

# LEAVE NO TRACE AND NATIONAL PARK WILDERNESS AREAS

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## Abstract

Leave No Trace (LNT) is an educational program designed to reduce recreationalists' impact on the nation's wildlands. The goal of this research was to determine how the National Park Service (NPS) uses individual park websites to disseminate information about LNT principles. Forty-five NPS units containing wilderness were evaluated. Although both the parks and the wildernesses have existed for more than a decade, there is less use of LNT than might be expected. Over one third of the parks do not mention LNT at all. Of the parks that do mention LNT, some only mention it in administrative documents rather than ones users would be most likely to view during trip planning. To better protect wilderness values, the NPS should make more use of their websites to communicate LNT principles. If educational programs like LNT are not effective, a more heavy-handed regulatory approach will be needed to protect wilderness values.

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## 1.0 Introduction

As backcountry and wilderness recreational use in the U.S. grew, so did impacts to the biophysical resource. Agencies used various methods to reduce impacts including restricting user activities. However, wilderness management principles dictate that managers' first priority to reduce user impacts should be to use education, primarily outside of wilderness, rather than restrict users within wilderness (Hendee and Dawson 2002).

Leave No Trace (LNT) is probably the most well known effort to educate users in hopes of changing their attitudes and subsequent behavior when recreating in the nation's wildlands. A Memorandum of Understanding formalized a partnership between the Bureau of Land Management, Fish and Wildlife Service, Forest Service and the National Park Service and Leave No Trace, Inc. to collaboratively work on modifying users' behaviors (Marion and Reed 2001). The Leave No Trace Center for Outdoor Ethics is "dedicated to promoting and inspiring responsible outdoor recreation through education,

**Table 1.—Leave No Trace Principles**

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Plan Ahead and Prepare  
Travel and Camp on Durable Surfaces  
Dispose of Waste Properly  
Leave What You Find  
Minimize Campfire Impacts  
Respect Wildlife  
Be Considerate of Other Visitors

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Source: (LNT 2004)

research and partnerships. Leave No Trace builds awareness, appreciation and respect for our wildlands" (Leave No Trace 2004).

The Leave No Trace program's widespread adoption is due in part to the fact that their principles are based on science. Print media are distributed widely by both land management agencies and LNT, Inc. The seven principles are packaged as short phrases in hopes that people will better retain the messages (Table 1). They also have an active program utilizing classroom and field training activities.

The focus of this research is to determine how the Leave No Trace message is communicated via National Park Service (NPS) websites that have Congressionally-delegated wilderness within them. The results of this research are important because if educational programs like LNT are not effective, a more heavy-handed regulatory approach will be needed to protect wilderness values.

## 2.0 Methods

The NPS was used in this research for several reasons. First, the public generally views the parks as having a recreational emphasis, which is the focus of LNT. Second, of the four land management agencies, their mission is the most restrictive; thus, they might be expected to have widely disseminated the LNT message. Only parks with wilderness areas were examined because one might expect wilderness areas to be the ones with the highest degree of protection and thus, would mention LNT more frequently. Another reason for only looking at the NPS is because they have the fewest number of wilderness areas (Figure 1).

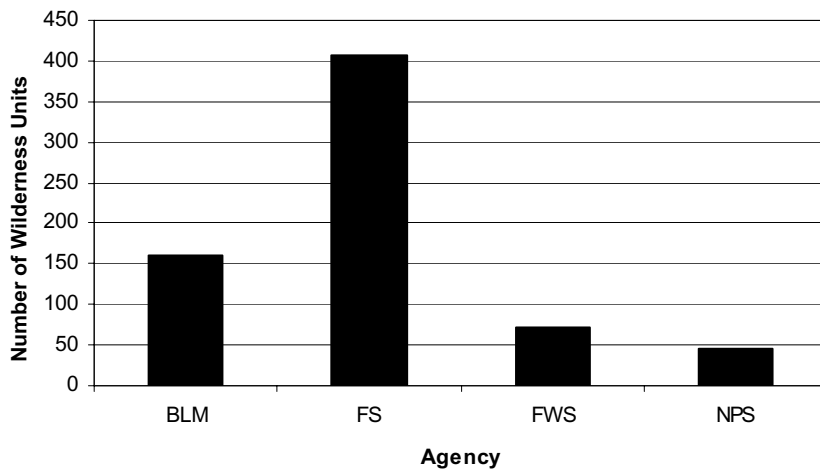


Figure 1.—Number of Wilderness Areas Managed by the Four Land Management Agencies

While the NPS communicates the LNT and other low impact messages using a variety of techniques (e.g., brochures, signs, ranger communication), the focus of this research was NPS websites. National Park Service websites were examined in this study because they were easily accessible by both the public and researchers.

Parks with wilderness designations were obtained from [www.wilderness.net](http://www.wilderness.net) (Table 2). As of December 2002, 45 parks had wilderness designations. For the purposes of this research, park is used generically to refer to any unit of the National Park Service. The website was downloaded using Adobe Acrobat. A search was done for the following phrases: Leave No Trace or LNT. Each time either of these phrases was identified, their location and the type of information on each page were entered in a spreadsheet. Statistical analysis was done using SPSS.

### 3.0 Results

The results are broken down into two sections. The first section focuses on summarizing information about the dataset. The second section focuses on the LNT message.

#### 3.1 Dataset

A total of 55,726 pages were analyzed. The average size of a website was 1,238 pages (median 501). The smallest website, Kobuk Valley, had 8 pages while the largest, Yosemite, had 14,581 pages. Most NPS websites are extensive indicating the websites can be a robust source of data for researchers to analyze. Larger websites had more user-related content but

often website size had more to do with the number of administrative documents included in their entirety (e.g., General Management Plan, Environmental Assessment).

National park size varies considerably for the 45 units with wilderness (Fig. 2). Devils Postpile was the smallest unit analyzed and Wrangell-St. Elias was the largest. The number of recreational visitors and park size varies considerably (Figure 3, Table 3). Recreational visits is significantly larger than wilderness visits, but it is used as a proxy for the popularity of the park. Noatak had the fewest visitors in 2001 and Gulf Islands had the most. There is a slight negative, but not statistically significant, correlation, between park size and number of visitors.

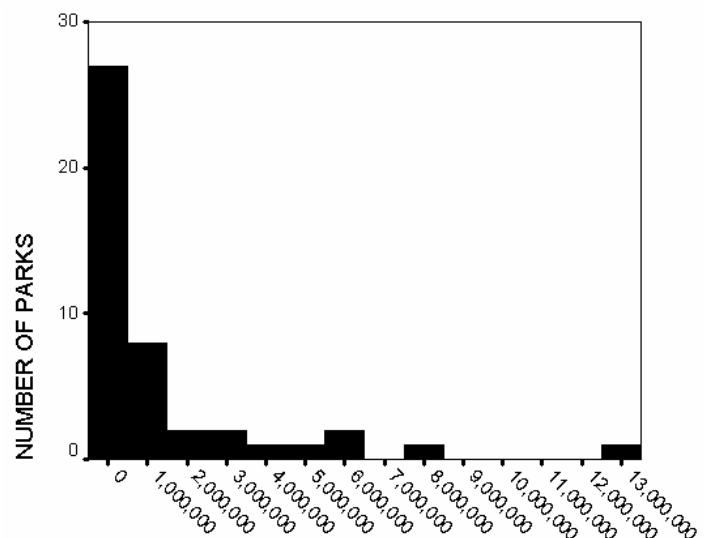


Figure 2.—Distribution of Parks by Park Acreage

**Table 2.—NPS Units with Wilderness as of December 2002**

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|  |
|--|
| Badlands National Park                             |
| Bandelier National Monument                        |
| Black Canyon of the Gunnison                       |
| Buffalo National River                             |
| Carlsbad Caverns National Park                     |
| Chiricahua National Monument                       |
| Congaree Swamp National Monument                   |
| Craters of the Moon National Monument and Preserve |
| Cumberland Island National Seashore                |
| Death Valley National Park                         |
| Denali National Park and Preserve                  |
| Devils Postpile National Monument                  |
| Everglades National Park                           |
| Fire Island National Seashore                      |
| Gates of the Arctic National Park and Preserve     |
| Glacier Bay National Park and Preserve             |
| Great Sand Dunes National Preserve and Monument    |
| Guadalupe Mountains National Park                  |
| Gulf Islands National Seashore                     |
| Haleakala National Park                            |
| Hawaii Volcanoes National Park                     |
| Isle Royale National Park                          |
| Joshua Tree National Park                          |
| Katmai National Park and Preserve                  |
| Kobuk Valley National Park                         |
| Lake Clark National Park and Preserve              |
| Lassen Volcanic National Park                      |
| Lava Beds National Monument                        |
| Mesa Verde National Park                           |
| Mojave National Preserve                           |
| Mount Rainier National Park                        |
| Noatak National Preserve                           |
| North Cascades National Park                       |
| Olympic National Park                              |
| Organ Pipe Cactus National Monument                |
| Petrified Forest National Park                     |
| Pinnacles National Monument                        |
| Point Reyes National Seashore                      |
| Rocky Mountain National Park                       |
| Saguaro National Park                              |
| Sequoia-Kings Canyon National Park                 |
| Shenandoah National Park                           |
| Theodore Roosevelt National Park                   |
| Wrangell-St. Elias National Park and Preserve      |
| Yosemite National Park                             |

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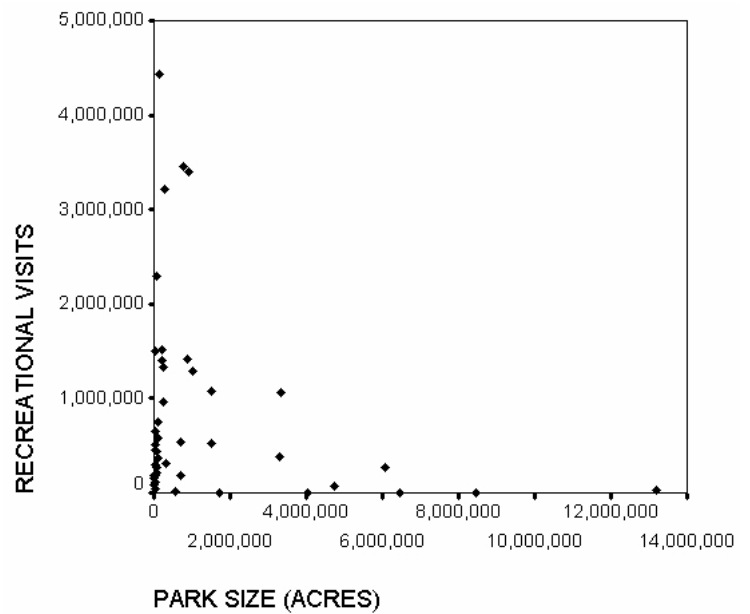


Figure 3. Recreational Visits Compared To Park Size

**Table 3.—Park Information**

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| Statistics | Recreational visits | Park size (ac) |
|------------|---------------------|----------------|
| Minimum    | 3,912               | 798            |
| Mean       | 819,063             | 1,388,366      |
| Median     | 441,989             | 209,695        |
| Maximum    | 4,428,944           | 13,175,903     |

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In keeping with the overall distribution of public land in the US, the majority of the parks with wilderness designations are found in the West (Table 4). The age of parks is important to examine because older parks would have had more time to create their websites. Most of the parks (71%) were created prior to the Wilderness Act in 1964 (Fig. 4). All of the wilderness units within the park unit were designated between 1970 and 1994; thus, the most recent wilderness was designated eight years before this data set was obtained (Fig. 5).

The average percentage of wilderness for the 45 units is 58%. Only 16 of the units have less than 50% of the unit designated as wilderness (Figure 6). Rocky Mountain has the lowest percentage of the park unit as designated wilderness (1%) while Death Valley has the largest (97%).

**Table 4.—Regional Distribution of Parks**

| Region        | Percent |
|---------------|---------|
| Pacific West  | 36      |
| Intermountain | 24      |
| Alaska        | 18      |
| Midwest       | 9       |
| Southeast     | 9       |
| Northeast     | 4       |

**3.2 Mention of LNT**

The number of times Leave No Trace was mentioned was counted. The dataset is heavily skewed by two national parks (Figure 7). Olympic National Park includes an individual page devoted to each of their hikes and Rocky Mountain National Park includes a similar designation for their backcountry hikes; both include at least one mention of leave no trace on the hikes. These two parks account for 75% of the 850 times LNT was mentioned for the 45 parks. The two outliers prevent the use of a mean as useful measure for subsequent analyses (mode was 0 mentions of LNT, and the median was 2). Figure 8 shows that 35% of the parks with wilderness do not mention LNT anywhere on the website. In some cases the only mention of LNT occurred on administrative pages (e.g., General Management Plan, Environmental Assessment).

Twenty-seven percent of the parks contained at least one link to the LNT website. The median and mode for links to the LNT website was 0. Few (13%) of the parks listed all seven principles (Fig. 9). Nearly 50% did not list any of the seven principles. The most commonly listed principle was “Dispose of Waste Properly” while the least mentioned is “Respect Wildlife” (Fig. 10).

Spearman correlation coefficients were analyzed for mention of Leave No Trace (recoded as yes or no) and the actual number of times LNT was mentioned. I speculated that parks and wilderness areas that are older will mention LNT and will mention it more frequently than newer parks or wilderness areas. Although there is a positive correlation, it is not statistically significant (Table 5).

I also thought that larger parks and wilderness areas would mention LNT and mention it more frequently than smaller ones. There is a positive correlation between

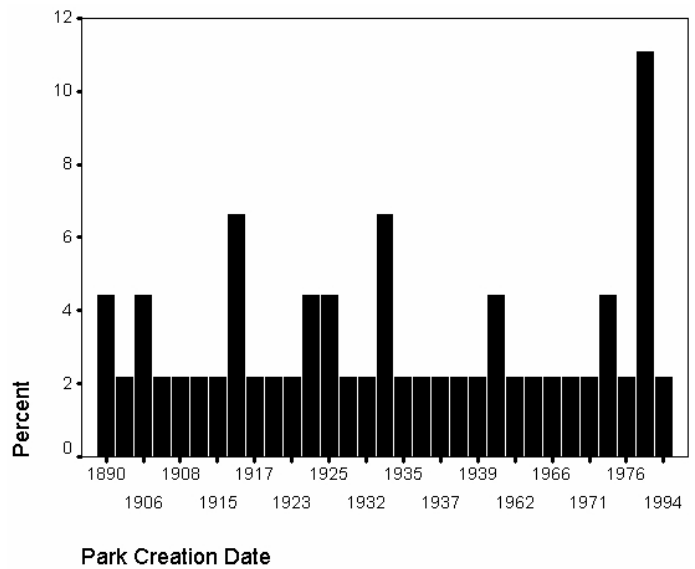


Figure 4.—Distribution of Parks by Date of Creation

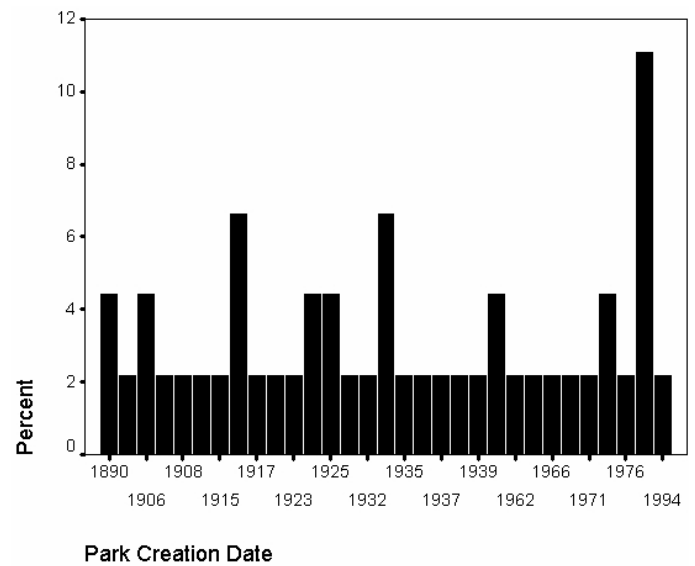


Figure 5.—Date Wilderness was Designated in Each NPS Unit

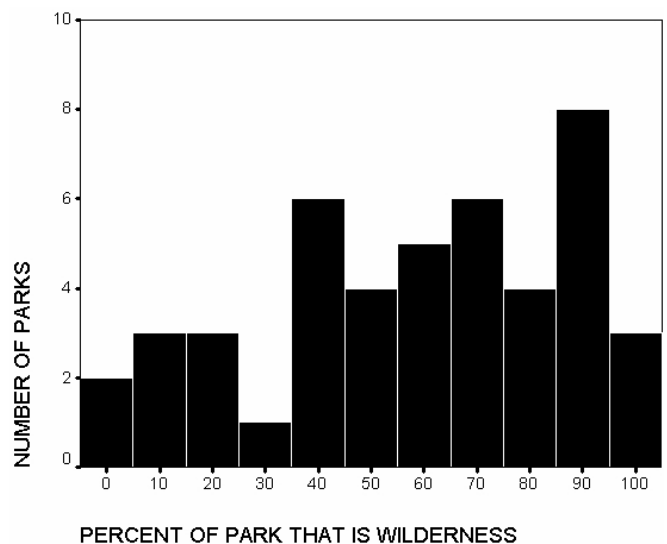


Figure 6.—Number of Park Designated as Wilderness

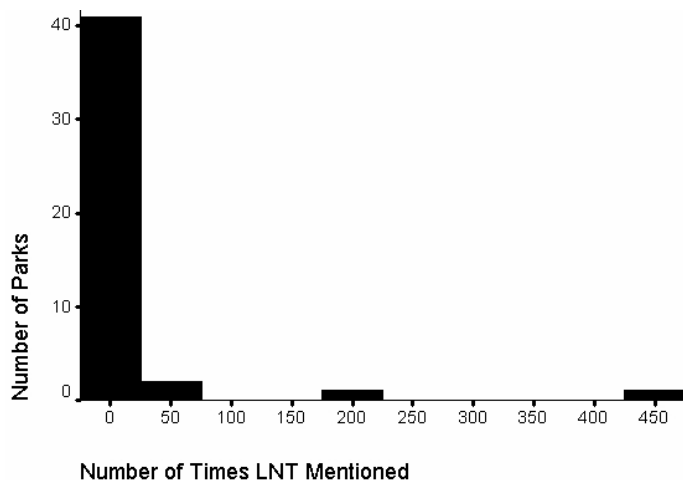


Figure 7.—Number of Times National Parks Mention LNT

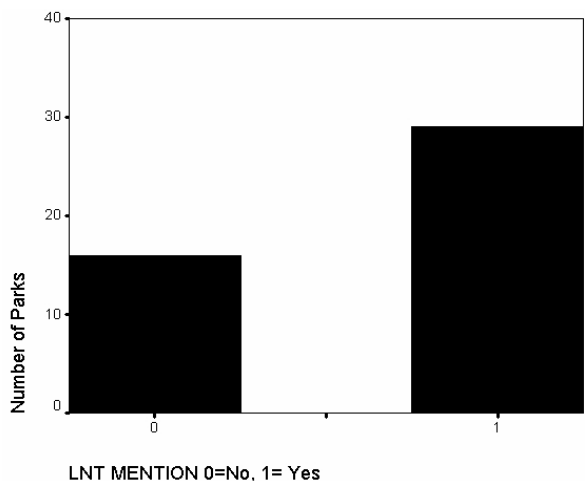


Figure 8.—Breakdown of the Number of Times National Parks mention LNT

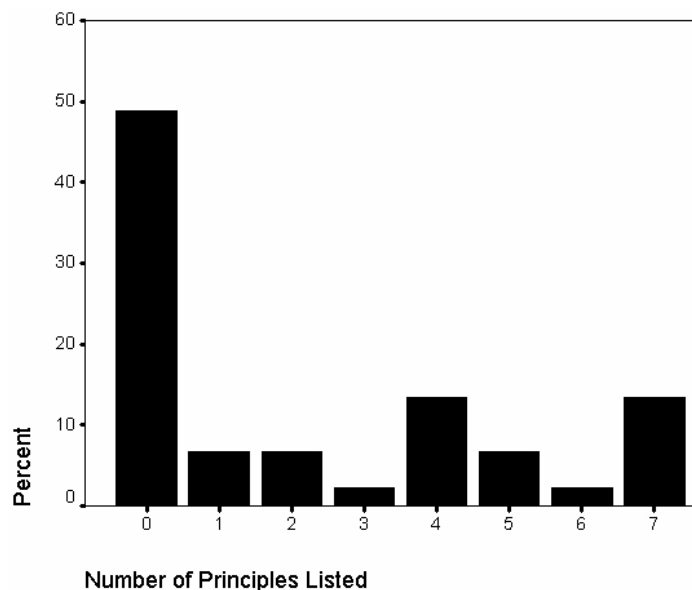


Figure 9.—Number of Principles Listed

wilderness and park size (Table 5). There is a statistically significant correlation between the number of times LNT is mentioned and wilderness size. There is also a statistically significant correlation between park size and the mention of LNT at all (as opposed to the number of times mentioned).

Parks with a larger percentage of wilderness might be expected to mention LNT and mention it more frequently than those with a small percentage of wilderness. There is a correlation but it is negative – the higher the percentage of wilderness found in a park, the less likely LNT is mentioned or is mentioned frequently (Table 5).

Finally, the number of recreational visits is positively correlated and statistically significant for both mention of LNT and frequency of mention.

#### 4.0 Discussion and Conclusions

There is significant variation in park size and number of recreational visitors to a NPS unit containing wilderness. The parks have existed for a long time, wilderness designation was made more than a decade ago, and wilderness occupies a majority of most parks. These attributes of the dataset were hypothesized to be strongly positively correlated with the mention or frequency of mention of Leave No Trace, but in most cases the correlation is weakly positive and not statistically significant.

Despite the decade old Memorandum of Understanding with Leave No Trace, Inc. there is less usage of the LNT message on NPS websites than would be expected. This is particularly disturbing given the park’s preservation mission. Although other parks were not analyzed, one would expect the term to occur more frequently on park web pages with wilderness than for other parks. Even though two thirds of the parks with wilderness do mention LNT, some of them only do so as a link to the Leave No Trace website. Linking to LNT is good, but the principles were designed to be short; thus, it may be advantageous for the National Park Service to list the LNT principles in addition to linking to LNT. The NPS should try to disseminate the Leave No Trace message as often as possible. Since the LNT message is relatively static, it could easily be added to many places on NPS websites and would require little updating. If the Leave

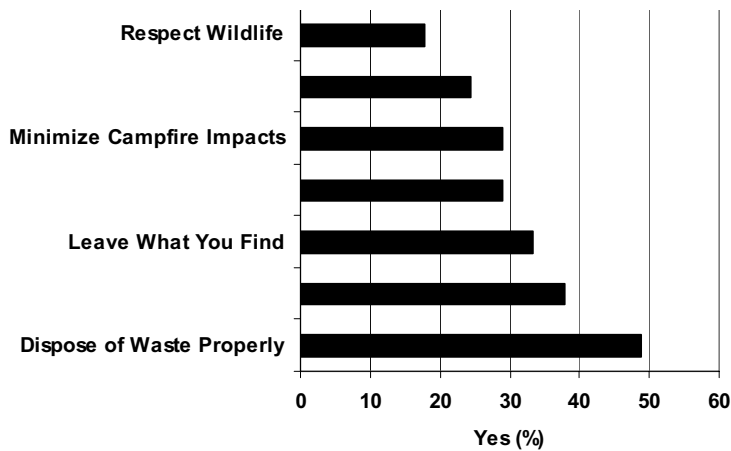


Figure 10.—Frequency of Mention for Each LNT Principle

Table 5.—Correlations of Leave No Trace With Several Variables

| Variable                      | LNT<br>(yes or no) | LNT<br>(number of times<br>it occurs) |
|-------------------------------|--------------------|---------------------------------------|
| Wilderness Year               | 0.110              | 0.175                                 |
| Wilderness Size               | 0.164              | *0.316                                |
| Wilderness Percent            | -0.153             | -0.014                                |
| Park Year                     | 0.153              | 0.037                                 |
| Park Size                     | **0.415            | 0.289                                 |
| Number of Recreational Visits | *.353              | *.303                                 |

\*= statistically significant at 0.05 level

\*\*=statistically significant at 0.01 level

No Trace message isn't communicated regularly and subsequently adopted by wilderness users, the wilderness resource will suffer. The result will be the inevitable use of regulatory techniques to reduce the human impact on wilderness values.

## 5.0 Limitations

There are several limitations to the study. First, the content of a park's website may be decentralized in that there may be many contributors. Wilderness stewardship is a collateral duty for nearly every NPS employee; thus, given the multiplicity of duties, updating the website may take a low priority. Second, the point behind the principles may appear on the website, but the LNT phrase may not accompany the principles.

## 6.0 Acknowledgments

The assistance of Soon Hong from GVSU's Statistical Consulting Center is much appreciated.

## 7.0 Citations

Hendee, J.C. and C.P. Dawson. (2002). Wilderness management. Stewardship and protection of resources and values (third ed.). Golden, CO: Fulcrum Pub.

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