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EVALUATION OF A WILDERNESS EDUCATION PROGRAM
BASED ON COGNITIVE AND AFFECTIVE CHANGES

by

Debi L. Dowell

B.A. (Psychology) Bowling Green State University, 1977

Presented in partial fulfillment of the
requirements for the degree of

* Master of Science *

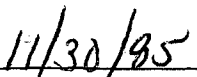
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Evaluation of a Wilderness Education Program based
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Director: Stephen F. McCool *SJM*

Many wilderness managers are striving to make appropriate changes in visitor behavior through information and education programs. These programs, many stressing minimum impact camping methods, have grown rapidly in recent years but with little evaluation of content and communication media or determination of effectiveness based on actual behavioral changes. In this study, an information dissemination program entitled, "Leave No Trace", was evaluated based on changes in cognitive and affective domains. Both the communication media and source were manipulated and their effectiveness determined by post treatment test scores.

Boy Scouts and leaders from Missoula, Montana, served as subjects (n = 215) for the experiment. Participating troops were randomly selected to receive various treatments. A modified Solomon's four group experimental design was chosen in order to test for potential effects of the pre-test on the post-test scores. During regularly scheduled troop meetings each participating Scout completed questions in a test booklet (the measurement instrument) one week before the treatment (the pre-test score), immediately following the treatment (the post-test score), and again approximately one month after the treatment (the retention score).

Overall, the major conclusion of this study was that exposure to the "Leave No Trace" program induced significant changes in Boy Scouts' wilderness knowledge, skills and intentions to perform specific appropriate minimum-impact behaviors. Evidence of affective changes in wilderness beliefs and attitudes due to participation in the program were mixed. Manipulation of the communication source revealed that the effectiveness of the program is not necessarily dependent on who presents the information (i.e., a uniformed, male, U. S. Forest Service presenter vs. a non-uniformed, female, graduate student). Retention scores for wilderness knowledge, skills and behavioral intentions were significantly higher than pre-test scores but there were also significant decreases in retention scores compared to post-test scores for skills and behavioral intentions.

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I would like to gratefully acknowledge the understanding contributions of my graduate committee which includes Dr. Mark Clark, Dr. Robert Lucas and Dr. Stephen McCool. Their hours spent reviewing my thesis and providing suggestions helped immeasurably in strengthening the final draft.

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CHAPTER I

INTRODUCTION - WILDERNESS EDUCATION

The Need to Evaluate Wilderness Education Programs

There is no question that recreational use is the source of many wilderness management challenges. Washburne and Cole (1983) found that recreationally induced impacts were viewed as a problem in more than 70 percent of the units comprising the National Wilderness Preservation System. As overwhelmingly expressed at the National Wilderness Management Workshop (Krumpe 1985), education and information programs are frequently viewed as the key to solving these problems, and many wilderness managers and users consider them preferable to more direct, intrusive and regulatory techniques (Hendee et. al. 1978; Peterson and Lime 1979; Washburne and Cole 1983).

Washburne and Cole (1983) also reported that nearly 60 percent of the wilderness managers they questioned used information programs to help minimize impacts from visitor use. In fact, their study revealed that such minimum impact education programs were used more frequently than any other wilderness management technique. The heavy investment in and reliance on these programs indicates a faith in their ability to efficiently reduce impacts. However, the question of effectiveness is one little researched.

Lucas, et. al. (1985) suggested that:

. . . more needs to be done to identify the key information that we supply to visitors, how to best convey this information, how to determine whether education produces the desired behavior, and finally, how to evaluate the performance of different educational approaches as well as other management strategies.

In a review of wilderness education literature, Mercer (1984) attempted to integrate these identified needs, and suggested guidelines for future wilderness education efforts. He recommended that such education and information programs include not only techniques to reduce or avoid impacts, but also information about wilderness philosophies and values, wilderness history and policy, management techniques and tools and the ecosystem itself. Mercer implied that effective communication of minimum-impact skills depends on an understanding of the rationale for such skills.

This paper reports the results of an experiment to evaluate the cognitive (i.e. knowledge) and affective (i.e. feelings or emotional) changes induced by a minimum-impact education program. The program was developed jointly by the U.S. Forest Service and the Boy Scouts of America to address specific impact problems in wilderness.

Research Objective

The basic objective of this study is to evaluate the cognitive and affective changes induced by exposure to a minimum-impact educational program, titled "Leave No Trace" (LNT). Since one of the goals of wilderness education is to teach appropriate recreational behaviors, Fishbein and Ajzen's behaviorally-based information processing model was adopted to direct this evaluation. This model provided the conceptual framework to determine not only the program's effectiveness based on improvements in knowledge levels but also allowed consideration of associated changes in affective domains (i.e. beliefs, attitudes and behavioral intentions). In addition to determining cognitive and affective changes, manipulation of communication source and media enabled a more complete evaluation of the program.

CHAPTER II

LITERATURE REVIEW

The purpose of this research project is to evaluate a specific wilderness education program in terms of the cognitive and affective changes induced by exposure to the program. In order to accomplish this purpose, it is first necessary to look at previously completed research. Since wilderness education is a somewhat recently acknowledged field, literature on wilderness program evaluation techniques is very limited. However, there are several studies pertaining to wilderness users' information needs, types of information available and the affect of information on behavior which provide some insight for establishing evaluation criteria.

Visitors' Information Needs vs. Managers' Perception of Needs

While the use of information programs and other "light-handed", non-regulatory approaches to wilderness management has long been advocated (Lime 1976; Lime and Stankey 1971; McCool 1976), only recently have researchers and managers become aware of how they are being used and in what types of situations. Martin and Taylor (1981)

have shown that wilderness managers frequently depend on brochures, maps and signs to encourage minimum-impact behavior. However, they reported that managers feel that slide shows and television are the most effective media for communicating information about these behaviors.

From the viewpoint of wilderness visitors, Dowell and McCool (1983) found that 90 percent of the sampled visitors to the Bob Marshall Wilderness Area (located in western Montana) considered accurate maps desirable forms of information and 71 percent considered guidebooks desirable. However, only 37 percent found explanatory signs desirable. This indicates a discrepancy between what managers may be using to convey information, i.e. signs explaining minimum-impact practices, and what visitors consider desirable.

Wilderness Program Content and Information Sources

Essential elements in communication include the message content and the perceived source or sender of the information. Fazio's (1979) study found that historical information was included in only 16 percent of the wilderness literature he examined, and only 30 percent discussed sanitation or fire prevention. Almost 60 percent of the publications discussed "wilderness manners" and 73 percent addressed equipment, safety and comfort, indicating

that skills and trip planning are often, but not always presented in such visitor oriented literature.

The importance of developing source credibility is stressed in much of the persuasive communication literature (McGuire 1969 and 1972). Martin and Taylor (1981) found that personnel based communication methods were rated higher than mass media communication sources by wilderness managers. The average rating, as determined on a Likert scale from poor (1) to excellent (5), for mass media sources was 2.54, while personnel based communications averaged 3.42. The LNT program may be used as either a personnel based communication means by actually using Forest Service employees to present the material or the program package may be presented by the Scout leaders.

Information to Influence Behavior and Knowledge Levels

~

A variety of research has examined the effectiveness of various communication media in environmental education (see, for example, Schwabb 1982; Weiss and Knudson 1980; Zimmerman et. al. 1978). These studies all showed that information presented to individuals in a variety of situations can result in major shifts in knowledge levels and behavior.

In a classic field experiment, Krumpke and Brown

(1982) studied the potential changes in trail selection among visitors to Yellowstone National Park backcountry. They found that 27 percent of the visitors changed their planned routes when given alternatives identified through a "backcountry trail selector" presented at ranger stations. Oye (1984) looked at cognitive and affective changes resulting from a wilderness education program directed at sixth grade students in Missoula, Montana. His study suggested that the hour long wilderness education program significantly increased knowledge scores, but it did not change attitudes toward wilderness. However, his post-test measure was taken the day after the treatment and the measurement instrument used for the pre-test was formatted differently than the post-test. Oye did not evaluate how long subjects retained the newly acquired information.

More recently, Oliver et. al. (1985) tested the effectiveness of several information treatments on actual behavior in a developed campground. Their study indicates that information about appropriate behavior can reduce recreationists' impacts. Robertson's study (1981) supports this finding. She investigated the relationship between visitors' knowledge levels and appropriate wilderness behavior and found that 35 percent of the variance in behavior was explained by knowledge levels alone. However,

Robertson was testing the relationship between knowledge level and behavior and not measuring actual changes in knowledge or behavior resulting from additional information.

Difficulties of Off-Site Program Evaluation

Although the Oliver et. al. study looked at actual behavior, the program investigated was an on-site informational type, opposed to the great many off-site school and user group programs now in use. Effectiveness determined by measureable and observable behavior changes is difficult to assess in these off-site education programs, yet important because of the frequency with which these programs are used.

Another difficulty of off-site program evaluation is determining how long the information will be retained. Will this newly acquired knowledge be remembered a month or even years later when a visitor is actually camping in a wilderness area? Also, answering more specific questions about the effects of different media forms and information sources on long term memory, may have important ramifications in determining overall program effectiveness. Perhaps the short term value of recently acquired information in affecting behavior may be quite different than the projected long term value.

Education and psychology literature have dealt extensively with defining and measuring short and long term memory as well as testing word and visual associations which may elicit recall (Bruning 1983; Deutsch and Deutsch 1975; Masson and Miller 1983; Purdy and Luepnitz 1982; Slemecka and McElree 1983). However, no literature was found which specifically addresses the most appropriate time to test retention rates. Even though program evaluations rarely mention information retention, the need to test for it has been clearly identified (Oye 1984; Mercer 1984).

Linking Program Evaluation with Behavioral Prediction

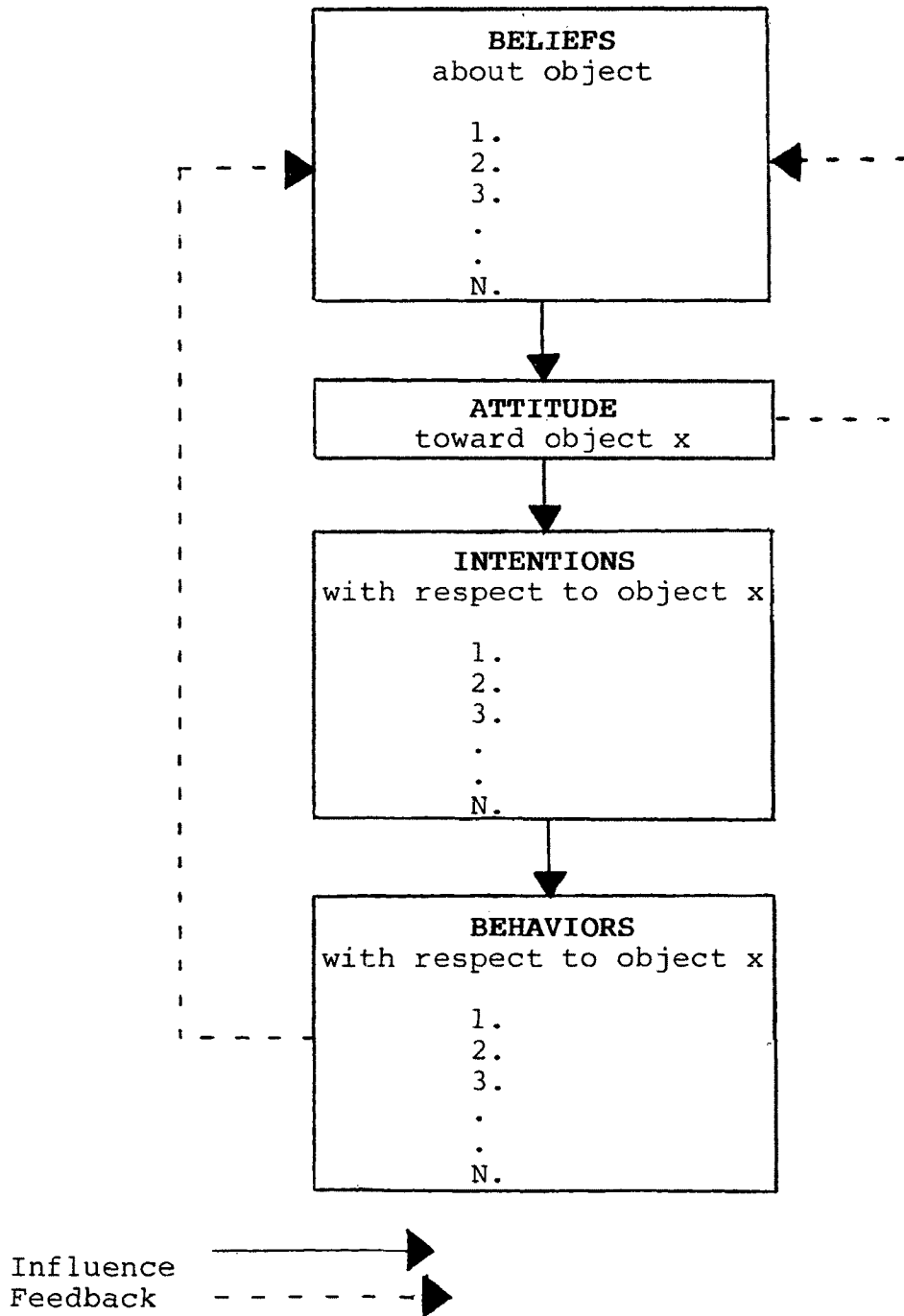
It is evident that managers are concerned about reducing the impacts from recreation use through minimum impact education programs. However, many programs have not been tested for their effectiveness in changing levels of knowledge about appropriate behavior, or changing behavior. Since wilderness managers are placing heavy reliance on these programs, testing for their effectiveness by systematic evaluation is important.

Recently, the USDA Forest Service, in cooperation with the Boy Scouts of America, developed a minimum-impact educational program, titled "Leave No Trace", to affect changes in Boy Scouts' wilderness camping behavior.

The program consists of a 20 minute automated slide and tape program and associated booklet with discussion and test items. The program concentrates almost exclusively on minimum-impact wilderness skills, with little discussion or wilderness philosophy, values, history, legislation, ecology or management. Due to growing popularity of the program, interest has been expressed for a thorough evaluation of it.

Evaluating the effectiveness of the program in the cognitive and affective domains is important, but managers are seeking an actual change in behavior. Because many programs similar to the one examined here are conducted off-site, the effectiveness in changing actual behavior is difficult to assess. However, Fishbein and Ajzen (1975) offer a conceptual model that links attitudes, beliefs and behavioral intentions as predictors of actual behavior (see Figure 1). They define attitude as the amount of affect for or against some object, person, issue or action. Beliefs link objects to some attribute, such as "wilderness areas are places where a person can be alone." Behavioral intentions are special cases of beliefs, in which the object is always the person and the attribute is always a behavior, for example, "On my next wilderness camping trip, I plan to bury all aluminum cans." Fishbein and Ajzen, in addition to a number of other researchers, have found that behavioral intentions

Figure 1. Fishbein and Ajzen's model relating beliefs, attitudes, intentions and behaviors with respect to a given object (Fishbein and Ajzen 1975).



are predictive of actual behavior.

Further explanation of the relationship between these behavioral antecedents and actual behavior may help better understand Fishbein and Ajzen's conceptual model. A person learns or forms a number of beliefs based on direct observation, information received from outside sources, or various inference processes. The totality of a person's beliefs serves as an informational base that ultimately determines his or her attitudes, intentions, and behaviors. Since attitudes are based on salient beliefs, if beliefs are favorably associated with the issue in question (i.e. appropriate minimum-impact camping techniques), then attitudes will tend to be favorable also. The opposite is also true, a negative attitude will result if an object of issue is associated with primarily unfavorable attributes. Attitude toward an object or issue is related to the person's intentions to perform a variety of behaviors with respect to that object or issue. Each intention is viewed as being related to the corresponding behavior. Since most social behavior is a matter of choice, excluding unforeseen events, a person should perform those behaviors he or she intends to perform.

The most fundamental principle underlying Fishbein and Ajzen's approach is that man is basically a rational information processor whose beliefs, attitudes, intentions

and behaviors are influenced by the information available to him or her. This principle implies that any analysis of a persuasive attempt must begin with the items of information made available to subjects in the persuasive communication. The subject's processing of this information determines the effect of the communication on the dependent variables, i.e. knowledge levels, attitudes, beliefs, etc.

In this study, therefore, not only were changes in knowledge about wilderness minimum-impact skills assessed, but changes in attitudes, beliefs and behavioral intentions resulting from exposure to the minimum-impact information program were also considered.

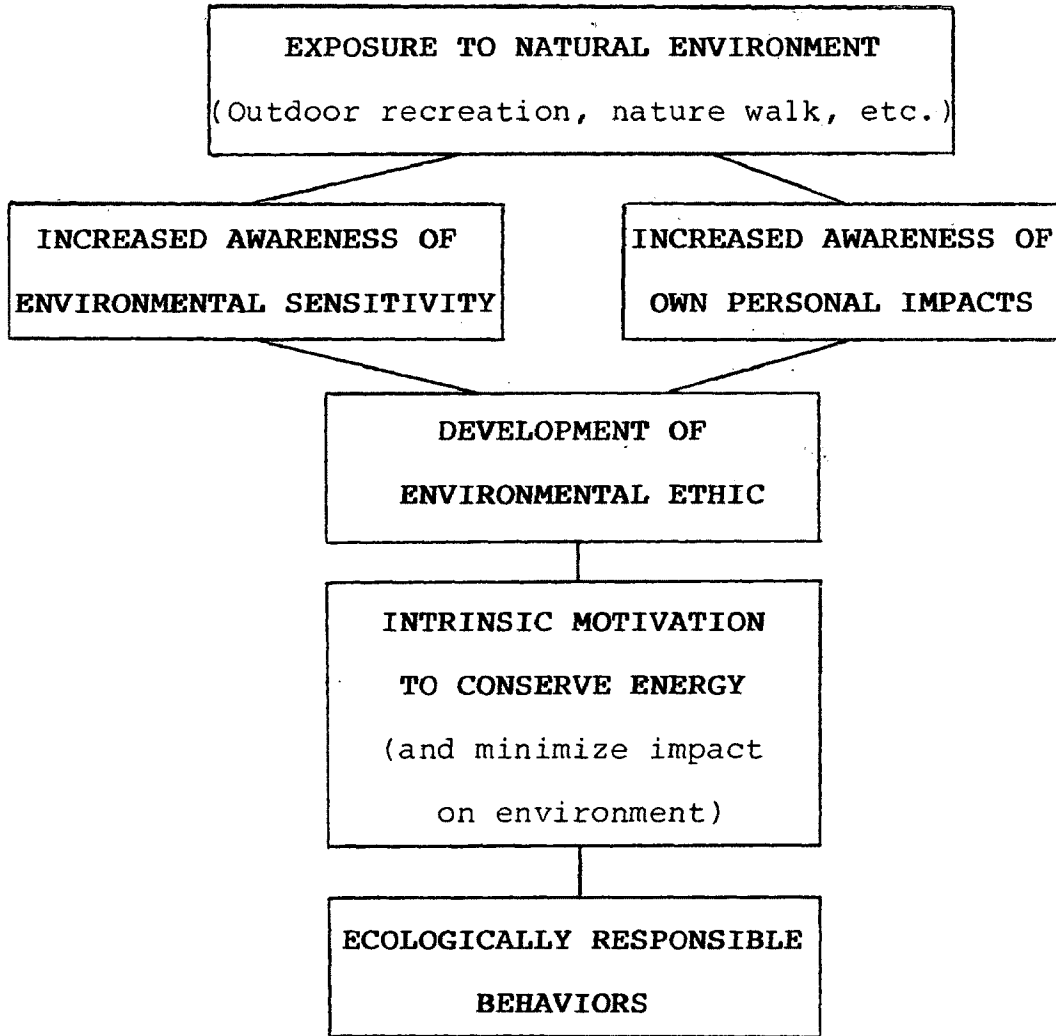
Including Recreational Experience in Behavioral Prediction

While modifying inappropriate camping behaviors through information and education is the basic premise of this study, it is also important to consider recreation experiences that may motivate these behaviors. Allen and McCool (1981) reported on several studies which examined relations between outdoor recreation participation and energy conservation or ecologically responsible behavior. For sake of clarity, **ecologically responsible behavior** refers to actions which are taken to improve relations between people and the environment. Allen and McCool

note that operant applications to encourage ecologically responsible behavior, such as providing information designed to promote appropriate camping behavior, have their place and should be vigorously pursued, however, actual camping experiences that may motivate these responsible behaviors also need consideration.

Allen and McCool propose a preliminary model which includes exposure to the natural environment as an antecedent to increased awareness of one's own personal impacts and environmental awareness (Figure 2). These lead to development of an environmental ethic which when combined with motivational influences to minimize environmental impacts culminate in ecologically responsible behaviors. Perhaps by including past outdoor recreation experience in predicting actual behavior, the Fishbein and Ajzen model may be strengthened.

Figure 2. Model showing relations between participation in outdoor recreational activities and ecologically responsible behavior.



CHAPTER III

METHODOLOGY

Boy Scouts from the Missoula, Montana, area served as subjects for the experiment. Three treatments representing different components of the program were tested:

(1) the slide show alone, (2) the booklet alone and (3) the booklet and slide show combined. Because the program is designed for a wide variety of situations and because source credibility appears to be a major issue in communications research, it was decided to test for the effects of two different types of leadership situations: A male Forest Service employee in uniform and a female graduate student (the author) non-uniformed.

The resulting two factorial structure was tested using an expanded version of Solomon's four group experimental design (Campbell 1957), and is displayed in Figure 3. This design was chosen in order to test for potential effects of the pre-test on the post-test score. This is known as the "familiarity effect". Also, it was possible to test the effect of manipulating the independent variables, communication media and source, on the dependent variable, the degree of change in cognitive and affective domain levels. In addition, the design allows for testing the effects of maturation and history. History refers to events that have occurred during the

Figure 3. Modified Solomon's four group experimental design.

<u>Group</u>	<u>Pre-test</u>	<u>Treatment</u>	<u>Post-test</u>	<u>Retention</u>
1	X	A	X	X
2	X	A1	X	X
3	X	B	X	X
4	X	B1	X	X
5	X	C	X	X
6	X	C1	X	X
7		A	X	
8		A1	X	
9		B	X	
10		B1	X	
11		C	X	
12		C1	X	
13	X		X	
14			X	

A: slide show, USFS instructor

A1: slide show, graduate student instructor

B: booklet, USFS instructor

B1: booklet, graduate student instructor

C: slide show and booklet, USFS instructor

C1: slide show and booklet, graduate student instructor

X: measurement

time span between the pre-test and post-test and which may affect the results. Maturation covers those effects which are systematic with the passage of time and not, like history, a function of the specific events involved (Campbell 1957). Thus, this experimental design allows the researcher to control and test for the effects of a number of possible extraneous variables. As a result, a total of 14 Boy Scout troops (N = 215) were selected for the study. Participating troops were randomly selected to receive the various specific treatments.

In the pre-test, each participating Scout completed a background information form and test booklet (see Appendices A and B) one week before the treatment. The background information provided data on social-demographic characteristics as well as outdoor recreation experience. The booklet contained a number of items measuring skills knowledge, and knowledge about the ecological, philosophical, managerial, and legal dimensions of wilderness. It also included beliefs, attitudes and behavioral intentions associated with minimum-impact camping. The same booklet was given to Scouts immediately following the treatment (the post-test score). Approximately one month after the post-test, a retention test was given using the same test booklet.

Before the actual experiment began, a trial run with local Boy Scouts as subjects was conducted to forewarn of any possible problems with the measurement instrument and/or program presentation. This trial run indicated that the measurement instrument was too easy, as the average score was 80 percent correct on the pre-test. Obviously, this allowed little room for score improvement on the post-test. Hence, the test questions were made more difficult plus additional questions were included. Pre-test scores on the second trial run with fifth grade students were much lower, yet the questions were comprehensible.

Reliability analysis of the five sections in the test booklet indicated that some questions should not be included, therefore several were omitted. In order to determine suitability of questions in each of the five section, covariance matrices were computed which provided correlation coefficients for each question with every other question within the same section. A Cronbach's alpha procedure using the Statistical Package for the Social Science (SPSSx 1983) provided an estimate of item and scale reliabilities. An alpha of .60 or greater for each section was used as a guideline to retain or delete questions. Table 1 shows Cronbach's alpha for the appropriate scale.

Table 1. Reliability test for the various domain scales.

<u>Domain</u>	<u>Cronbach's Alpha</u>
Knowledge	.61
- Questions 1-5, 7-16, 19 <u>1/</u>	
Skills	.68
- Questions 6, 17, 18, 20-23	
Beliefs	.62
- all Likert-scaled questions under beliefs	
Attitudes	.56 <u>2/</u>
- all Likert-scaled questions under attitudes	
Behavioral Intentions	.74
- all Likert-scaled questions under behavioral intentions	

1/ Questions in test booklet, Appendix A.

2/ This was the highest attainable Cronbach's alpha possible for this section.

The knowledge questions were scored (1) for a correct answer and (0) for an incorrect answer, and cumulative scores were calculated for each subsection, i.e. knowledge of skills and general wilderness knowledge. A total of 7 points were possible for the skills section, while there was a total of 16 points possible for the general wilderness knowledge section. Next, Likert-scale scores (ranging from a value of 1 to 5) were used to measure wilderness beliefs, attitudes and behavioral intentions. These scores represented the degree of agreement with LNT ethics and practices. The possible points for each section were: beliefs - 20 points, attitudes - 20 points, behavioral intentions - 45 points.

CHAPTER IV

RESULTS

Social-Demographic Characteristics

The background information collected provided social-demographic data about the subjects. The median age of participants was 14 years old, with 81 percent of the subjects between 10 and 18 years old. Forty-one percent of the subjects had completed elementary school, 31 percent had finished junior high school and another 13 percent had finished high school. Eighth grade was the mean education level completed. The majority of Scouts' mothers were housewives. Thirty-seven percent of the Scouts' fathers were in professional positions, followed by 19 percent in operative jobs, i.e. millworkers, equipment operators, and loggers.

Nearly as many Scouts belonged to other clubs as didn't and sports clubs comprised the largest percentage (35%) of these other clubs. The majority of subjects had belonged to Boy Scouts 4 years or less.

Recreation Experience

All of the Scouts stated that they had spent at least one night camping. After reading a brief definition

of what legally constitutes a designated wilderness area, the majority of subjects (81%) reported taking a day hike in a wilderness area. Most Scouts (76%) responded they had spent a night in a wilderness area while 18 percent did not know if their overnight experience had been in a wilderness area. When asked to name the wilderness area(s) which they had visited, 30 percent of the Scouts did not know the name, 10 percent identified areas which are not currently designated wilderness areas and approximately 30 percent correctly named a wilderness area. Not surprisingly, the popularized Bob Marshall Wilderness, located within an hour's drive of Missoula, was the most frequently identified wilderness area. National parks were named as wilderness areas by 17 percent of the subjects.

As far as trip characteristics, Scouts were asked who they usually go with when visiting wilderness areas and 41 percent identified a club, usually meaning their Boy Scout troop. Families were also frequently mentioned. The vast majority (84%) of Scouts travel in wilderness areas on foot. Interestingly, 11 percent of the subjects mentioned cars as their major method of wilderness travel. This may reflect Scouts' confusion regarding "designated" wilderness areas versus what might otherwise be considered "undesigned" wilderness areas or perhaps the respondents were thinking in terms of how they traveled "to" a

wilderness instead of how they traveled once they were "in" a wilderness.

Differences among Treatment Groups

Preliminary analysis of results indicated that in spite of random assignment of groups to treatments, some groups differed significantly from other groups on pre-test scores, and post-test scores varied according to pre-test scores. The Solomon's four group experimental design proved invaluable by allowing clear evidence of a strong familiarity effect of the pre-test scores on the post-test scores. The familiarity effect was tested by adopting Campbell's (1957) suggestion of using a simple two-by-two analysis of variance (ANOVA) design as follows:

	Control	Experimental Treatment
Pre-tested	x post score (Group 13)	x post score (Groups 1-6)
Unpre-tested	x post score (Group 14)	x post score (Groups 7-12)

A two-way ANOVA was conducted for each of the five tested domains. Table 2 shows a composite of main effects of pre-testing, treatment and the interaction of the two for each of the tested domains. Given these results, analysis of covariance (ANCOVA) was used to test for treatment effects among the various groups. A hierarchical ANCOVA (Nie et. al. 1975) was chosen because it controls

(1) for unequal cell sizes and (2) for the effects of the covariate (the pre-test scores) prior to testing for the main effects of the treatments..

Table 2. Test for main effects of pre-testing for various domains.

<u>Domain</u>	<u>Main Effects</u>	<u>Significance</u>
Knowledge	pre-test	<.01
	treatment	.31
	2-way interaction	.88
Skills	pre-test	<.01
	treatment	.03
	2-way interaction	.35
Beliefs	pre-test	<.01
	treatment	.10
	2-way interaction	.37
Attitudes	pre-test	<.01
	treatment	.09
	2-way interaction	.56
Behavioral Intentions	pre-test	<.01
	treatment	.47
	2-way interaction	.31

By use of a t-test, the combined effects of maturation and history can be tested by comparing post-test scores of the unpre-tested control group with pre-test scores of the pre-tested control and experimental groups. Analysis indicated that in fact, maturation and history may have affected most of the post-test scores (Table 3).

Table 3. Test for main effects of maturation and history on mean scores for each tested domain.

<u>Domain</u>	<u>Unpre-tested Control</u>	<u>Pre-tested Control & Experimental</u>	<u>Signi- ficancel/</u>
Knowledge			
Skills			
Beliefs			
Attitudes			
Behavioral Intentions			

1/ Two-tailed probability.

Communication Source

A two-way ANOVA indicated that the variable concerning leadership of the program (the person making the presentation) had no significant main effects on the five dependent variables measured: (1) knowledge of skills; (2) general wilderness knowledge; (3) wilderness beliefs; (4) wilderness attitudes; (5) behavioral intentions (Table 4).

Table 4. Mean post-test scores and equivalent percentages by communication source and tested domain. 1/

<u>Domain</u>	<u>Communication Source</u>		Signif- <u>icance</u> <u>2/</u>
	<u>male, USFS</u>	<u>female, U of Mt</u>	
Knowledge	6.06 (87%)	6.29 (90%)	.98
Skills	11.52 (72%)	12.09 (76%)	.11
Beliefs	18.01 (90%)	17.84 (89%)	.69
Attitudes	17.77 (89%)	17.86 (89%)	.83
Behavioral Intentions	37.83 (84%)	38.31 (85%)	.60

1/ Mean scores adjusted for effects of covariate.

2/ Hierarchical analysis of covariance with pre-test score as covariate.

Communication Media

The three communication media treatments significantly affected post-test scores for wilderness knowledge, minimum-impact skills and behavior intentions (Table 5). The highest post-test scores for knowledge and skills were reported for the slide treatment, while the book seemed to have a greater effect on behavioral intentions. Post-test scores did not differ significantly for the affective domains: beliefs and attitudes. While there was some difference among the mean post-test scores by treatment, there was no major overall difference in these scores, suggesting that using the book may be as effective as the slide show. The treatment using both book and slide show sometimes resulted in slightly lower scores than either the book or slide show alone. This may be due to the length of time of the combined treatment; often, it appeared that the subjects became distracted or bored with the presentation.

The effects of the media treatments on difference scores are shown in Table 6. The difference scores are simply the mean difference between the individual Scout's pre-test and post-test scores and indicate the absolute amount of improvement as a result of the specific treatment. The ANCOVA indicates that the treatment had a significant effect on knowledge, skills, attitudes

Table 5. Mean post-test scores and equivalent percentages by communication media and tested domain. 1/

<u>Domain</u>	<u>Communication Media</u>			<u>Signif- icance^{2/}</u>	
	<u>Control</u>	<u>Book</u>	<u>Slides</u>		<u>Book & Slides</u>
Knowledge	10.99 (69%)	11.14 (70%)	12.22 (76%)	12.04 (75%)	.02
Skills	3.77 (54%)	5.88 (84%)	6.50 (93%)	6.14 (88%)	<.01
Beliefs	17.36 (87%)	18.06 (90%)	17.71 (86%)	17.97 (90%)	.71
Attitudes	17.25 (86%)	18.04 (90%)	17.55 (88%)	17.81 (89%)	.55
Behavioral Intentions	33.07 (73%)	38.91 (86%)	37.38 (83%)	37.72 (84%)	<.01

1/ Mean scores adjusted for effects of covariate.

2/ Hierarchical analysis of covariance with pre-test score as covariate.

Table 6. Mean difference scores by communication media and tested domain. 1/

<u>Domain</u>	<u>Communication Media</u>				<u>Signif- icance^{2/}</u>
	<u>Control</u>	<u>Book</u>	<u>Slides</u>	<u>Book & Slides</u>	
Knowledge	-.10	.19	.94	1.10	.04
Skills	-.27	2.21	2.56	2.70	<.01
Beliefs	.51	.24	-.12	1.10	.17
Attitudes	-.01	.50	-.25	1.26	.05
Behavioral Intentions	1.27	3.79	1.15	4.28	.04

1/ Difference = post-test score - pre-test score;
mean scores adjusted for effects of covariate.

2/ Hierarchical analysis of covariance with pre-test
score as covariate.

and behavioral intentions. The combined media of book and slides resulted in the greatest improvement. This may seem contradictory to the post-test score results, however, it must be kept in mind that these are two different measurements. The difference scores reflect the actual degree of change in the domain levels opposed to the post-test scores which do not consider the pre-test domain levels.

A comparison of mean retention scores and mean difference scores between the post-test and retention score for the various communication media forms revealed no major differences. Retention scores were significantly higher than pre-test scores for knowledge, skills and behavioral intentions (Table 7). However, there were also significant decreases in retention scores compared to post-test scores for skills and behavioral intentions (Table 8). Interestingly, knowledge increased and just missed statistical significance at an alpha level of .05.

Strength of Association Between Dependent Variables

Now that the effects of manipulating the independent variables on the dependent variables have been discussed, it is important to see how they combined to predict behavioral intentions. Bivariate correlation analysis was

Table 7. Mean pre-test scores and mean retention scores by tested domain.

<u>Domain</u>	<u>Test</u>		<u>Significancel/</u>
	<u>Pre-test</u>	<u>Retention</u>	
Knowledge	11.71	12.49	<.01
Skills	3.98	5.82	<.01
Beliefs	18.13	18.04	.38
Attitudes	17.36	17.62	.23
Behavioral Intentions	35.18	36.87	<.01

1/ One-tailed probability.

Table 8. Mean post-test scores and mean retention scores by tested domain.

<u>Domain</u>	<u>Test</u>		<u>Significancel/</u>
	<u>Post-test</u>	<u>Retention</u>	
Knowledge	12.14	12.55	.06
Skills	6.37	5.81	<.01
Beliefs	18.63	18.33	.17
Attitudes	18.14	17.82	.11
Behavioral Intentions	38.22	36.88	<.01

1/ One-tailed probability.

conducted to summarize the strength of association between the dependent variables. First, Pearson's correlation coefficients based on pre-test scores were computed. Table 9 shows that behavioral intentions are significantly correlated with knowledge, beliefs, attitudes and skills. Also, it is important to note the strong positive correlations between all five tested domains. These results support the strength of relationship between the behavioral antecedents which Fishbein and Ajzen proposed in their behavioral prediction model.

In order to further test the degree of linear dependence of behavioral intentions on the other independent antecedents, multiple regression analysis was used. For this purpose, review of the R squared values shows that 28 percent of the variation in behavioral intentions is explained by general wilderness knowledge and beliefs (Table 10). These explained variance values reflect the overall strength of the prediction equation and points out the need to consider other variables which may be affecting behavioral intentions.

Table 9. Pearson's Correlation Coefficient for the tested domains, pre-test data.

	Skills	Knowledge	Beliefs	Attitudes
Knowledge	² r .92 sig. <.01			
Beliefs	² r .88 sig. <.01	² r .95 sig. <.01		
Attitudes	² r .89 sig. <.01	² r .95 sig. <.01	² r .98 sig. <.01	
Behavioral Intentions	² r .89 sig. <.01	² r .96 sig. <.01	² r .98 sig. <.01	² r .97 sig. <.01

Table 10. Prediction of pre-test behavioral intention scores by wilderness knowledge, skills, beliefs and attitudes, multiple regression.

<u>Variable</u>	<u>Multiple R</u>	<u>R Square</u>	<u>Adjusted R sq</u>	<u>Beta</u>	<u>Signif- icancel/</u>
Knowledge	.44	.19	.18	.44	<.01
Skills and Knowledge	.52	.28	.25	.07	<.01
Beliefs, Skills and Knowledge	.51	.26	.24	.27	<.01
Attitudes, Beliefs, Skills and Knowledge	.53	.28	.25	.14	<.01

1/ Values represent significance of F when test includes all preceding variables.

Prediction of Behavioral Intentions by Social-Demographic and Recreation Experience

To predict behavioral intentions from other social-demographic and recreation experience variables, both of which are important considerations according to the "ecologically responsible behavior" literature (Allen and McCool 1982), a series of stepwise multiple regression analyses were conducted. All social-demographic and recreation experience variables were included in the analyses. Stepwise inclusion allows for the variable that explains the greatest amount of variance in the dependent variable to be entered first; the variable that explains the greatest amount of variance in conjunction with the first is second, and so on. In other words, the variable that explains the greatest amount of variance unexplained by the variables already in the equation enters the equation at each step.

First of all, results indicated that two variables, education level and overnight camping experience, accounted for 31 percent of the variance of pre-test behavioral intentions (Table 11). The single item education level emerged first, but overnight camping experience added a significant amount to understanding behavioral intentions. When all social-demographic and recreation experience variables (13 total) were included in the regression

Table 11. Prediction of pre-test behavioral intention scores by social-demographic and recreational experience variables.

<u>Variable</u>	<u>Multiple R</u>	<u>R Square</u>	<u>Adjusted R sq</u>	<u>Beta</u>	<u>Signif-icancel/</u>
Educational Level	.37	.13	.13	.37	<.01
Overnight Camp. Exper.	.56	.31	.30	.43	<.01
All Other Variables	.62	.38	.29		<.01
<ul style="list-style-type: none"> - Wilderness Overnight Experience - Type of Group - Other Club Membership - Father's Occupation - Mother's Occupation - Travel Method - Other Types of Clubs - Wilderness Area Name - Years in Scouts - Wilderness Day-Use Experience - Age 					

1/ Values represent significant of F when test includes all preceding variables.

equation, 38 percent of the variation in pre-test behavioral intentions was explained. Caution must be heeded in interpreting these results since both education level and camping experience are probably age-related. Even though age was selected in the initial analysis as a significant predictor for only skills knowledge, perhaps the high correlation between education level, age and camping experience influenced the results.

In order to gain some insight regarding the overall strength of association among the social-demographic and recreation experience variables, Pearson's correlation coefficients were computed. Not surprisingly, age and education level were highly correlated (.90) while the number of years subjects had belonged to their respective Boy Scout troops was also highly correlated with both age (.48) and education level (.52). Furthermore, overnight camping experience and day use in Wilderness areas was strongly associated (.73).

Considering these findings and the need to avoid any multicollinearity effect of age, education level and years in Boy Scouts, as well as, wilderness day use and overnight camping experience, two new variables were created and used in the regression equation in place of their individual components. Nie et. al. (1975) suggest using a composite scale as a possible solution for

controlling confounding effects of strongly correlated independent variables. As might be expected, the combined age variable accounted for the largest percentage of explained variance (15%) in pre-test behavioral intentions, and when the type of group with which Scouts usually visited Wilderness areas was added, 33 percent of the variation in pre-test behavioral intentions was explained (Table 12).

Further multiple regression equations were computed to determine the linear dependence of other pre-test domains (i.e. knowledge, beliefs, attitudes and skills) on the social-demographic and experience variables. The two newly created variables as well as all other social-demographic and recreation experience variables were included. Generally, social-demographic and experience variables were not significant in explaining variation in pre-test scores for the affective domains (i.e., wilderness beliefs and attitudes). Interestingly though, 31 percent of the variance in pre-test general wilderness knowledge scores, a cognitive domain, was explained by age group alone (Table 13).

Table 12. Prediction of pre-test behavioral intention scores by social-demographic and recreation experience variables with age re-grouped.

<u>Variable</u>	<u>Multiple r</u>	<u>R Square</u>	<u>Adjusted R square</u>	<u>Beta</u>	<u>Signif- icancel/</u>
Age Group	.39	.15	.15	.39	<.01
Type of Group	.50	.33	.32	.42	<.01
All Other Variables	.63	.40	.31		<.01
<ul style="list-style-type: none"> - Wilderness Recreation Experience - Father's Occupation - Other Club Membership - Mother's Occupation - Travel Method - Wilderness Area Name - Other Types of Clubs 					

1/ Values represent significance of F when test includes all preceding variables.

Table 13. Prediction of pre-test general wilderness knowledge by social-demographic and recreational experience variables.

<u>Variable</u>	<u>Multiple R</u>	<u>R Square</u>	<u>Adj'ted R sq</u>	<u>Beta</u>	<u>Signif-icancel/</u>
Age Group	.56	.31	.30	.56	<.01
Type of Group	.59	.35	.33	.20	<.01
All Other Variables	.64	.41	.34		<.01

- Other Club Membership
- Wilderness Experience
- Father's Occupation
- Mother's Occupation
- Travel Method
- Wilderness Area Name
- Other Types Clubs

1/ Scores were adjusted for the effect of the covariate, pre-test scores, for each of the tested domains.

Because of the importance of age in predicting knowledge and behavioral intention scores, further analysis of the effect of this variable on test scores was conducted. It was found that pre-test scores for the skills, general knowledge, beliefs, and behavioral intentions sections were significantly different for the various age groups (Table 14). Subjects who had finished high school which included Explorer Scouts, assistant leaders and leaders had exceptionally higher pre-test scores than the younger Scouts. Also, post-test scores for all domains except beliefs were found to be significantly different among the various age groups (Table 15). However, the difference scores (post-test scores - pre-test scores) which reflect the actual improvement in test scores indicate no statistically significant differences among age groups (Table 16). Perhaps it is important to note that difference score results indicate that overall, high school level Scouts (ages 14 through 18) showed the greatest degree of improvement in behavioral intentions and skills knowledge. This finding suggests that the LNT program may be more effective in actually promoting appropriate minimum-impact camping techniques with Scouts in the upper age group (high school level) compared to the younger Scouts.

Since the type of group with which Scouts most frequently visit Wilderness areas appears to be an important factor in explaining variation in pre-test behavioral intention scores, ANOVA tests were conducted to indicate which groups were associated with the greatest amount of improvement in test scores for the various domains. It was found that there was no statistically significant differences in post-test or difference scores among the various types of groups. However, Scouts who reported most frequently visiting Wilderness areas with their families showed the greatest overall improvement in skills, general wilderness knowledge, attitudes and behavioral intentions. Perhaps these same Scouts, as a result of their exposure to the LNT program, will be influential in positively affecting the camping practices of their other family members.

One final series of tests of variance was necessary to determine the interaction effects of age group and treatment assignment on the various test scores. By completing these final analyses, it became apparent that the main effect of treatment was the most important determining factor for post-test scores (Tables 17 and 18).

Table 14. Mean pre-test scores by age group for tested domain.

<u>Domain</u>	<u>Age</u>				<u>Significance</u>
	<u>Elementary</u>	<u>Jr. H.S.</u>	<u>H.S.</u>	<u>Finished HS</u>	
Skills	1.62	1.40	1.74	3.13	.01
Knowledge	4.22	4.85	5.19	8.71	<.01
Beliefs	7.34	7.81	7.52	11.23	.05
Attitudes	7.06	7.14	7.45	11.13	.24
Behavioral Intentions	13.96	14.99	14.52	24.03	<.01

Table 15. Mean post-test scores by age group for tested domain. 1/

<u>Domain</u>	<u>Age</u>			<u>Finished HS</u>	<u>Significance</u>
	<u>Elementary</u>	<u>Jr. H.S.</u>	<u>H.S.</u>		
Skills	5.30	5.87	6.18	6.33	.02
Knowledge	10.13	11.87	11.96	13.38	<.01
Beliefs	17.20	17.99	17.96	18.33	.39
Attitudes	17.03	17.37	18.04	18.67	.04
Behavioral Intentions	34.65	37.37	38.68	40.14	<.01

1/ Hierarchical analysis of covariance with pre-test score as covariate. Scores reflect adjustment for the effect of pre-testing.

Table 16. Mean difference scores (post-test score - pre-test score) by age group for tested domain.

<u>Domain</u>	<u>Age</u>				<u>Significance</u>
	<u>Elementary</u>	<u>Jr. H.S.</u>	<u>H.S.</u>	<u>Finished HS</u>	
Skills	1.94	2.35	2.46	1.69	.24
Knowledge	.65	.96	.46	-.15	.16
Beliefs	1.24	-.19	.46	.38	.39
Attitudes	.24	.38	.23	.69	.91
Behavioral Intentions	1.47	3.35	3.62	2.46	.69 .46

Table 17. Main effects of age group and treatment on post-test scores for tested domain.

<u>Domain</u>	<u>Main Effects</u>	<u>Significance</u>
Skills	Age Group	.02
	Treatment	<.01
	2-way interaction	.81
Knowledge	Age Group	<.01
	Treatment	.02
	2-way interaction	.58
Beliefs	Age Group	.54
	Treatment	.59
	2-way interaction	.67
Attitudes	Age Group	.05
	Treatment	.64
	2-way interaction	.86
Behavioral Intentions	Age Group	<.01
	Treatment	<.01
	2-way interaction	.63

1/ Hierarchical analysis of covariance with pre-test score as covariate. Scores reflect adjustments for the effect of pre-testing.

Table 18. Main effects of age group and treatment on difference scores (post-test score - pre-test score) for tested domain.

<u>Domain</u>	<u>Main Effects</u>	<u>Significance</u>
Skills	Age group	.46
	Treatment	<.01
	2-way interaction	.50
Knowledge	Age group	.49
	Treatment	.25
	2-way interaction	.56
Beliefs	Age group	.29
	Treatment	.49
	2-way interaction	.31
Attitudes	Age group	.92
	Treatment	.23
	2-way interaction	.54
Behavioral Intentions	Age group	.48
	Treatment	.18
	2-way interaction	.85

CHAPTER V

DISCUSSION AND FUTURE RESEARCH NEEDS

Overall, the major conclusion of this study is that exposure to the LNT program induced significant, short-term changes in Boy Scouts' wilderness knowledge, skills and behavioral intentions. Scouts who were not exposed to the program material (the control group) showed little or no score improvement.

Generally, the evidence of affective changes in wilderness beliefs and attitudes because of participation in the program were mixed. However, Scouts indicated more positive LNT beliefs and attitudes when exposed to the book alone and to the book and slide show in combination as opposed to the slide show alone. Perhaps the time allowed for group discussion and writing ones' general thoughts on wilderness in the booklet treatment allowed Scouts to think beyond skills and activities. There is no obvious explanation for the decrease in belief and attitude scores when the slide show was presented alone.

Manipulation of the communication source revealed that the effectiveness of the LNT program is not necessarily dependent on who presents the information. Apparently

uniformed and non-uniformed personnel were seen as equally credible. Also, presentation by a male opposed to a female did not prove to be an important factor in establishing credibility with Scouts. The program was obviously associated with the Forest Service and University of Montana and was well-prepared in advance by both persons making the presentation. This may have been enough to earn credibility with the Scouts. The implication of this finding is that well-designed media, properly presented and targeted at a specific population, may be very useful even without direct presentation by agency personnel.

Given the evidence in "ecologically responsible behavior" literature that recreational experience and social-demographic characteristics may be important considerations in developing certain environmental ethics, these factors were also considered in this study. Results from a series of multi-variate regression analyses suggest that along with age, overnight camping experience was also an important predictor of intended wilderness behaviors. Scouts in high school showed the greatest improvement in behavioral intention scores after exposure to the LNT program. Perhaps this older age group of Scouts are the ones who will be most likely to substantially change their inappropriate camping practices to more appropriate practices.

In summary, the LNT program effectively uses a variety of media forms to increase wilderness knowledge levels, especially knowledge of skills, which in turn affects behavioral intentions. According to Fishbein and Ajzen's theory of belief, attitude, intention and behavior, the best single predictor of an individual's behavior will be a measure of intention to perform that behavior (Fishbein and Ajzen 1975).

Fishbein and Ajzen warn that three major factors may influence the magnitude of the relationship between intention and behavior. These are (1) the degree to which intention and behavior correspond in their levels of specificity, (2) stability of the intention and (3) the degree to which carrying out the intention is completely under the person's volitional control. Level of specificity refers to specificity of the behavior itself, the target, the situation and time. An example of a high degree of specificity is: On my next wilderness camping trip, I intend to dig a drainage ditch around my tent. Stability of the intention refers to changes in intentions over time. Fishbein and Ajzen propose that the longer the time interval between measurement of intention and observation of behavior, the greater the probability that the individual may obtain new information or that certain events will occur which will change his intention. Thus, the longer the time interval, the lower correlation

between intention and behavior. This, of course, is often the case with off-site education programs. A third factor, volitional control, suggests that intentions may not be carried out if performance of the behavior requires certain abilities or resources that the individual does not possess, or if it depends on the cooperation of another person. Also, weather and environmental conditions may be important uncontrollable factors.

The specificity factor was addressed by trying to use sound question design in the measurement instrument. Intentions were measured as specifically as possible for this study. Stability of the intention over time may be examined by considering retention scores. Retention dropped significantly for behavioral intentions within a month after presentation of the program. This suggests the further need to reinforce the LNT ethic and practices with some form of periodic follow up. Ideally, a hands-on experience such as a field or camping trip may prove invaluable by ingraining the newly acquired information. One troop leader involved in the experiment decided to reinforce the program content by awarding LNT Boy Scout patches only after the Scouts actually demonstrated appropriate minimum-impact camping behaviors.

One further comment regarding Fishbein and Ajzen's limits of predictability refers to the volitional control factor. It is imperative to stress leader's active

participation in the LNT program because their decisions and actions may strongly influence others. Scouts between the ages of 10 and 18 largely depend on authority figures as role models. Often, leaders are responsible not only for setting examples of appropriate behavior but for trip planning which may directly influence appropriate behaviors. For example, leaders' forethought in supplying garbage bags and lightweight gas stoves, as well as planning the campsite location, allows Scouts the opportunity to follow minimum-impact camping practices which otherwise might be impossible.

In review of wilderness education program content, there is a strong need to direct more attention at increasing general wilderness knowledge levels regarding historical, legislative and ecological issues. Even though results from the LNT program evaluation indicate an increased level of awareness about these facets of wilderness, still the overall emphasis is on skills. Perhaps this is appropriate for wilderness education programs, such as LNT, which are targeted at specific wilderness user groups (i.e. Boy Scouts) with the purpose of encouraging appropriate minimum-impact camping practices. However, in order to strongly ingrain the rationale behind these practices, it is also vital to inform the same segment about the importance of wilderness within a broader context.

Specific to the LNT program, there are a few modifications which may increase the program's applicability to a more general public. For instance, the LNT slide show provides a much more universal portrayal of wilderness users (i.e. young, old, male, female, family groups, groups of friends, etc.) whereas, the booklet illustrations almost exclusively depict male characters. Slight changes in the booklet illustrations would enhance its' more universal appeal. The booklet is also geared toward earning "Wilderness Skills" certification (even though this certification dimension was not included or tested in this study) and is probably in this respect more effective with Scouts rather than the general group of wilderness recreationists.

The LNT slide show is applicable to a wide variety of wilderness recreationists, however the importance of an accompanying booklet should not be overlooked. The booklet which participants keep for their own use provides an invaluable source of information for reference at a later time and also allows the opportunity to actually record one's personal thoughts about the meaning of wilderness. Another strong point of a booklet similar to the one used in the LNT program is the provision it makes for group discussion. Basically, viewing a slide show is non-interactive and involves only passive participation, whereas group discussion and recording

one's personal thoughts requires interaction and personal involvement.

One further comment regarding the LNT booklet, perhaps the quiz which is currently included may be replaced with the test booklet which was used in this study. One criticism voiced by Boy Scout leaders is that the quiz currently in the booklet is too easy. Results from this study indicate that the test questions designed to measure the effectiveness of the LNT program are reliable and suitable for the age group involved in Boy Scouts.

In conclusion, this study offers some insight as to possible future wilderness education program evaluation techniques. Even though this evaluation was designed exclusively for the LNT program, the underlying conceptual framework which includes documenting changes in both cognitive and affective domains as indicators or behavioral change is applicable to other programs as well.

→ [Future research needs may include developing a more generic evaluation form which retains the necessary degree of specificity. Also, results of this study indicate the importance of evaluating education programs in terms of their effectiveness with particular age groups.] For instance, results of this study suggest if a decision had to be made based on budget or managerial constraints whether to present the LNT program to Cub Scouts or to an older group of Explorer Scouts, the older group would

be the better choice.

An additional factor which may be very important to wilderness education program effectiveness is the time of the year in which it is presented. Programs directed at teaching appropriate camping practices would undoubtedly be more effective when given in close proximity to a time when participants may actually be able to go camping. The drop in information retention rates found in this study stresses the need to rapidly reinforce newly acquired knowledge.

In order for environmental education and more specifically, wilderness education, to gain support of instructors and managers involved with environmental concerns, program effectiveness must be evident by actually heightening individual's awareness to the level of improving behavior. Despite high costs, field observation may be the optimal evaluation criterion to document appropriate wilderness behavior.

HELPFUL DEFINITIONS

The following definitions may prove helpful in clearly understanding the conceptual framework, methodology, and results of this study:

Leave No Trace - The title of the minimum-impact, wilderness education program which was evaluated in this study; referred to as LNT throughout the text.

Test Booklet - The booklet of questions used to measure cognitive and affective changes.

Background Information Form - This form included questions designed to collect social-demographic and previous recreation experience data.

Trial Test - The preliminary run of the LNT program presentation and test administration.

Pre-test scores - Scores obtained on the test booklet given at the first meeting before exposure to the LNT program.

Post-test scores - Scores derived from the same test booklet used in the pre-test but administered one week after the pre-test and immediately following presentation of the LNT program.

Retention test scores - The same test booklet as used in the pre-test and post-test was again administered approximately one month after the program presentation and scores were obtained.

Difference scores - Either the total of subtracting the pre-test score from the post-test scores or the total of subtracting the post-test scores from the retention score for each participating subject.

References and Literature Cited

- X Allen, Stewart; McCool, Stephen F. 1982. Energy conservation, recreation experience, and ecologically responsible behavior. In: Forest and river recreation: research update. Proceedings of a symposium on leisure research; 1981 October 25-27; Minneapolis, MN: Misc. Pub. 18, 1982; St. Paul, MN: Dept. of For. Resources, U. of MN; 111-114.
- X Bruning, Iva L. 1983. An information processing approach to a theory of instruction. Ed. Comm. & Tech.: A Journal of Theory, Research, and Development; 31(2): 91-101.
- Campbell, Donald T. 1957. Factors relevant to the validity of experiments in social settings. Psychological Bulletin. 54(4): 297-311.
- X Deutsch, Diana; Deutsch, J. Anthony. 1975. Short-term memory. New York: Academic Press, Inc.
- X Dowell, D. L.; McCool, Stephen F. 1983. Information: a management tool to help optimize wilderness users' satisfaction. In: McCool, Stephen F., ed. The Bob Marshall Wilderness visitor study. Missoula, MT: School of Forestry, U. of MT; 62-83.
- X Fazio, James R. 1979. Communicating with the wilderness user. Bulletin no. 29. Moscow, ID: U.S. Dept. of Ag., Forest Service, U. of ID Forestry, Wildlife, and Range Experiment Station.
- X Fishbein, Martin; Ajzen, Icek. 1975. Belief, attitude, intention and behavior: an introduction to theory and research. Reading, Mass.: Addison-Wesley Publishing Co.
- Hendee, John C.; Stankey, George H.; Lucas, Robert C. 1978. Wilderness management. Misc. Pub. No. 1365. Washington, D.C.: U.S. Dept. of Ag., Forest Service.
- Kaplan, Stephen; Kaplan, Rachel. 1982. Cognition and Environment: functioning in an uncertain world. New York, NY: Praeger Publishers.
- X Krumpe, Edwin E.; Brown, Perry J. 1982. Redistributing backcountry use through information related to recreation experiences. Journal of Forestry; 80: 360-364.

- Krumpe, Edwin E. 1985. Moving into action. In: Issues in wilderness management. Proceedings: 1st national wilderness management workshop; 1983 October; Moscow, ID: Westview Press Inc.; 189-201.
- X Lime, David W.; Stankey, George H. 1971. Carrying capacity: maintaining outdoor recreation quality. In: Recreation symposium proceedings; 1971 October 12-14; Syracuse, NY: 174-184.
- X Lime, David W. 1976. Principles of recreational carrying capacity. In: proceedings of the southern states recreation research applications workshop; Asheville, NC: USDA Forest Service Gen. Tech. Report SE-9; 122-134.
- Lucas, Robert C.; Cole, David N.; Stankey, George H. 1985. Research update: what we have learned about wilderness management. In: Issues in wilderness management. Proceedings: 1st national wilderness management workshop; 1983 October; Moscow, ID: Westview Press, Inc.; 173-185.
- X Martin, Burham H.; Taylor, Dorothy T. 1981. Informing backcountry visitors: a catalog of techniques. Gorham, NH; Appalachian Mountain Club.
- X Masson, Michael E. J.; Miller, Jo Ann. 1983. Working memory and individual differences in comprehension and memory of text. Journal of Educational Psych. 72(2): 314-318.
- X McCool, Stephen F. 1976. Strategies and techniques for managing dispersed recreation in national parks. In: proceedings of the 3rd resources management conference; 1976 April 29-30; Fort Worth, TX: U.S. Dept. of the Interior, Southwest Region; 259-290.
- X McGuire, William J. 1969. The nature of attitudes and attitude change. The Handbook of Social Psychology (2nd edition). Gardner and Aronson, editors. Reading, Mass.: Addison-Wesley Publishing Co.; 136-314.
- X McGuire, William J. 1972. Attitude change: the information processing paradigm. In: Experimental social psychology. Charles Graham McClintock, ed. New York: Holt, Rinehart and Winston.

- Mercer, John. 1984. In search of the ideal document: a problem analysis of literature-based wilderness education efforts. Unpublished paper on file at: U.S. Dept. of Ag., Forest Service, Information Office, Missoula, MT.
- Nie, Norman H.; Hull, C. Hadlai; Jenkins, Jean G. (and others). 1975. Statistical package for the social sciences. 2nd ed. NY: McGraw-Hill; 379, 405-408.
- Nie, Norman H.; Hull, C. Hadlai; Jenkins, Jean G. (and others). 1983. SPSSx user's guide. NY: McGraw-Hill.
- X Oliver, Susan S.; Roggenbuck, Joseph W.; Watson, Alan E. 1985. Education to reduce impacts in forest campgrounds. *Journal of Forestry*. 83(4): 234-236.
- X Oye, Gary A. 1984. Wilderness education: evaluation of a sixth grade approach. Unpub. thesis on file at: U. of MT Library; Missoula, MT.
- Peterson, George L.; Lime, David W. 1979. People and their behavior: a challenge for recreation management. *Journal of Forestry*. 77(6): 343-364.
- X Purdy, Jesse E.; Luepnitz, Roy R. 1982. Immediate and long-term retention for pictorial and verbal stimuli. *Perceptual and Motor Skills*. 55(3) pt. 2: 1079-1082.
- X Robertson, Rachel D. 1982. Visitor knowledge affects visitor behavior. In: forest and river recreation: research update. Proceedings of a symposium on leisure research; 1981 October 25-27; Minneapolis, MN: Misc. Pub. 18, 1982; St. Paul, MN: Dept. of For. Resources, U. of MN; 49-51.
- X Schwabb, Karl E. 1982. Instructional methods: their use and effectiveness in environmental education. *Journal of Environmental Education*. 14(2): 8-12.
- X Slamecka, Norman J.; McElree, Brian. 1983. Normal forgetting of verbal lists as a function of their degree of learning. *Journal of Experimental Psych.: Learning, Memory, and Cognition*. 9(3): 384-397.
- SPSSx. 1983. SPSSx user's guide. McGraw-Hill, New York.

Washburne, Randall F.; Cole, David N. 1983. Problems and practices in wilderness management: a survey of managers. Res. Pap. INT-304, USDA Forest Service. Intermountain For. and Range Experiment Station; Ogden, UT.

X Weis, Charles N.; Knudson, Douglas M. 1980. Naturalists and the mass media reaching beyond the parks. Journal of Environmental Education. 11(4): 41-44.

X Zimmerman, Donald E.; Scherer, Clifford; Larson, Mark. 1978. The use of conservation and environmental mass media by Pennsylvania educators. Journal of Environmental Education. 10(2): 43-48.

LEAVE NO TRACE.....
PROGRAM EVALUATION

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NAME.....

TROOP.....

APPENDIX A - TEST BOOKLET 1/

WHAT DO YOU KNOW ABOUT WILDERNESS CAMPING?

Please answer all of the following questions as best as you can.

TRUE - FALSE (Check the correct box)

1. In frontier days and even in modern times, the challenge is for people to survive in the wilderness.
 true false
2. Only beginning in the 1980's did Americans even begin thinking about wilderness preservation.
 true false
3. Most wilderness managers prefer arresting violators of "minimum impact camping techniques" rather than trying to teach violators about appropriate wilderness use.
 true false
4. Cutting across trail switchbacks causes soil erosion and changes the scenery.
 true false
5. An ecosystem includes all the organisms of an area, their environment, and a series of linkages between them.
 true false
6. Horses should not be tied to trees in the Wilderness.
 true false
7. Currently there are no laws governing Wilderness but Congress is working on some.
 true false
8. In Wilderness areas, ecosystems are continually changing.
 true false
9. "Leave No Trace" means you will leave no marks of your visit.
 true false
10. Before the National Wilderness Preservation System began in 1964, there were no protected wildlands.
 true false

1/ Correct answers are marked.

MULTIPLE CHOICE - Choose the best answer for each and check the appropriate box.

11. Wilderness trails are usually designed to:
- a. drain water and make your travel as easy as possible.
 - b. test hikers sense of direction and compass skills.
 - c. provide the greatest amount of physical exercise possible in the shortest distance.
12. The scenic beauty of wilderness is preserved:
- a. by allowing logging which keeps the views clear.
 - b. to look like it was when Indians and mountain men roamed the frontier.
 - c. by immediately putting out all wild fires.
13. Which statement most clearly describes true wilderness character?
- a. A wild place where only a few friends get together for dirt bike races.
 - b. A natural-looking areas where man is only a visitor.
 - c. A small, mountain town with only a few cabins.
14. The "minimum tool" approach to wilderness management means:
- a. managers need to keep down tool costs.
 - b. not making any rules or suggestions about what recreationists can or cannot do in Wilderness.
 - c. managing human use and influence so that natural processes are not altered.
15. The Wilderness Act of 1964 provides:
- a. only broad guidelines and directions for management.
 - b. detailed instructions for setting up camp.
 - c. information about visitor attractions in Wilderness.

16. Many early American settlers believed wild places:
- a. were wonderful for family vacations.
 - b. were scary, useless lands and they didn't care to visit them.
 - c. should be saved in the "wild" state for future generations to enjoy.
17. When hikers and horseback riders meet along the trail, hikers should:
- a. move around and talk a lot.
 - b. softly pat each horse as they pass.
 - c. stand off the trail on the lower side.
18. Washing in streams:
- a. pollutes the water and destroys aquatic plants.
 - b. is acceptable when the water is rapidly moving.
 - c. disturbs fish only temporarily.
19. Wilderness management methods should:
- a. be firm and direct with the greatest control over wilderness visitors.
 - b. be based on solid timber production theory.
 - c. indirectly affect wilderness visitors, allowing for individual's freedom of choice.
20. The best colors for tents, packs and other visible gear that will be used in wilderness areas are:
- a. bright colors like orange and yellow.
 - b. no colors are better than others.
 - c. dark colors like brown and green.
21. Gas stoves are:
- a. dangerous and should be used only in emergencies.
 - b. easy to pack.
 - c. responsible for many wild fires.
22. Latrines should be located:
- a. 200 feet or more from camp and water.
 - b. anywhere that is convenient.
 - c. at least 25 feet from camp and water and 4 inches deep.

Check the appropriate box

I believe (contd.):

Strongly agree	Agree	Don't care	Disagree	Strongly disagree
----------------	-------	------------	----------	-------------------

wilderness is only in
our minds and doesn't
really exist.

()	()	()	()	()
-----	-----	-----	-----	-----

wilderness is for people
first, then wildlife,
natural ecosystems, etc.

()	()	()	()	()
-----	-----	-----	-----	-----

How well do each of the following statements below describe
your attitude about wilderness?

Check the appropriate box

I feel:

Strongly agree	Agree	Don't care	Disagree	Strongly disagree
----------------	-------	------------	----------	-------------------

it is important to make
a lot of noise while
hiking in wilderness
areas to let other
people know where
I am at.

()	()	()	()	()
-----	-----	-----	-----	-----

that wilderness doesn't
need to be managed.

()	()	()	()	()
-----	-----	-----	-----	-----

it is more fun to visit
wilderness areas with big
groups (20 or more people)
than smaller groups.

()	()	()	()	()
-----	-----	-----	-----	-----

it is boring for me to
spend some time alone
in the wilderness.

()	()	()	()	()
-----	-----	-----	-----	-----

In order for us to have an idea about what you actually do or intend to do when you are visiting wilderness areas, please answer the following questions as if you were thinking about an upcoming trip.

Please check the appropriate box

On my next wilderness
camping trip:

*Strongly
agree* *Agree* *Don't care* *Disagree* *Strongly
disagree*

I plan to build a lean-to shelter with fresh saplings. () () () () ()

I want to carve my name into a tree. () () () () ()

I intend to pack lightly. () () () () ()

I am going to cut extra firewood to leave by the fire ring for the next campers. () () () () ()

I want to visit a less popular place. () () () () ()

I plan to bury all aluminum and cans. () () () () ()

I will stay on the trails when hiking. () () () () ()

I plan to hide my camp from the view of other groups. () () () () ()

I will be prepared for rain by making ditches around my tent. () () () () ()

APPENDIX B - BACKGROUND INFORMATION

Now we have some questions about you personally which provide information useful in evaluating the "Leave No Trace" program. Remember, your answers are confidential and will not be personally identified with you, so please be honest.

1. What is your present age? _____
2. What is the highest level of education you have completed so far? (Circle one number)

2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ELEMENTARY				Jr. HS		HIGH SCHOOL				COLLEGE				
3. What is your mother's and father's occupation? (Please indicate what kind of work they do, not for whom they work. If he or she is a homemaker, student, or retired, please write that.)

mother's job _____

father's job _____
4. Are you a member of other clubs or organizations? If yes, please name them.

5. How long have you been involved with Boy Scouts of America?

Finally, we would like information about your wilderness experience. Please answer the following questions as they relate to your own experience.

6. Have you camped in a forest where you slept in a tent or on the ground?

<input type="checkbox"/> yes	<input type="checkbox"/> no
------------------------------	-----------------------------

Designated Wilderness Areas are specially governed places that meet certain requirements in order to be included in the Wilderness Preservation System.

7. Have you been in a Designated Wilderness Area for a day hike?

<input type="checkbox"/> yes	<input type="checkbox"/> no
------------------------------	-----------------------------

8. Have you been in a Designated Wilderness Area for an overnight trip?
 yes no

9. If you have been in a Designated Wilderness Area, please list the area(s) name(s).

10. Most of the time who goes with you when you visit wilderness areas?

no one, I go alone
 family
 friends

friends and family
 club or organized group

(group name)

11. By what method do you usually travel in wilderness areas?

foot
 horseback

boat
 other _____