and map attention are taken separately, there is also no significant difference in attention. Differences in day hikers and backpackers suggested by Lucas (1981, 1983) are not found with regards to attention.

Method of travel and its possible affect on attention to the bulletin board is explored in Hypothesis 7. Results support the hypothesis and have important implications for management regarding the methods used to present information and the design of information campaigns. Findings support Lucas (1980, 1983, 1985) in concluding that horse users and hikers are different in their information seeking behavior and in their willingness to stop at bulletin boards.

Findings from the analysis of Hypothesis 7 suggest the bulletin board design used in this study was not effective in informing or educating horse users about low-impact practices. It has been suggested that bulletin boards for horse users be constructed so the

information is at eye level and that this might increase the boards effectiveness. Another suggested method to contact horse users is by personal contact in the parking area.

Possible differences in retention for day versus overnight users were examined in Hypothesis 11. The hypothesis is partially supported by the results from the analysis. Differences in retention scores are significant but aided and unaided recall scores are not significantly different. Day and overnight users were different as suggested by Lucas (1981, 1983) but not in all instances.

So what are some of the conclusions from these findings that are important to managers and researchers? Are there suggestions and methods that agencies can use to improve current information and education programs? What implications for future research emerge from the many questions raised by this study?

Implications of using different ways to operationalize attention address decisions made by visitors as they arrive at the bulletin board. These decisions help define the different ways of operationalizing attention. Operationalizing attention as all visitors who passed bulletin board allows for measurement of the effectiveness of the bulletin board in attracting attention by getting visitors to stop and look. It gives an overall measure of attention because both visitors who looked at the information on the board and those who did not look are included.

Another implication of using these different ways to operationalized attention is that visitors who stopped and looked at the messages or the map provide a more specific measure of actual attention. This operationalization takes the decision of to stop or not out of consideration and directly measures how much attention the messages or the map were given when visitors actually paid attention to them. An example of why it is important for management to understand the different operationalizations of attention is found by comparing message attention to the actual time it takes to read the messages. When this comparison is made, it is apparent that it takes longer to read the messages

than the average visitor actually spent looking at the messages. This is true even when only those who looked at the messages are considered.

Future research can be guided by these implications. One research direction suggested is to explore ways to convince more visitors, especially horse users, to stop at the bulletin board. Another direction for research is that of increasing attention once visitors decide to stop and look at information on the bulletin board.

One important finding is that increasing the number of messages did not seem to result in a decrease in attention. While there was a significant difference in attention for the treatment with 6 messages and the treatments with 2, 4, and 8 messages, attention increased rather that decreased as more messages were added.

An area for future investigation is to vary the number of messages one at a time instead of two at a time. This could help determine if there is a threshold to the number of messages that visitors will read and where this possible threshold comes into play with regards to decreasing attention. Another important need to address is that of increasing the total number of messages visitors will read and retain.

The success of the map as an attractor is another important finding. Evidence shows that the presence of the map increased the time spent looking at the bulletin board. However, it is also important to remember that this increased attention was to the map and did not translate to increased attention to the messages on the board. An important direction for future research is to investigate how to transfer this attention to the map into increased attention to the messages. This could be accomplished through design of maps with integrated messages or by varying the message format. Message format, including color and the use of more elaborate graphics, is an area that lends itself to this type of applied field research.

Support for the hypothesized interaction between attention and retention makes the relationship between the presence of the map and increased attention to the bulletin

board important to understand. The finding that more attention results in more retention again points to the need for a way to translate attention to the map into more attention to messages. Accomplishing this can help managers better inform and educate visitors about proper low-impact practices. This improvement in informing and educating visitors could give managers the ability to better protect the resource while also instilling a sense of ownership in the users of that resource.

The lack of success in attracting attention of horse users is another important finding and points out the importance of looking closer at what are the best ways to communicate with these users. Is it the placement of the bulletin board or messages that affect whether or not horse users stop? Or is it the nature of horse use itself that determines when and where a stop is made regardless of bulletin boards or messages? Horse users are a substantial segment of the user population that are not being reached by information presented on bulletin boards. An effective method for communicating with horse users would be a valuable tool for managers.

Positioning the bulletin board up the trail from the parking area has been shown (Petersen 1985, Lucas and Kovalicky 1982, Stubbs 1990) to be effective in attracting attention. However, such positioning might not be effective for horse users. It would be important to know if trailhead bulletin boards are more effective in attracting attention from horse users than boards positioned up the trail. The trailhead positioning of the board might give horse users the opportunity to read information on the board before mounting their horse. A reason for positioning the board a short way up the trail is that hikers might want to stop and adjust their packs or just take a short break. Horse users might not need a break so soon into their trip.

Another avenue for future study would be the use of a different attractor to increase attention. This study attempted to measure the affect of an interpretive display

on attention and contrast it's effectiveness with that of the map. However, this portion of the experiment was unsuccessful due to failure of the camera used to record attention.

The camera used in this study was a Super 8 movie camera. This camera is, at best, ancient technology when compared with what is available today. One problem encountered in using super 8 equipment was the availability of film. A related problem was the availability of film processing and the actual time it took to have the film processed. The total time it took to have film processed and returned was from 4 to 6 weeks. There was also difficulty in viewing the film. With a projector that has a single frame advance with forward and reverse capability, viewing was not very difficult. However, if the film must be viewed on a small screen viewer, the problem becomes one of eye fatigue along with increased time to obtain the results.

Future studies of this type would be enhanced by the use of VHS or super VHS type equipment for filming. This type of film can be viewed on an ordinary television set and does not require processing. There is also the advantage of being able to record the entire stop at the bulletin board instead of having to shoot one frame of film every four seconds as was done in this study. The ability to view the film without waiting for processing makes results much quicker to obtain.

APPENDIX A

MESSAGES USED IN THE STUDY

MESSAGES USED IN THE STUDY

1. Hikers, to minimize conflicts when meeting horse users, Please step off the downhill side of the trail, Stand still, Speak softly until the horses pass.

2. When camping areas with obviously impacted campsites, 1. Select a campsite that is already barren, 2. Confine tents and activities to places that are already barren. This will concentrate impact on places that are already disturbed and spare places that haven't been damaged.

3. When hiking in areas without trails, spread out instead of walking single-file. This will minimize impact to fragile vegetation.

4. Please dispose of human waste in a hole 6-8" deep and at least 200' from water and campsites. This helps avoid water pollution and the spread of disease.

5. Please dispose of fish entrails (guts) by scattering them over a wide area. Do not throw them back into the water (they decompose slowly in cold water) or bury them (animals dig them up).

6. To minimize impact on areas without well-developed campsites or trails, disperse your impact, 1. Select a previously unused site for camping and 2. Avoid repeat traffic over the same area.

7. When having a campfire where others have already been built, please use an existing fire ring. When breaking camp, destroy all existing fire rings by scattering the rocks and ashes over a wide area.

8. If you have a campfire where one has never been built before, do not use rocks to ring the fire. Use downed dead wood that is small enough to break by hand. Camouflage the fire scar when you leave.

APPENDIX B

OUTLINE OF EXPERIMENTAL DESIGN

OUTLINE OF EXPERIMENTAL DESIGN

Treatment 1. Map plus messages 1 and 4.

Treatment 2. Map plus messages 1, 4, 5, and 3.

Treatment 3. Map plus messages 1, 4, 5, 3, 2, and 6.

Treatment 4. Map plus messages 1, 4, 5, 3, 2, 6, 7 and 8.

Treatment 5. Control, map only.

Treatment 6. Messages 1, 4, 5, and 3 without the map.

Sampling period is June 21, through September 12, 1993.

Sampling schedule by week and treatment.

Week 1	June 21 - 27	Treatment 6
Week 2	June 28 - July 4	Treatment 4
Week 3	July 5 - 11	Treatment 5
Week 4	July 12 - 18	Treatment 2
Week 5	July 19 - 25	Treatment 3

The week of July 26 - Aug. 1 was not sampled due to the trail closure.

Week 6	Aug. 2-8	Treatment 1
Week 7	Aug. 9-15	Treatment 6
Week 8	Aug. 16 - 22	Treatment 4
Week 9	Aug. 23 - 29	Treatment 1
Week 10	Aug. 30 - Sept. 5	Treatment 2
Week 11	Sept. 6 - Sept. 12	Treatment 3
Week 12	Sept. 13 - 19	Treatment 5

APPENDIX C

STUDY QUESTIONNAIRE

STUDY QUESTIONNAIRE

We are interested in your level of wilderness experience. Please answer the following questions as they relate to your experience in the Bitterroot Canyons and wilderness in general.

Q-1 About how long was your stay on this visit to Big Creek?
_____nights

Q-2 If one day only, about how many hours was your stay?
_____ hours

Q-3 About how many total visits to the Bitterroot canyons have you made?
_____visits

Q-4 About how many different designated wilderness areas have you visited?
_____areas

Q-5 About how many total visits to designated wilderness areas have you made?
_____visits

Q-6 About how many visits per year, on average, do you make to designated wilderness areas?
1 or less____ 2-5_____6-10_____More than 10_____

Q-7 Which of the following best describes the length of your typical wilderness visit?
Usually a few hours____ Usually 1-2 nights____
Usually a full day____ Usually more than 2 nights___

Q-8 During this visit, what information have you seen about wilderness travel? (Please list)

_____

_____

_____

_____

_____

Q-9 About how frequently have you seen information about low-impact wilderness travel? (Please Circle One)
Never Not very frequently Frequently Very frequently

Q-10 How knowledgeable do you consider yourself about low-impact practices? (Please Circle One)
Not very Somewhat Very Extremely

According to information you may have seen on this visit, please choose the *one* answer that best completes the following statements.

Q-11 When camping in obviously impacted areas you should:
_____ Spread activities around to places that have not been disturbed
_____ Pitch your tent on a non-impacted site
_____ Avoid sites that are heavily impacted
_____ None of the above

Q-12 When hiking off-trail you should:
_____ Hike single file to minimize impacts
_____ Spread out instead of walking single file to minimize impacts
_____ Follow existing animal trails
_____ None of the above

Q-13 When building a campfire where fires have previously been built:
_____ Leave all existing fire rings in place when you leave
_____ Destroy all existing fire rings when you leave
_____ Build a new fire ring
_____ Leave only one small clean fire ring when breaking camp

Q-14 When disposing of human waste in the wilderness:
_____ Cover waste in a shallow hole -- no more than 1-2 inches deep
_____ Place waste in a latrine 2 feet deep
_____ Bury waste 100 feet from campsite and water
_____ None of the above

Q-15 When hiking and encountering a horse party you should:
_____ Step off to the uphill side of the trail
_____ Move quickly past the horses
_____ Speak softly until the horses pass
_____ Once the horses have come to a stop, move quickly past them

Q-16 When disposing of fish entrails you should:
_____ Scatter entrails over a wide area
_____ Toss entrails into deep water
_____ Bury entrails in a hole 6 to 8 inches deep
_____ Throw entrails into swiftly moving water

Q-17 When camping in areas without well-developed campsites or trails you should:
_____ Select a site with no evidence of previous camping
_____ Confine activities to one part of the site
_____ Select a campsite that has been lightly impacted
_____ None of the above

Q-18 When building a campfire where one has never been built before:
_____ Build a new fire ring using rocks
_____ Leave the fire ring you built for later use
_____ Do not use rocks to ring the fire
_____ Dig a pit for the fire

Q-19 About how experienced are you with wilderness travel?
Very___ Somewhat_____ A little___ Not at all_____

Q-20 The following types of information are commonly given to wilderness visitors. Which of these did you see on this visit?

_____How to Dispose of Litter
_____How to Build Campfires
_____How to Prepare for Trips
_____How to Handle Stock
_____How to Hike Off-Trail
_____How to Minimize Wildlife Impacts
_____How to Select Campsites
_____How to Minimize Horse-Hiker Conflicts
_____How to Dispose of Human Waste
_____How to Dispose of Fish Entrails (Guts)

Q-21 Listed below are several sources of information people use in order to learn how to camp in the backcountry. Please check the *one* source you feel is most reliable.

_____ Forest Service brochures
_____ Rangers you met in the backcountry
_____ Magazine articles
_____ Other backcountry users
_____ Signs and bulletin boards
_____ Films and TV programs
_____ Newspaper articles
_____ Other members of your group
_____ Your previous camping experience
_____ Exhibits at visitor centers
_____ Information from maps
_____ Other _____

Finally, we have a few questions about you. Remember, you will not be identified with your answers.

Q-22 What is your age?_____

Q-23 Are You? M F (Please circle)

Q-24 What is the highest level of education you have completed so far?
Grade school (1-8)____ High school (9-12)____
Some college_____ College graduate_____ Post graduate_____

APPENDIX D

GROUP INFORMATION FORM

Date:_____

Treatment:_____

Group #	# of People	Enter/Exit time	Bridge
			Y N

Identifying Characteristics of Group

Group #	# of People	Enter/Exit time	Bridge
			Y N

Identifying Characteristics of Group

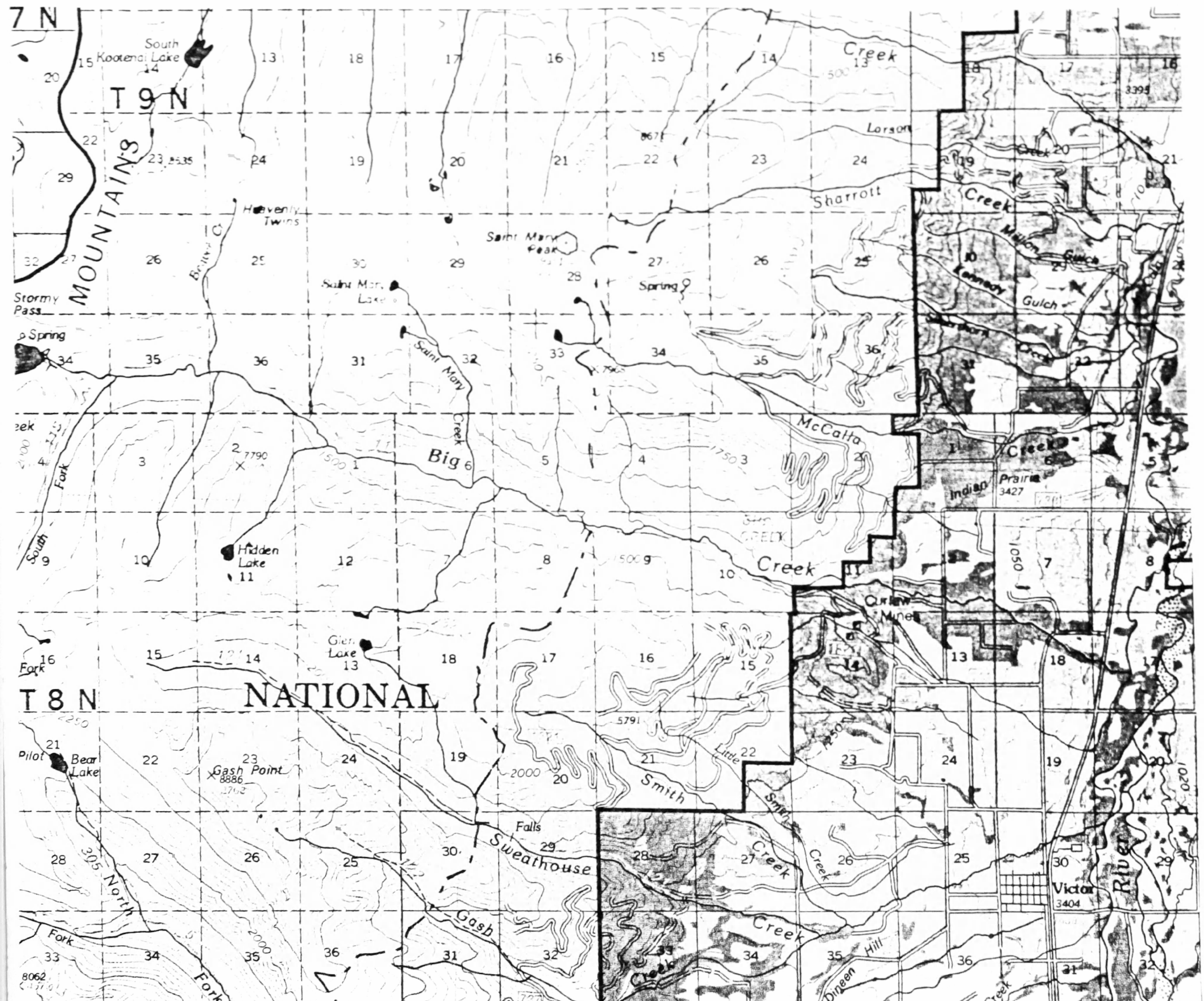
Group #	# of People	Enter/Exit time	Bridge
			Y N

Identifying Characteristics of Group

APPENDIX E

MAP OF STUDY AREA

BIG CREEK


T9N
T8N
MOUNTAINS
NATIONAL
South Kootenai Lake
Heavenly Twins
Saint Mary Peak
Saint Mary Lake
Stormy Pass
Big Creek
McCalla Creek
Sharrott Creek
Larson Creek
Hidden Lake
Glen Lake
Bear Lake
Gash Point
Sweathouse Creek
Smith Creek
Little Smith Creek
Gash Creek
North Fork
South Fork
Indian Prairie
Curlew Mine
Dineen Hill
Victor
3404
River

APPENDIX F

OBSERVATION AND COMPUTATION OF ATTENTION

OBSERVATION AND COMPUTATION OF ATTENTION

As stated earlier, there are 217 observations of attention that have corresponding questionnaire data and an additional 289 observations of attention that do not have matching questionnaire data for a total combined sample size of 506 attention observations. The analysis for the first two hypotheses includes data for all 506 visitors for whom observations of attention are available.

Because the camera equipment was not available at the beginning of the study, the attention observations during the first two and a half weeks of sampling were made by a researcher in the field. This was accomplished by positioning the researcher where he could view visitors as they approached the bulletin board but also where he was not obtrusive or distracting to them. The observations were measured in seconds using a stop watch. Placement of the researcher was such that he could observe the visitors and measure their attention but was not able to determine if visitors were looking at the messages or the map. For this reason, only total attention to the bulletin board is available for those visitors observed during the first two and a half weeks of sampling.

Visitors observed during the first two and a half weeks of sampling were exposed to treatments 4, 5 and 6. Of these treatments, treatment 5 was the map with no messages and treatment 6 was four messages without the map. Treatment 5 had 5 observations recorded by the researcher and treatment 6 had 22. Since these two treatments did not have both map and messages displayed at the same time, observations are easily combined with those from the camera.

However, treatment 4 had messages plus the map. The significance of this is that treatment 4 has 19 observations that cannot be separated into message and map attention. This does not present a problem in the analysis of total attention. However, when message and map attention are isolated for analysis, the 19 observations recorded by the

researcher will not be included due to the inability to separate message from map attention.

Once installed, the camera equipment allowed a single frame of Super 8 movie film to be exposed every four seconds after the triggering device was first tripped. The camera was set to run at the rate of a frame every four seconds for a period of four minutes. Because visitors sometimes moved back and forth across the infrared beam used to trigger the camera, some observations exceed four minutes in length. There was concern that four minutes might not capture the full time some visitors viewed the bulletin board, but observations from the film showed this not to be true. Those visitors who viewed the board longer that four minutes tripped the infrared beam enough to record their full viewing time at the board.

Placement of the camera allowed for the differentiation of whether visitors were looking at the messages or the map. This was recorded and entered in the data base as entrance attention to the messages or the map. There are also measures of exit of attention to the messages and map for some groups. But because the camera equipment was arranged to maximize the opportunity for measuring entrance attention, exit attention measures are not available for all groups and will not be included in the analysis.

To make the personal and camera observations compatible for analysis, total attention for visitors observed by the camera is defined as the total time spent looking at the bulletin board. This variable is simply the total attention to the bulletin board measured by the researcher for the first two and one half weeks for the study and the combination of entrance attention to the messages plus entrance attention to the map from the camera observations.

Separate message and map attention is also available for all treatments. However, for the nineteen visitors who were observed by the researcher during placement of treatment 6, there as no separate message and map data. For visitors who were observed

by the researcher during placement of treatments 5 and 6, all data can be used since these treatments had only the messages or the map displayed. Thus there is no need to separate map from message attention for these two treatments.

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