

# **Comparing Day-Users' and Overnight Visitors' Attitudes Concerning Leave No Trace**

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Leave No Trace is the most prominent educational message used to influence behaviors of protected-areas visitors with the end-goal of sustaining or improving resource conditions. The vast majority of previous research regarding Leave No Trace has focused on backcountry-overnight visitors. However, by sheer numbers alone, day-users are by far the largest user group of protected areas and research regarding this user-group is insufficient. The purpose of this study was to compare day-users' perceptions (perceived knowledge, awareness and support, and attitudes) of Leave No Trace with those of overnight users. Results indicate that day-users' and overnight users' perceptions of Leave No Trace are largely congruent, and suggest that similar messaging approaches may be employed in day-use and backcountry areas in the future.

**KEYWORDS:** leave no trace, attitudes, visitor behavior

The vast majority of recreationists are day-users (Outdoor Industry Foundation, 2012), and previous research has suggested that day-use is increasing in protected areas (Chavez, 2000; Cole, Watson, & Roggenbuck, 1995; Hendee & Dawson, 2002; Papenfuse, Roggenbuck, & Hall, 2000; Roggenbuck & Lucas, 1987; Roggenbuck, Marion, & Manning, 1994). For example, of the two hundred and eighty million national park visitors in 2012, less than one percent was backcountry-overnight visitors (National Park Service (NPS) Statistics, 2012). Given significant visitation, impacts to both the resource condition and visitor experience continue to be a primary concern for park managers (Marion & Reid, 2007). Education is one technique used to mitigate visitor impacts (Hammit & Cole, 1998; Hendee & Dawson, 2002; Lucas, 1983; Manning, 2003; 2007; Marion & Reid, 2001; 2007), and the seven Leave No Trace (LNT) Principles for responsible recreation have become the most prominent method to encourage appropriate behavior and discourage depreciative behavior in protected areas (Harmon, 1997; Marion & Reid, 2001; 2007; Taff, Newman, Bright, & Vagias, 2011; Vagias & Powell, 2010).

The LNT Principles were initially developed to curb impacts of backcountry-overnight visitors (Marion & Reid, 2001), and correspondingly, most research and educational efforts related to LNT have focused on this user-group (Marion & Reid, 2001; 2007). Despite the substantial number of day-users, research and educational efforts focused on this user-group have largely been neglected (Cole, 2001; Papenfuse et al., 2000; Roggenbuck et al., 1994). Previous research has suggested that managers should expect the same level of understanding and respect for resource protection from day-users as they do from overnight visitors, and therefore these groups should be managed similarly (Cole, 2001; Papenfuse et al., 2000). However, very little is known about day-users regarding their LNT understanding and practice. Therefore, the purpose of this study was to gain greater understanding of visitors' knowledge, awareness and support, and attitudes toward LNT Principles by comparing day-users at Rocky Mountain National Park (RMNP), Colorado, and overnight users at Olympic National Park (ONP), Washington. This project aimed to improve efficacy and inform management of effective methods that could curb depreciative behaviors among both user-groups.

## **Leave No Trace**

The seven LNT Principles were developed to supplement direct management measures in an effort to mitigate biophysical impacts to wildlands in the 1960s (Marion & Reid, 2001). Over the ensuing decades, LNT has continued to grow from an educational program into a registered non-profit organization, now known as the LNT Center for Outdoor Ethics. The Center's philosophies have been adopted nationally by the four primary federal land management agencies (National Park Service, Fish and Wildlife Service, Bureau of Land Management, and Forest Service) as well as many state and urban parks, and internationally (Marion & Reid, 2001). The LNT Center promotes stewardship-based ethics through various educational initiatives focused on many types of recreationists (e.g., backcountry-overnight, frontcountry, youth), but all efforts stem from the following seven principles:

1. Plan ahead and prepare
2. Travel and camp on durable surfaces
3. Dispose of waste properly
4. Leave what you find
5. Minimize campfire impacts
6. Respect wildlife
7. Be considerate of other visitors

### **Previous Research, Knowledge, Awareness and Support, and Attitudes**

The majority of minimum-impact related research has focused on backcountry-overnight visitors (Christensen & Cole, 2000; Daniels & Marion, 2005; Fazio, 1979; Huffman & Williams, 1987; Lucas, 1981; Roggenbuck & Berrier, 1982; Vagias & Powell, 2010), and many studies have addressed education and visitor knowledge of recommended practices (Cole, Hammond, & McCool, 1997; Confer, Mowen, Graefe, & Absher, 2000; Daniels & Marion, 2005; Dowell & McCool, 1986; Fazio, 1979; Jones, 1999; Jones & Bruyere, 2004; Leung & Attarian, 2003; McAvoy & Hamborg, 1984; McCool & Cole, 2000; Newman, Manning, Bacon, Graefe, & Kyle, 2003; Stewart et al., 2000). Knowledge and awareness of minimum-impact skills are important components for mitigating depreciative behaviors. If visitors lack knowledge or awareness, they may unintentionally engage in unskilled or inappropriate behaviors (Manning, 2003; 2007). However, visitor knowledge and awareness of recommended behaviors alone does not necessarily mean that visitors will adopt or practice recommended behaviors (Lawhon et al., 2013; Vagias & Powell, 2010). Therefore, in addition to these measures, social psychology has advanced understanding of human behavior and suggests attitudes influence and, in many instances, are the primary determinant of behavioral intentions and actions (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Manfredo, 1992; Ham, 2007; Ham & Krumpal, 1996).

Vagias and Powell (2010) applied attitude theory to examine backcountry-overnight visitors' general perceptions of LNT and their attitudes toward backcountry behaviors that corresponded with prescribed behaviors at three NPS units. Results indicated that general perceptions (i.e., awareness and discernment) of LNT were positive, a finding that suggests backcountry-overnight visitors are largely supportive of LNT. However, attitudes (i.e., perceived appropriateness) toward specific recommended practices varied depending upon the behavior in question. This incongruity between general perceptions of LNT and attitudes toward specific LNT practices suggests that positive impressions of the program did not necessarily equate to positive attitudes toward specific LNT practices. These results also suggest that certain LNT practices were either not fully understood by the backcountry-overnight visitors, or that there was a level of indifference regarding the recommendations (Vagias & Powell, 2010).

The Vagias and Powell (2010) study provided greater understanding of backcountry-overnight visitors with regard to LNT by applying attitude theory to explore awareness and support, knowledge, and attitudes toward LNT. However, research concerning the majority of recreationists – day-users – has largely been overlooked (Cole, 2001; Papenfuss et al., 2000; Roggenbuck et al., 1994). Newman et al. (2003) began to address this deficiency by examining Appalachian Trail (AT) visitors' knowledge concerning minimum-impact practices through a 10-item quiz. Findings suggested that only a few statistically-significant differences existed between day-hikers, overnight, sectional, and thru-hikers concerning minimum-impact practices. Overall results indicated that day-hikers had a similar understanding of minimum-impact practices as the other user-groups. The Newman et al. (2003) study helped advance understanding of visitor user-groups and their knowledge of minimum-impact practices, but did not specifically address LNT or other aspects of visitor perceptions, such as awareness or attitudes.

Lawhon et al. (2013) recently advanced the need for LNT-focused research, specifically examining the role of day-use national park visitors' perceived knowledge, attitudes, effectiveness, and difficulty of following LNT recommended practices in the future. Results suggested that perceived effectiveness was the strongest predictor of behavioral intent for this user-group. This recent research has advanced our understanding of day-users, and perceptions that may lead to actual LNT behaviors. Additionally, this previous study provided greater understanding regarding how researchers and managers may formulate interpretive messaging to focus on the ef-

fectiveness of LNT practices in curbing resource and social impacts. However, there is still a lack of research and understanding about day-users and their perceptions of LNT. In particular, building upon the previous research described here by examining perceived knowledge, awareness and support, and attitudes toward LNT, practitioners can advance educational approaches to improve messaging and efficacy.

## **Study Purpose**

The LNT Center for Outdoor Ethics and land managers must better understand the largest and growing recreationist user-group – day-users – in order to effectively mitigate depreciative behaviors. Furthermore, by determining day-user perceptions (i.e., knowledge, awareness and support, and attitudes) of and toward LNT, the Center, land managers, and practitioners can increase efficacy and improve effective messaging strategies. Ultimately, this understanding can be applied to alter visitor behaviors in a manner that better preserves resource conditions and visitor experiences. Therefore, the purpose of this study was to develop a better understanding of day-user perceived knowledge, awareness and support, and attitudes toward LNT, by contrasting their characteristics with those of overnight users. This study evaluated these perceptions by comparing day-users at RMNP and backcountry-overnight visitors at ONP. Contrasting perceived knowledge, awareness and support, and attitudes of these visitor-groups will allow the LNT Center, land managers, and practitioners to better understand the discrepancies that may impede adopting LNT skills and ethics and therefore, may assist with the development of more effectual educational approaches.

## **Method**

### **Study Areas**

Backcountry-overnight visitors were sampled at ONP, Washington, during the summer of 2007. The park contains nearly one million acres of designated wilderness consisting of rugged coastline, temperate rainforest, and alpine peaks (Powell, Wright, & Vagias, 2008). Day-use visitors were sampled at RMNP during the summer of 2009 (Taff et al., 2011). The park is within close proximity to the Denver, Colorado front-range community, allowing easy access for day-visitors wishing to experience the park's forests, alpine meadows, lakes and tundra.

### **Survey Administration**

During July and August 2007, backcountry-overnight visitors at ONP were intercepted by trained graduate student surveyors during their permitting processes at the park's Wilderness Information Center and asked to provide contact information. Approximately one month after initial contact, respondents were sent self-administered mail-back surveys which yielded an overall response rate of 73% ( $n = 312$ ) (Powell et al., 2008).

During July and August 2009, day-users at RMNP were intercepted by trained graduate student surveyors in the Bear Lake corridor at the Glacier Gorge and Bear Lake Trailheads. The corridor is predominantly frequented by day-users and can have upwards of 8,000 visitors daily during peak season (Park, Lawson, Kaliski, Newman, & Gibson, 2010). Respondents were asked to complete an on-site written survey which yielded an overall response rate of 74% ( $n = 390$ ) (Taff et al., 2011).

Data collection took place in July and August at ONP and RMNP to capture representative respondents during peak use. Given the average visitation of backcountry-overnight visitors

and day-users to these parks during these periods of time, the high response rates, and sample sizes greater than  $n = 300$ , there is 95% confidence that the results of this comparison are accurate to +/- five percentage points (Vaske, 2008).

### Visitor Characteristics

Demographic results were similar between backcountry-overnight visitors at ONP and day-users at RMNP with regard to gender, mean age, race, and education. At ONP, there were slightly more male respondents (60%), while at RMNP approximately 53% of the respondents were female. ONP respondents were slightly younger with a mean age of approximately 42, while RMNP respondents were on average 48 years old. Across both samples, 95% or more of the respondents were Caucasian, and over 90% had attended college.

### Item Measurement

Respondents in both samples were asked to describe their “current knowledge of LNT practices” based on a 7-point Likert scale (0 = ‘No Knowledge’ – 6 = ‘Expert’) to determine their overall level of perceived knowledge. Respondents were also asked to indicate their level of agreement with a series of statements about LNT, which evaluated visitors’ awareness and support of the program based on a 7-point Likert scale (1 = ‘Strongly Disagree’ - 7 = ‘Strongly Agree’). All statements were coded to have higher means if the respondents supported LNT, except for the final statement, which portrayed the philosophies and practices as ineffectual in reducing environmental harm. Lower mean scores for this particular statement would have demonstrated support for LNT.

Respondent attitudes toward LNT-related behaviors were evaluated through statements developed from the following LNT Principles: #2, “Travel and Camp on Durable Surfaces,” #4, “Leave What You Find,” #6, “Respect Wildlife,” and #7, “Be Considerate of Other Visitors.” These Principles were used to evaluate the appropriateness of prescribed practices because these Principles are pertinent to both backcountry and day-user endeavors. The statements were evaluated on a 7-point Likert scale (1 = ‘Very Inappropriate’ – 7 = ‘Very Appropriate’). All statements represented inappropriate behaviors under a literal interpretation of LNT. For example, with regard to Principle #2, “Travel and Camp on Durable Surfaces,” respondents were asked to indicate the appropriateness of “walking around muddy spots on the trail.” Responses with lower mean scores indicated that respondent attitudes were more congruent with LNT practices. The majority of these items were cross-validated through previous research (Vagias, Powell, Moore, & Wright, 2012).

### Data Analyses

Independent samples t-tests were used to determine if day-users and backcountry-overnight visitors differed statistically with regard to their perceived knowledge, awareness and support, and attitudes. Test results were examined for both statistical and practical significance. The  $p$ -value for statistical significance was set at .05. However, because Sun, Pan, and Wang (2010) suggest that “a test result that is statistically significant as judged by the  $p$ -value is not necessarily practically significant as judged by the effect size” (p. 991), we also examined measures of practical significance. This is because survey research with relatively large sample sizes, as is the case with this study, may result in statistically significant results, but actually have little practical value (Vaske, 2008). Therefore, effect size as a measurement of practical signifi-

cance provides additional understanding of differences between groups by offering “a standardized estimate of the magnitude of variable relationships” (Vaske, 2008, p. 117). Evaluating effect size measures allows for greater intuitive meaning of practical differences between samples. Effect sizes between these samples were determined by evaluating Eta values ( $\eta$ ) categorized as having either a “minimal”, ( $\eta = \sim .10$ ), a “typical”, ( $\eta = \sim .30$ ), or a “substantial” effect measure ( $\eta = \sim .50$ ) (Cohen, 1988; Vaske, 2008; Vaske, Gliner, & Morgan, 2002). Overall examination of statistical significance and practical significance was determined by considering the  $p$ -values (established by comparing the  $t$ -values with the theoretical distribution), Eta values, and the practical importance of the mean differences between samples. The independent samples  $t$ -tests were conducted using SPSS 19 software.

## Results

### Perceived Knowledge of LNT

Results concerning perceived knowledge of LNT practices indicated that the majority of both backcountry-overnight visitors and day-users consider themselves as having ‘Average’ to ‘Expert’ knowledge of the program (Table 1). Mean values resulted in statistical differences between the samples, (ONP  $M = 3.97$ ; RMNP  $M = 3.45$ ,  $p < .001$ ,  $\eta = .177$ ), although the effect size suggested a minimal practical difference. Furthermore, mean differences of 0.52 based on the 7-point Likert scale also suggested that there were little practical differences between backcountry-overnight and day-use visitors with regard to perceived knowledge of LNT. However, percentage totals suggested that slightly fewer day-users (75%) considered themselves as having ‘Average’ to ‘Expert’ knowledge of LNT practices than backcountry-overnight visitors (96%).

Table 1

Perceived Knowledge of LNT Practices – ONP (Backcountry-overnight visitors) and RMNP (Day-users)

Unit	<i>n</i>	Mean	SD	<i>t</i> -value	<i>p</i> -value	Eta ( $\eta$ )
ONP	303	3.97	0.94			
RMNP	384	3.45	1.74	5.03	<.001	.177

*Note.* Variables coded on a 7-point Likert scale (0 = No Knowledge – 6 = Expert)

### Awareness and Support of LNT

Evaluation of the statements addressing global support of LNT resulted in similar mean values across both backcountry-overnight visitors and day-users (Table 2). Results indicated that both groups were largely supportive of LNT, with minimal statistical and practical differences between backcountry-overnight visitors and day-users. Mean values for four out of the five statements that suggested support of LNT were all greater than 5.84, indicating that both backcountry-overnight visitors and day-users perceived LNT positively on a global level.

Percentage totals for backcountry-overnight visitors and day-users were nearly identical, as approximately 93% in each sample indicated that LNT *is important to practice*, and approximately 91% suggested that they *get upset when they see other visitors not following LNT*. Approximately 95% of the backcountry-overnight visitors and 92% of the day-users indicated that they would change their behaviors if they *learned that their actions were damaging the environment*, and 90% of the backcountry-overnight and 83% of the day-users indicated that they *insist that LNT be practiced by their group members*. Approximately 93% of the backcountry-overnight and 83% of the day-users disagreed with the last statement, which was reverse-coded and portrayed LNT as ineffectual in reducing environmental harm. This item yielded statistically-significant differences, (ONP  $M = 1.56$ ; RMNP  $M = 1.92$ ,  $p = .001$ ,  $\eta = .122$ ), but mean differences of only 0.36, and the minimal effect size further supports finding little practical differences in perceptions of LNT between the samples.

Table 2

*Comparison of ONP (Backcountry-overnight visitors) and RMNP (Day-users) Awareness and Support of LNT*

Attitude Statements <sup>1</sup>	Unit	<i>n</i>	Mean	SD	<i>t</i> -value	<i>p</i> -value	Eta ( $\eta$ )
It is important to practice "LNT" techniques when in the Park.	ONP	302	6.46	1.2	0.51	.607	.020
	RMNP	384	6.51	1.1			
If I learned my actions in the Park damaged the environment, I would change my behavior.	ONP	302	6.46	0.9	0.41	.686	.015
	RMNP	384	6.50	1.1			
I get upset when I see other individuals in the Park not following "LNT" practices.	ONP	303	6.14	1.1	1.87	.064	.071
	RMNP	386	6.30	1.2			
I insist that "LNT" practices are followed by all members of my group.	ONP	306	5.84	1.2	1.46	.143	.055
	RMNP	386	6.0	1.3			
Practicing "LNT" does not reduce the environmental harm caused by travel in the Park.	ONP	302	1.56 <sup>2</sup>	1.6	3.35	.001	.122
	RMNP	384	1.92 <sup>2</sup>	1.7			

*Notes.* Variables coded on a 7-point Likert scale (1 = Strongly Disagree – 7 Strongly Agree); "LNT" = Leave No Trace.

<sup>1</sup>Survey instruments utilized slightly different phrasing to make the survey question applicable to the respective sample populations of either overnight or day-use recreationists.

<sup>2</sup>Lower mean values reflect attitudes that support LNT because statements portray LNT as ineffectual in reducing environmental harm.

## Attitudes Regarding Specific LNT Principles

Analyses of differences between attitudes of backcountry-overnight visitors and day-users varied depending upon the Principle (Table 3). Evaluation of Principle #2, "Travel and Camp on Durable Surfaces," indicated that responses based on the appropriateness of *walking around muddy spots on the trail* were statistically significant between backcountry-overnight visitors and day-users, (ONP  $M = 4.02$ , RMNP  $M = 4.48$ ,  $p = .001$ ,  $\eta = .125$ ), but effect sizes reflected a minimal difference. Mean differences of only 0.46 also suggest minimal difference between the samples. The variable *hike side by side on an existing trail* resulted in similar lower mean values (ONP  $M = 2.93$ , RMNP  $M = 3.37$ ,  $p = .001$ ,  $\eta = .128$ ), and despite statistically-significant differences, the practical significance was minimal based upon the effect size. Mean differences of only 0.44 also support this finding. Twenty-nine percent of the backcountry-overnight visitors and 11% of the day-user respondents considered *keeping a small item as a souvenir* to be an appropriate behavior, which is addressed by Principle #4, "Leave What You Find." Statistically significant differences resulted among the samples (ONP  $M = 3.52$ , RMNP  $M = 2.25$ ,  $p < .001$ ,  $\eta = .353$ ). The typical effect size and mean difference of 1.3 reinforce this significant finding. Examination of Principle #6, "Respect Wildlife," suggests that only 0.6% of the backcountry-overnight visitors and only 4.4% day-users *found dropping food on the ground to provide wildlife a food source* to be an appropriate behavior. Statistical differences were significant among the samples, (ONP  $M = 1.19$ , RMNP  $M = 1.43$ ,  $p = .001$ ,  $\eta = .117$ ), although the minimal effect size and mean difference of 0.24 suggest little practical difference between the user-groups. Attitudes regarding LNT Principle #7, "Be Considerate of Other Visitors" by *taking a break along the edge of a trail* resulted in the majority of both samples reflecting attitudes that did not align with the LNT-recommended behavior. Approximately 78% of the backcountry-overnight respondents and 74% of the day-users indicated that this behavior was appropriate, yielding insignificant statistical differences among the groups (ONP  $M = 5.69$ , RMNP  $M = 5.48$ ,  $p = 0.57$ ).

## Discussion

LNT is a prominent educational method employed to alter visitor behaviors and mitigate resource and social impacts in parks and protected areas. Though day-users are the largest group of recreationists, very little is known about this user-group's understanding and practice of LNT. Understanding how day-users perceive LNT is essential to management so that effective messaging can be designed for this growing user-group. Therefore, the goal of this study was to develop a better understanding of day-user knowledge, awareness and support, and attitudes toward LNT, by comparing their characteristics with those of overnight users. Statistical and practical significance was examined by considering the  $p$ -values, and the practical importance of the mean differences between samples. Overall findings suggest that the sampled backcountry-overnight visitors and day-users were rather similar with regard to perceived knowledge, awareness and support of LNT, and most of the examined attitudes regarding the prescribed Principles.

Examination of perceived LNT knowledge resulted in a minimal effect size and a mean difference of only 0.5 on a 7-point Likert scale, suggesting little practical difference between the two user-groups. The majority of respondents reported their understanding of LNT practices at the 'Average' to 'Expert' level. This finding suggests that both samples were fairly certain in their knowledge of the program, although a slightly smaller percentage of day-users had confidence in their knowledge of LNT than backcountry-overnight visitors. Perhaps of more importance, and similar to previous research focused specifically on backcountry-overnight visitors (Vagias & Powell, 2010), perceived knowledge did not necessarily equate to attitudes that



aligned with recommended LNT principles. This suggests that educational efforts must target all visitors, not just those that are inexperienced or perceive themselves to be unknowledgeable regarding LNT practices.

Table 3

*Comparison of ONP (Backcountry-overnight visitors) and RMNP (Day-users) Attitudes Regarding LNT Practices*

Attitude Statements <sup>1</sup>	Unit	<i>n</i>	Mean	SD	<i>t</i> -value	<i>p</i> -value	Eta ( $\eta$ )
<i>LNT Principle #2: Travel and Camp on Durable Surfaces</i>							
Walk around muddy spots on the trail	ONP	308	4.02	1.6	3.39	.001	.125
	RMNP	385	4.48	2.0			
Hike side by side with members of my group on existing trails	ONP	308	2.93	1.6	3.44	.001	.128
	RMNP	387	3.37	1.8			
<i>LNT Principle #4: Leave What You Find</i>							
Keep a single item like a rock, plant, stick or feather as a souvenir	ONP	309	3.52	1.7	9.87	<.001	.353
	RMNP	388	2.25	1.6			
<i>LNT Principle #6: Respect Wildlife</i>							
Drop food on the ground to provide wildlife a food source	ONP	310	1.19	0.7	3.30	.001	.117
	RMNP	388	1.43	1.2			
<i>LNT Principle #7: Be Considerate of Other Visitors</i>							
Take a break along the edge of the trail	ONP	304	5.69	1.4	1.90	.057	.071
	RMNP	387	5.48	1.6			

*Note.* All attitude statements reflect inappropriate actions based on LNT Principles

Variables coded on a 7-point Likert scale (1 = Very Inappropriate – 7 Very Appropriate); “LNT” = Leave No Trace.

<sup>1</sup> Survey instruments utilized slightly different phrasing to make the survey question applicable to the respective sample populations of either overnight or day-use recreationists.

These findings also indicated that both backcountry-overnight visitors and day-users were highly supportive of LNT. Both user-groups strongly agreed with statements that positively portrayed LNT, and strongly disagreed with the statement that depicted the program as ineffective.

This supports recent research where day-use respondents indicated that they would be extremely likely to practice LNT in the future (Lawhon et al., 2013). These findings suggest that LNT is perceived as important and effective in minimizing resource and social impacts by mitigating depreciative behaviors. This is valuable for the LNT Center and protected area managers as they strive to influence visitor behaviors, suggesting that both overnight and day-use visitors will be supportive of future LNT-related educational strategies.

Attitudes regarding specific LNT principles were congruent across both samples for Principles #2, "Travel and Camp on Durable Surfaces," #6, "Respect Wildlife," and #7, "Be Considerate of Other Visitors." Concepts concerning "Respecting Wildlife" resulted in attitudes that align with LNT recommended practices and resonated with both user-groups. This suggests that backcountry-overnight and day-users are cognizant of and agree with the recommended ethics regarding their behavior around wildlife. Behaviors embodied within "Traveling and Camping on Durable Surfaces" and "Being Considerate of Other Visitors" were, to a great extent, found to misalign with both the backcountry-overnight and day-users' attitudes toward these practices. These Principles and the encompassing behaviors deserve additional educational focus.

Previous LNT related research suggests that educational messages should be clear, concise, and occur early in the visitor's planning process (Cole et al., 1997; Douchette & Cole, 1993; Lime & Lucas, 1977; Roggenbuck & Berrier, 1982; Stewart et al., 2000), be reinforced and timely near potential problematic areas (Hockett & Hall, 2007; Widner & Roggenbuck, 2000), and not provide so much information that the receiver is overloaded (Cole et al., 1997). Furthermore, educational messages should be based on theoretical frameworks (Manning, 2003; Marion & Reid, 2007), target salient beliefs and attitudes by making them content-relevant (Ham & Krumpe, 1996), and should strive to be contextually specific (Vagias & Powell, 2010). The results from this study suggest that future educational strategies should target backcountry and day-use visitors' behaviors related to "Traveling and Camping on Durable Surfaces" and "Being Considerate of Other Visitors" similarly, while considering and implementing messaging that include findings from previous research. For example, if a park is experiencing trail widening in low-lying locations, in addition to presenting language specific to Principle # 2 at the trailhead signage (i.e., "Travel and Camp on Durable Surfaces"), management may include a message near the problematic trail areas stating, "Staying on trails, even when wet and muddy, protects trailside plants and minimizes erosion." This type of example message is short, clear, presented at the location of relevance, and ultimately targets specific attitudes toward the associated Principle by providing reasoning for altering depreciative behaviors.

Attitudes towards Principle #4, "Leave What You Find," resulted in substantial differences between the user-groups. More backcountry-overnight than day-user respondents found "Keeping a single item as a souvenir" to be appropriate, based on statistically-significant mean differences of 1.3. This suggests that backcountry-overnight visitors and day-users may require different educational strategies to effectively address this particular behavior. These results are important for the LNT Center because they may indicate an overall lack of agreement or understanding concerning the concepts related to this Principle, but perhaps more so with backcountry-overnight visitors. The LNT Center, protected areas managers and practitioners should consider employing more focus to backcountry-overnight visitors regarding Principle #4. For instance, the LNT Center could work with protected areas to implement additional messages that complement "Leave What You Find" at the pre-trip planning level through permitting websites, permitting offices, and backcountry trailhead locations.

## Study Limitations and Future Research

There were several limitations to this study that merit additional research to support and further validate findings. The ONP respondents completed self-administered mail-back surveys, while the RMNP respondents completed onsite surveys administered by researchers. Also, the two survey instruments utilized slightly different phrasing to make the survey question applicable to the respective sample populations of either overnight or day-use recreationists. If feasible, future studies should apply the same survey design and wording across samples. This study only evaluated perceived knowledge, awareness and support of LNT, and attitudes regarding Principles #2, #4, #6, and #7 because these Principles encompass behaviors that are similar and pertinent to both overnight and day-use endeavors. Subsequent studies should attempt to include the remaining three LNT Principles, #1, "Plan Ahead and Prepare," #3, "Dispose of Waste Properly," and #5, "Minimize Campfire Impacts."

While these results indicated similarities between backcountry-overnight visitors and day-users with regard to LNT, this study only applied to respondents at ONP and RMNP. The similar sample demographics support our speculative reasoning that these user-groups are alike, perhaps because they may be drawn from homogeneous populations, as other studies have suggested (Cole, 2001). For example, a day-user in RMNP may be a backpacker in ONP during another occasion. Future research may consider including variables that examine visitors' previous outdoor experience and motivation to better understand these factors. While this study addressed two separate national parks, research pertaining to overnight and day-use visitors within the same protected area should also be studied. Furthermore, comparisons across several types of protected areas and demographically diverse locations (e.g., city parks, state parks, wildlife refuges, etc.) should be studied to evaluate the generalizability of findings to bolster future educational efforts.

## Conclusion

This study improves our understanding of day-user perceived knowledge, awareness and support, and attitudes regarding LNT by comparing them with those of overnight users. The findings suggest that backcountry-overnight visitors and day-users are rather similar with regard to perceived knowledge, awareness and support of LNT, and attitudes regarding Principles #2, #6, and #7. LNT is believed to be important and highly effective in minimizing resource impacts and curbing depreciative behaviors across both user-groups, suggesting that future educational strategies will be well received. Principles #2 and #7 may warrant additional educational focus and clarity, and Principle #4 may require different messaging approaches for backcountry visitors. However, this study suggests that backcountry-overnight and day-users can largely be educated about LNT in similar ways. Additional research is needed to determine the salience of these findings across different demographics and protected area types.

## References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.
- Ajzen, I. & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Chavez, D. J. (2000). Wilderness visitors in the 21st century: Diversity, day use, and preferences. *International Journal of Wilderness*, 6(2), 10-11.

- Christensen, H., & Cole, D. N. (2000). LNT practices: Behaviors and preferences of wilderness visitors regarding use of cookstoves and camping away from lakes. In S. F. McCool, W. T. Borrie, & J. O'Loughlin (Eds.), *Proceedings: Wilderness Science in a Time of Change Conference* (pp. 77 – 85). Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. (2nd ed.). Hillsdale, NJ: Erlbaum.
- Cole, D. N. (2001). *Day users in wilderness: how different are they?* USDA Forest Service Research Paper RMRS-RP-31. Ogden, UT: Rocky Mountain Research Station.
- Cole, D. N., Hammond, T., & McCool, S. (1997). Information quality and communication effectiveness: Low-impact messages on wilderness trailsides bulletin boards. *Leisure Sciences*, 19(1), 59-72.
- Cole, D. N., Watson, A. E., & Roggenbuck, J. W. (1995). *Trends in wilderness visitors and visits: Boundary Waters Canoe area, Shining Rock, and Desolation Wildernesses*. USDA Forest Service Research Paper INT-RP-483. 38. Ogden, UT: Intermountain Research Station.
- Confer, J. J., Mowen, A. J., Graefe, A. R., & Absher, J. D. (2000). Magazines as wilderness information sources: assessing users' general wilderness knowledge and specific LNT knowledge. *Proceedings – Rocky Mountain Research Station, RMRS-P-15-VOL4*, 193-197.
- Daniels, M. L., & Marion, J. L. (2005). Communicating LNT ethics and practices: Efficacy of two-day trainer courses. *Journal of Park and Recreation Administration*, 23(4), 1-19.
- Douchette, J. E., & Cole, D. N. (1993). *Wilderness visitor education: Information about alternative techniques*. USDA Forest Service General Technical Report INT-295. Ogden, UT: Intermountain Research Station.
- Dowell, G. S., & McCool, S. F. (1986). Evaluation of a wilderness information dissemination program. In R. C. Lucas (Ed.), *Proceedings: National Wilderness Research Conference: Current Research*. USDA Forest Service General Technical Report INT-212. Ogden, UT: Intermountain Research Center.
- Fazio, J. R. (1979). *Communicating with the wilderness user*. Bulletin 28. Moscow, ID: University of Idaho College of Forestry, Wildlife and Range Experiment Station.
- Fishbein, M., & Manfredo, M. J. (1992). A theory of behavior change. In M. J. Manfredo (Ed.), *Influencing human behavior: Theory and application in recreation, tourism, and natural resources management* (pp. 29-50). Champaign, IL: Sagamore.
- Ham, S. H. (2007). From interpretation to protection: Is there a theoretical basis? *Journal of the Association for Heritage Interpretation*, 12(3), 20-23.
- Ham, S. H., & Krumpke, E. E. (1996). Identifying audiences and messages for nonformal environmental education - A theoretical framework. *Journal of Interpretation Research*, 1(1), 11-23.
- Hammit, W. E., & Cole, D. N. (1998). *Wildland recreation: Ecology and management*. New York, NY: John Wiley & Sons.
- Harmon, W. (1997). *LNT: Minimum impact outdoor recreation*. Helena, MT: Falcon.
- Hendee, J. C., & Dawson, C. (2002). *Wilderness management: Stewardship and protection of resources and values* (3rd ed.), Golden, CO: Fulcrum.
- Hockett, K. S., & Hall, T. E. (2007). The effect of moral and fear appeals on park visitors' beliefs about feeding wildlife. *Journal of Interpretation Research*, 12(1), 4-26.

- Huffman, M. G., & Williams, D. R. (1987). Computer versus brochure information dissemination as a backcountry management tool. *Proceedings of the National Wilderness Research Conference: Issues, State-of-Knowledge, Future Directions*, (pp. 501-508). USDA Forest Service, Intermountain Research Center Ogden, UT General Technical Report INT-212.
- Jones, M. (1999). *LNT: Pilot project report*. Retrieved from [http://www.bouldercolorado.gov/index.php?option=com\\_content&task=view&id=3054&Itemid=411](http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=3054&Itemid=411)
- Jones, M., & Bruyere, B. (2004, June). *Frontcountry LNT program evaluation, city of Boulder Open Space and Mountain Parks*. Paper presented at the International Symposium on Society and Resource Management Keystone, Colorado.
- Lawhon, B., Newman, P., Taff, B. D., Vaske, J. J., Vagias, W. M., Bright, A., & Monz, C. (2013). Factors influencing behavioral intentions for LNT behavior in Rocky Mountain National Park. *Journal of Interpretation Research*, 18(1), 23-38.
- Leung, Y. F., & Attarian, A. (2003). Frontcountry visitor information/education programs: Are there lessons for wilderness? *International Journal of Wilderness*, 9(1), 32-33.
- Lime, D. W., & Lucas, R. C. (1977). Good information improves the wilderness experience. *Naturalist*, 28, 18-20.
- Lucas, R. C. (1981). *Redistributing wilderness use through information supplied to visitors*. USDA Forest Service Research Paper-INT-277. Ogden, UT: Intermountain Forest and Range Experiment Station.
- Lucas, R. C. (1983). The role of regulations in recreation management. *Western Wildlands*, 9(2), 6-10.
- Manning, R. E. (2003). Emerging principles for using information/education in wilderness education. *International Journal of Wilderness*, 9(1), 20-27.
- Manning, R. E. (2007). *Studies in outdoor recreation: Search and research for satisfaction*. (3rd ed). Corvallis, OR: Oregon State University Press.
- Marion, J. L., & Reid, S. E. (2001). Development of the United States LNT program: A historical perspective. In M. B. Usher, (Ed.), *Enjoyment and Understanding of the Natural Heritage* (pp. 81-92). Edinburgh, Scotland: The Stationary Office Ltd.
- Marion, J. L., & Reid, S. E. (2007). Minimizing visitor impacts to protected areas: The efficacy of visitor education programs. *Journal of Sustainable Tourism*, 15(1), 5-27. doi:10.2167/jost593.0
- McAvoy, L. H., & Hamborg, R. (1984). Wilderness visitor knowledge of regulations: A comparison of visitor contact methods. *Journal of Interpretation*, 9(1), 1-10.
- McCool, S. F., & Cole, D. N. (2000). *Communicating minimum impact behavior with trailside bulletin boards: Visitor characteristics associated with effectiveness*. USDA Forest Service Report RMRS-P-15-VOL-4, 208 – 216.
- National Park Service Statistics. (2012). Retrieved from <http://www.nature.nps.gov/stats/>
- Newman, P., Manning, R., Bacon, J., Graefe, A., & Kyle, G. (2003). An evaluation of Appalachian Trail hikers' knowledge of minimum impact skills and practices. *International Journal of Wilderness*, 9(2), 34-38.
- Outdoor Industry Foundation. (2012). *Outdoor Recreation Participation Report 2012*. Boulder, CO. Retrieved from: [http://www.outdoorindustry.org/research/participation.php?action=detail&research\\_id=170](http://www.outdoorindustry.org/research/participation.php?action=detail&research_id=170).
- Papenfuse, M. K., Roggenbuck, J. W., & Hall, T. E. (2000). The rise of the day visitor in wilderness: should managers be concerned? In D. N. Cole, S. F. McCool, W. T. Borrie, & J. O'Loughlin. (Eds.), *Wilderness science in a time of change conference: Wilderness visitors, experiences, and visitor management*, (pp. 148-154). U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

- Park, L., Lawson, S., Kaliski, K., Newman, P., & Gibson, A. (2010). Modeling and mapping hikers' exposure to transportation noise in Rocky Mountain National Park. *Park Science* 26(3), 59-64.
- Powell, R. D., Wright, B. A., & Vagias, V. M. (2008). *Preliminary evaluation of recreational skills and ethics training programs occurring on public lands: The LNT visitor education program*. Department of Parks, Recreation and Tourism Management, Clemson University, Clemson, SC.
- Roggenbuck, J. W., & Berrier, D. (1982). A comparison of the effectiveness of two communication strategies in dispersing wilderness campers. *Journal of Leisure Research*, 14, 77-89. doi:10.1177/004728758302100441
- Roggenbuck, J. W., & Lucas, R. C. (1987). Wilderness use and user characteristics: a state-of-knowledge review. In R. C. Lucas (Ed.), *Proceedings of the National Wilderness Research Conference: Issues, State-of-Knowledge, Future directions*, (pp. 204-245). Ogden, UT.
- Roggenbuck, J. W., Marion, J. L., & Manning, R. F. (1994). Day users of the backcountry: The neglected national park visitor. *Trends*, 31(3), 19-24.
- Stewart, W., Cole, D. N., Manning, R., Valliere, W., Taylor, J., & Lee, M. (2000). Preparing for a day hike at Grand Canyon: What information is useful. In D. N. Cole, S. F. McCool, W. T. Borrie, and J. O'Loughlin (Eds.), *Wilderness science in a time of change conference* (pp. 221-225). USDA, Forest Service, Rocky Mountain Research Station.
- Sun, S., Pan, W., & Wang, L. L. (2010). A comprehensive review of effect size reporting and interpreting practices in academic journals in education and psychology. *Journal of Educational Psychology*, 102(4), 989-1004. doi:10.1037/a0019507
- Taff, B. D., Newman, P., Bright, A., & Vagias, W. M. (2011). Day-user beliefs regarding LNT in Rocky Mountain National Park. *Journal of Outdoor Recreation, Education and Leadership*, 3(2), 112-115. doi:10.7768/1948-5123.1110
- Vagias, W., & Powell, R. B. (2010). Backcountry visitors' LNT attitudes. *International Journal of Wilderness*, 16(3), 21-27.
- Vagias, W., Powell, R. B., Moore, D., & Wright, B. (2012). Development, psychometric qualities, and cross-validation of the Leave No Trace Attitudinal Inventory and Measure (LNT AIM). *Journal of Leisure Research*, 44(2) 234-256.
- Vaske, J. J. (2008). *Survey research and analysis: Applications in parks, recreation and human dimensions*. State College, PA: Venture.
- Vaske, J. J., Gliner, J. A., & Morgan, G. A. (2002). Communicating judgments about practical significance: Effects size, confidence intervals and odds ratios. *Human Dimensions of Wildlife*, 7, 287-300. doi:10.1080/10871200214752
- Widner, C. J., & Roggenbuck, J. R. (2000). Reducing theft of petrified wood at Petrified Forest National Park. *Journal of Interpretation Research*, 5(1), 1-18.