Backcountry Visitors' Leave No Trace Attitudes

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Abstract: This study examined overnight backcountry visitors' attitudes regarding 22 common backcountry behaviors. Each behavior corresponded with a specific Leave No Trace Principle for Responsible Recreation. Insight and further understanding of backcountry visitors' attitudes regarding common backcountry behaviors can assist in the development of more effective visitor education strategies, potentially resulting in the reduction of visitor-induced recreation impacts. Data were collected via a mail-back questionnaire from visitors to Cumberland Island National Seashore, Georgia, Glacier National Park, Montana, and Olympic National Park, Washington. Results indicate widespread variability in the perceived appropriateness of several common backcountry activities, indicating that backcountry behaviors may also vary.

Introduction

Wade and Brooke Vagias kayaking in western Maryland. Photo courtesy of Wade Vagias.

Robert Powell in the Everglades.

Park and protected area managers face many difficult and diverse management challenges. As an example, the U.S. National Park Service (NPS) is mandated to balance resource protection and visitor enjoyment while addressing challenges including incompatible adjacent land use, invasive species, climate change, and improper human behavior, among others. Managing visitor behaviors is further compounded, as sensitive environments found in many protected areas may be vulnerable to significant degradation from nominal recreational use (Leung and Marion 2000) and cumulative impacts can be substantial (Hammitt and Cole 1998).

To help mitigate negative impacts, natural resource managers typically employ a multipronged strategy of education and/or enforcement to help meet management objectives (Hendee and Dawson 2002; Lucas 1983; Manning 2003). Education is usually preferred over enforcement, as it provides managers "light-handed" options for lessening visitor-induced impacts and is considered to be more in line with the spirit of the Wilderness Act (Hendee and Dawson 2002). Further, research has shown that education-based programs are preferred by both managers (Washburne and Cole 1983) and visitors (Hendee, Stankey, and Lucas 1990) for protecting resources and reinforcing appropriate visitor behavior over enforcement. Yet the task of effectively educating the public regarding appropriate behaviors can be a complex assignment, with challenges including noncaptive nature of audiences, limited contact time between park personnel and the public, and others (Orams 1997). To assist in overcoming these impediments, agencies have employed social marketing and educational campaigns such as Woodsy Owl's "Give a Hoot, Don't Pollute," Smokey Bear's "Only You Can Prevent Forest Fires," and Leave No Trace.

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Leave No Trace

The most pervasive minimum-impact visitor education program used in protected area contexts today is Leave No Trace (LNT), a program designed to educate recreationists about minimum-impact practices with the end goal of protecting resources (Harmon1997; Marion and Reid 2001). Currently, the LNT message consists of the seven LNT principles:

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

The LNT program can be traced back to the 1960s when the U.S. Forest Service (USFS) began to encourage "pack it in—pack it out" messages to users (Marion and Reid 2001). Through partnership with the National Outdoor Leadership School, the LNT message continued to develop throughout the 1990s. Leave No Trace (now called the Leave No Trace Center for Outdoor Ethics, or just The Center) was incorporated as a 501©(3) nonprofit organization in 1994. The mission statement of The Center states that it is "dedicated to the responsible enjoyment and active stewardship of the outdoors by all people, worldwide" (www.lnt.org). Also in 1994, a memorandum of understanding was signed with the USFS, Bureau of Land Management, Fish and Wildlife Service, and NPS to formally adopt LNT as the primary minimum-impact visitor education message promoted on federal lands. Other adopters of the LNT program have included various state-level land management agencies, including the recent adoption by all 50 state park managers representing some 5,000-plus state parks, as well as several foreign countries, including Ireland, New Zealand, Canada, Australia, Montenegro, Hong Kong, South Korea, Greece, Scotland, Argentina, Mexico, and Taiwan (www.lnt.org). For a review of the history and evolution of LNT, see Marion and Reid (2001), and see Manning (2003) for a review of studies investigating the role of education as a visitor management tool in protected areas.

Knowledge—Attitude—Behavior Association

When using education to protect resources, protected area managers usually desire to influence or reinforce visitors' knowledge, attitudes, and/or behaviors (KAB). Knowledge refers to information we possess, or "what we know." Attitudes are defined as the "psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor" (Eagly and Chaiken 1993, p. 1). *Behavior*, which is a broad umbrella term, refers to any number of actions a person may undertake.

Focused context-specific educational messages designed to inform NPS visitors regarding specific practices may need to be used to complement the more prevalent general LNT educational effort

To influence KAB, early learning theorists operated under the assumption that the link between learning and behavior was simplistic or directly related, a link occasionally referred to as the "learning leads to loving hypothesis" (Ham 2009, pers. comm.). Under this model, information traveled one way, from the sender (provider of information) to the receiver (recipient of information). According to Ham, the assumption educators make can be described as: "If they know what we know, they'll care as we care" (in press, p. 4,). However, this assumption has proven incorrect (Hungerford and Volk 1990), and advances in psychology and social psychology have provided alternative models for understanding the relationship between education and human behavior (Heimlich and Ardoin 2008; Ham 2009). And although understanding, predicting, and influencing human behavior is particularly complex and context specific, social-psychological theory suggests that one important driver of behavior is a person's attitude regarding the behavior of interest (Ajzen 1991; Ajzen and Fishbein 1980; Kraus 1995). Thus to effectively change behavior, particularly environmental behaviors, researchers have shown that education should target individuals' attitudes or the salient belief structures that underpin those attitudes (Ajzen 1991; Pooley and O'Connor 2000; Ajzen and Fishbein 2005).

This study examined NPS overnight backcountry visitors' attitudes regarding the "appropriateness" of 22 common backcountry behaviors. Each behavior corresponded with a specific LNT Principle for Responsible Recreation. If attitudes are an important determinant of behavior, as social-psychological research contends (e.g., Ajzen 1991; Ajzen and Fishbein 1973, 2005), insight and further understanding of backcountry visitors' attitudes regarding common backcountry behaviors can assist in the development of more effective visitor education strategies, potentially

resulting in the reduction of visitor-induced recreation impacts (Ham et al. 2007).

Methods

Three NPS units were selected for inclusion in this research: Cumberland Island National Seashore (CINS), Georgia; Glacier National Park (GNP), Montana; and Olympic National Park (ONP), Washington. The three study locations were selected because all contain wilderness/de facto wilderness areas, are popular NPS backpacking destinations that attract a significant volume of overnight backcountry visitors annually, require permits for all overnight backcountry visitors, and mandate pretrip check-ins with ranger staff.

A systematic sampling strategy was employed to ensure both representativeness and a more accurate estimate of the error (Babbie 2005). Individuals and groups were intercepted as they registered/picked up their backcountry permits at the backcountry offices/ranger stations within the three respective NPS units. All adult group members present were asked to provide their contact information. This strategy allowed for the sampling of all party members, not just the registered trip leader, as past studies have shown that less experienced backcountry travelers rely on more experienced individuals as sources of information (Ramthun 1998). Questionnaires were subsequently mailed approximately one month after contact and followed a modified Tailored Design Method (Dillman 2007). An adjusted response rate of 65% (N = 162) for CINS, 68% for GNP (N = 279), and 73% (N = 312) for ONP was achieved.

Our principle interest in conducting this study was to explore the mean scores of respondents' attitudes regarding the behaviors of interest as well as the variability (spread in scores) as evidenced by standard deviations (SD). Global perceptions of LNT as a program were measured via two Likert-type statements anchored from 1 = strongly disagree to 7 = strongly agree. The appropriateness of specific LNT practices were measured using 22 Likert-type statements anchored from 1 = very inappropriate to 7 = very appropriate. Only attitudes pertaining to LNT Principles 2–7 were investigated, because LNT Principle #1 addresses behaviors that occur prior to the wilderness recreational experience. Each item was written to solicit maximum variation in responses. For example, one item reads "having a campfire." Having a campfire in the backcountry has been, and will likely continue to be, common practice among many backcountry campers, yet LNT principles recommend foregoing a fire to lessen environmental impact (www.lnt.org). In fact, all 22 of the specific items are considered inappropriate backcountry behaviors under strict interpretation of LNT.

Results

Greater than 63% of the GNP sample was male, with a mean age of 36.2 years; approximately 60% of ONP respondents were male, with an average age of 41.4; and 62% of CINS respondents were male, with an average age of 40.3 years. More than 95% of the total sample was white, and more than 90% of the respondents in each unit reported having a college degree or higher. Slightly more than half of respondents were registered as the trip leader. For 76% of GNP respondents and 63% of CINS respondents, this was their first trip to the respective NPS unit. This contrasts sharply with ONP, where 66% of respondents indicated visiting ONP at least once prior to being contacted for participation in this study.

Awareness and Global Perceptions of Leave No Trace

The majority of GNP, ONP, and CINS respondents reported they had heard of LNT (94%, 97%, and 89%, respectively). As a follow-up, respondents who answered yes were asked to indicate the year they first heard of LNT. ONP respondents indicated having heard of the LNT in 1992.5 (mean year), and GNP and CINS respondents both indicated 1995.

Overall, support for the LNT program appears high, with a majority of GNP, ONP, and CINS respondents answering either "6" or "7" to the item "it is important to use minimum-impact/LNT techniques when in the backcountry" (91%, 93%, and 89%, respectively). Likewise, a predominance of respondents indicated that they believe the LNT practices help reduce environmental harm. Approximately 68% of GNP respondents (M = 1.65), 69% of ONP respondents (M = 1.56), and 62% of CINS respondents (M = 1.74) "strongly disagreed" with the statement: "Minimum-impact/LNT techniques do not reduce the environmental harm caused by backcountry travel."

Attitudes Regarding Specific LNT Principles

Attitudes toward LNT Principle #2, Travel and Camp on Durable Surfaces, were evaluated by eight statements (see table 1). Mean scores as well as standard deviations varied widely. For example, "moving rocks and/or logs to make a campsite more comfortable" is viewed by GNP respondents as slightly inappropriate (M = 3.59), but slightly appropriate by both ONP and CINS

Table 1—Means and standard deviations of attitudes under LNT Principle #2: Travel and Camp on Durable Surfaces.

Item	Unit	N	Mean[1, 2]	SD
Walking around muddy spots on the trail	GNP	273	4.31	1.7
	ONP	308	4.02	1.6
	CINS	157	4.67	1.5
Hiking side by side with my friends on existing backcountry trails	GNP	275	2.88	1.7
	ONP	308	2.93	1.6
	CINS	159	3.55	1.6
Camping along the edge of a stream or lake	GNP	271	4.22	1.9
	ONP	309	3.78	1.9
	CINS	159	4.22	1.9
Moving rocks from where I plan to place my tent	GNP	275	4.37	1.6
	ONP	308	4.74	1.7
	CINS	159	4.94	1.5
Moving rocks and/or logs to make a campsite more comfortable	GNP	273	3.59	1.7
	ONP	308	4.25	1.7
	CINS	158	4.35	1.6
When camping in heavily used areas, placing the tent in an undisturbed spot	GNP	271	2.14	1.6
	ONP	306	2.07	1.4
	CINS	158	2.81	1.7
In popular backcountry areas, camping where no one has camped before	GNP	273	1.77	1.2
	ONP	309	1.77	1.2
	CINS	159	2.31	1.4
Camping two nights in a pristine camp	GNP	269	4.90	1.7
	ONP	301	4.67	1.8
	CINS	153	5.07	1.4

[1]Mean score based on a 7-point Likert scale (1 = very inappropriate, 4 = neutral, 7 = very appropriate).
[2]Lower mean score reflects attitude more congruent with behavior/LNT principle.

respondents (M = 4.25 and 4.35, respectively). The standard deviation (SD) was ≥ 1.6 points for each of the units investigated, indicative of widespread divergence in attitudes regarding the appropriateness of this behavior. Similar items that had mean scores close to neutral with relatively large SD included "camping along the edge of a stream or lake" and "walking around muddy spots on the trail (figure 1)." However, respondents from all three units reported attitudes more closely aligned with recommended LNT practices regarding the behaviors "Hiking side by side with my friends on existing backcountry trails" and "In popular backcountry areas, camping where no one has camped before."

Respondents were fairly consistent across the study sites in their attitudes regarding waste management practices (Principle #3, table 2). Of particular interest for managers is the finding that "burying used toilet paper" is viewed as slightly appropriate in all units (CINS M = 4.75, GNP M = 4.17, ONP M = 4.46). Further, the SD for this item was at least 2, indicating widespread variability among respondents about the appropriateness of this behavior. For example, approximately 18% of GNP respondents, 14% of ONP respondents, and 10% of CINS respondents indicated this as "very inappropriate" (scoring this item a "1"), whereas 24% of GNP respondents, 25% of ONP respondents, and 27% of CINS respondents indicated this as a "very appropriate" behavior (scoring the same item a "7"). Also of interest are attitudes regarding urinating on vegetation, with means ranging from 3.2 to 3.7. Although on the "inappropriate" side of the scale, the scores are close to neutral and may reflect a level of complacency about this action. Particularly in alpine environments, urinating on vegetation deposits salts that subsequently may be dug up by animals, killing the plant.

Results pertaining to various wilderness backcountry practices related

Table 2—Means and standard deviations of attitudes under LNT Principle #3: Dispose of Waste Properly.

Item	Unit	N	Mean[1, 2]	SD
Burying used toilet paper	GNP	274	4.17	2.2
	ONP	308	4.46	2.1
	CINS	158	4.75	2.0
Urinating on vegetation	GNP	273	3.15	1.6
	ONP	304	3.46	1.7
	CINS	159	3.70	1.9
Burning paper trash in the campfire	GNP	274	3.16	1.9
	ONP	309	3.84	2.1
	CINS	159	4.08	1.9
Using soap in streams as long as there are currents to help dilute the suds	GNP	275	1.89	1.2
	ONP	310	1.95	1.3
	CINS	158	2.13	1.4
Depositing human waste on top of the ground so it will decompose quickly	GNP	275	1.55	1.1
	ONP	309	1.58	1.1
	CINS	159	1.86	1.3
Disposing of dishwater in streams or lakes	GNP	275	1.52	0.9
	ONP	310	1.53	1.0
	CINS	159	1.45	0.9

[1]Mean score based on a 7-point Likert scale (1 = very inappropriate, 4 = neutral, 7 = very appropriate).
[2]Lower mean score reflects attitude more congruent with behavior/LNT principle.

Figure 1—Braided trail made by users avoiding a muddy trail tread. Photo by Ben Lawhon.

to LNT Principle #4, Minimize Campfire Impacts, suggest widespread variation across individuals and the three units (see table 3). Campfires have long been a part of the backcountry experience, and the results of this study show general acceptance for fires, with more than 50% of individuals from the three units indicating a neutral to very appropriate response for the item "having a campfire" and relatively wide variation on scores within the unit. Results regarding the three other campfire attitudinal items were similar (see figure 2). The item "building a fire ring if one is not present" received the lowest mean scores across all units with scores below 4. However, 33.4% of CINS respondents, 16.9% of GNP respondents, and 22.7% of ONP respondents indicated this behavior was appropriate (5 or higher).

The appropriateness of leaving what is found in the backcountry (Principle #5) was evaluated via the item "keeping a single small item like a rock or feather as a souvenir." A majority of individuals across the three units indicated that the behavior was slightly inappropriate to very inappropriate. However, 19% of GNP respondents, 28% of ONP respondents, and 36% of CINS respondents indicated that this behavior was slightly appropriate to very appropriate (M = 2.91, 3.52, and 3.70, respectively).

Principle #6, Be Considerate of Other Visitors, was evaluated with the statement: "camping with large groups (8 or more people) in the backcountry." The LNT message espouses that groups should be kept small and large groups broken into small groups. Mean scores ranged from 2.98 at ONP to 3.81 at CINS (GNP M = 3.10).

The seventh LNT Principle, Respect Wildlife, was evaluated with two items: "dropping food on the ground to provide wildlife a food source" and "feeding wildlife" (see table 4). Scores between GNP and ONP were quite similar across both items, with CINS visitors indicating slightly higher scores for both items. Overall, respondents indicated that the behaviors were very inappropriate.

Discussion and Management Implications

The purpose of this study was to examine overnight backcountry visitors' attitudes regarding the "appropriateness" of 22 common backcountry behaviors. Each investigated behavior corresponded directly with a specific LNT Principle for Responsible Recreation. A number of important findings emerged that transcended study sites and are worthy of further discussion. At a global level, respondents were very positive and supportive of using LNT techniques. This suggests they are largely supportive of the

Table 3—Means and standard deviations of attitudes under LNT Principle #4: Minimize Campfire Impacts.

Item	Unit	N	Mean[1, 2]	SD
Having a campfire	GNP	269	4.15	1.7
	ONP	305	4.10	1.8
	CINS	158	4.37	1.8
Cooking over a campfire in the backcountry	GNP	274	3.84	1.9
	ONP	308	3.72	1.9
	CINS	159	4.21	1.8
Building a fire ring if one is not present	GNP	273	2.41	1.9
	ONP	308	2.80	2.0
	CINS	159	3.25	2.3
Leaving charred wood contained in the fire ring	GNP	272	3.88	1.9
	ONP	307	4.13	1.9
	CINS	157	4.55	1.7

[1]Mean score based on a 7-point Likert scale (1 = very inappropriate, 4 = neutral, 7 = very appropriate).
[2]Lower mean score reflects attitude more congruent with behavior/LNT principle

Figure 2—Campfire ring and evidence of past use. Photo by Ben Lawhon.

message and the corresponding behaviors in a general sense. However, as can be seen in the discrepancy in mean scores between the two global items and 22 specific items, positive global attitudes do not necessarily equate to attitudes congruent with specific recommended LNT behaviors. For example, attitudes toward LNT Principle #2, Travel and Camp on Durable Surfaces, measured by items such as "moving rocks and logs to make a camp more comfortable," or "walking around muddy spots on the trail" (both inappropriate), received both supportive and unsupportive responses. The first item, "moving rocks and/or logs to make a campsite more comfortable" is viewed by 32.6% of GNP respondents as appropriate, 19% had a neutral response, and 48.3% felt the behavior was inappropriate. Similarly, in CINS, 59% of respondents felt it was appropriate to "walk around muddy spots on the trail," 22% were neutral, and 19% felt it was inappropriate.

The relatively high variability (SD) in scores on certain behaviors suggests that certain recommended practices may not be fully understood and/or supported by backcountry visitors. This incongruity between visitors' positive global support for the LNT message and the more varied attitudes toward specific behaviors suggests that opportunities exist to improve educational efforts. Social psychological theory and communication theory suggests that educational efforts aimed at influencing behaviors must be targeted and specific for the context, audience, and behavior (Ajzen 2005; Ham and Krumpe 1996). In other words, additional specific and targeted education efforts that complement general LNT messaging may need to target a specific "problem" behavior. Although a general message may promote a general philosophy and ethic, it may not necessarily translate into support and adoption of specific behaviors.

Conclusions

Attitudes toward the specific recommended LNT behaviors varied, at times widely. These results suggest that educational efforts need to target not only the seven general LNT principles but, more importantly, the specific behaviors that underpin each principle. In particular, this research suggests that additional or focused context-specific educational messages designed to inform NPS visitors regarding specific practices may need to be used to complement the more prevalent general LNT educational efforts. This appears particularly important in areas where visitors mistakenly undertake behaviors that negatively impact valuable resources due to ignorance or misunderstanding regarding the application of the LNT principles.

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Table 4—Means and standard deviations of attitudes under LNT Principle #7: Respect Wildlife.

Item	Unit	N	Mean[1, 2]	SD
Dropping food on the ground to provide wildlife a food source	GNP	275	1.19	0.7
	ONP	310	1.19	0.7
	CINS	159	1.33	0.8
Feeding wildlife	GNP	273	1.16	0.6
	ONP	310	1.21	0.8
	CINS	159	1.30	0.7

[1]Mean score based on a 7-point Likert scale (1 = very inappropriate, 4 = neutral, 7 = very appropriate).
[2]Lower mean score reflects attitude more congruent with behavior/LNT principle

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