

GREAT GULF WILDERNESS USE ESTIMATION: COMPARISONS FROM 1976, 1989, AND 1999

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Abstract: Wilderness visitor monitoring techniques can provide important baseline information on recreational use and assist managers in making recreation use management decisions. A demonstration project was conducted in the Great Gulf Wilderness using active infra-red beam type trail counters and brief on-site interviews to obtain information about visitor travel patterns, wilderness destinations, and estimate total recreational use by trail segments. The spatial and temporal distribution of use was analyzed to understand the concentration of use that occurred in the Great Gulf Wilderness.

Introduction

Recreational use in the National Wilderness Preservation System (NWPS) has increased greatly over the last 40 years, but the same trend has not been evident in all wilderness areas (Cole 1996). Overall, wilderness recreational use is expected to continue to grow at a more modest rate in the future within the NWPS and many individual wilderness areas (Cordell and others 1990; Cordell and Teasley 1998). This study reports on recreational use of the Great Gulf Wilderness during the summer of 1999 and compares some information from similar studies over the last two decades.

The Great Gulf Wilderness was designated under The Wilderness Act of 1964. The 5,550 acre area is located in the White Mountain National Forest (NH and ME) with Mt. Washington and the Presidential Mountain range forming the main boundaries in all directions except the eastern side. The Great Gulf Wilderness includes the basin area within the crescent shaped Presidential Mountain range, but not the summits of those mountains. This small wilderness is within a five-hour drive of the major metropolitan areas of Boston and Montreal.

Management of wilderness use is necessary to protect the wilderness resource and the wilderness experience for users (e.g., solitude). One of the first requirements for sound wilderness planning and management is to establish a baseline level of recreational use and then monitor for changes in use and subsequent changes in the wilderness resource and the wilderness experience. Numerous direct and indirect methods of estimating recreational use are available and each has strengths and weaknesses (Hollenhorst and others 1992; Yuan and others 1995; Hornback and Eagles 1999; Watson and others 2000). Wilderness area managers reportedly use a wide variety of techniques to estimate recreation use and many areas use a combination of estimation techniques (Washburne and Cole 1983). Systematically observing visitors and interviewing them (or requesting names and addresses for a later mail surveys) at a sample of trailheads is often used, but highly variable use patterns make reliable sampling difficult and costly. Large samples are difficult to obtain because of the extensive land areas, numerous access points, and variable recreation use both temporally and spatially in many wilderness areas. Although stratified sampling can be designed to concentrate monitoring on more heavily used times and places, thereby increasing the efficiency of sampling, it requires some information on recreation use patterns to plan a sampling stratification approach.

One approach that can partially reduce the cost and staff time involved in estimating recreation use is data collection with trail traffic counters. O'Rourke (1994) reports that the use of automatic electronic traffic counters on trails has been increasing, because of new technology and improved operation, especially with higher accuracy active infrared systems. An active infrared system emits an infrared beam to a receiver or reflector and registers a count whenever there is an interruption by some large object moving through the beam. Active infrared types of counters cannot identify whether the objects were hikers, packhorses, or deer, nor direction of travel (e.g., entry or exit). However, automatic counters, like active infrared types, are being used in a number of wildernesses, in conjunction with other methods (e.g., user interviews or mandatory permits) and provide useful information, especially to estimate trends in recreation use (Hollenhorst and others 1992; O'Rourke 1994; Yuan and others 1995).

The objective of this study is to demonstrate the utility of trail counter systems when used with brief on-site interviews to obtain information about visitor travel, destinations, and estimate total recreational use by trail segments within the wilderness. User information is then compared with data obtained from previous studies in 1976 (Leonard and others 1978) and 1989 (Cross and Davis 1989) to estimate trends in use within the Great Gulf Wilderness, although the previous studies do not use the same research methodologies.

Methods

A research study of hikers in the Great Gulf Wilderness in the White Mountain National Forest of New Hampshire

was conducted in the summer of 1999. The study research design reported here consisted of two parts:

1. Estimating hiking use with automated counters, having infra-red beam technology, at the eight access trails into the wilderness area during June 2 to September 11, 1999; the counters measured exit or entry events in the wilderness area and data was recorded by site and date.
2. Measuring wilderness use and travel patterns via brief on-site interviews during June 2 through September 2, 1999 at the two major access sites to the wilderness; a total of 316 users were systematically interviewed and were included in the analysis.

The summits of the mountains in the Presidential Range are some of the primary destination points for users, but these summits and ridgeline trails are outside of the Great Gulf Wilderness boundary. Total visitor use in the Great Gulf Wilderness was estimated from the trail counter units and adjusted with the interview information for the number of entrances and exits made by a visitor during their trip. For example, some visitors only had one entrance and one exit for a trip while others came into the wilderness (1st entrance), then climbed a summit like Mount Madison outside the wilderness (1st exit), and returned to their camp in the wilderness (2nd entrance) and left for home the next day (2nd exit). Thus, the counter data had to be adjusted for the proportion of users with one, two or three exits and entrances during a single trip to the Great Gulf Wilderness.

Results and Discussion

Short trips, both in distance traveled and duration, are characteristic for most wildernesses (Lucas 1980). In 1999, Great Gulf Wilderness visitors were most often day hikers (55%) and those that stayed over night in the wilderness (45%) did so for an average of 1.5 nights. The percentage of day hikers in 1989 was nearly the same with 54%, although the 1976 study reported 75% day use. The average length of stay for overnight users was 1.5 nights in 1989 and 2.0 nights in 1976.

Forty-seven percent of the visitors to the Great Gulf in 1999 had been there previously for an average of 4.4 previous visits. Most visitors were from the northeastern states. The states and provinces that contributed the most visitation were: Massachusetts (28%), New Hampshire (20%), Connecticut (8%), Maine (6%), New York (5%), Province of Quebec (5%), Vermont (3%), New Jersey (3%), and other states and provinces (22%). A similar percentage contribution of these northeastern states and provinces was reported from the 1976 study; no comparisons were available from the 1989 study.

Comparisons in recreation use between the 1976, 1989, and 1999 study results are difficult because all three studies used different research designs and data collection methods. The visitor use in 1976 was estimated at between 2,978 and 3,838 visitors from July 3 through August 27, 1976 (Leonard and others 1978). In 1989, visitor use was projected as 9,000 to 10,000 visits annually, with 7,923 visitors using the area from July 2 through September 3, 1989 (Cross and Davis 1989). Total visitor use was estimated, from combined counter and interview data, as 7,930 visitors on trails during June 2 through September 11, 1999 with 5,700 visitors from July 2 through September 3, 1999 in the Great Gulf Wilderness. Thus, the 1999 visitor data indicates an approximate 28% reduction in visitor use over 1989 for the same time period.

The temporal distribution of wilderness recreational use is uneven with 1999 daily use increasing through the early season, reaching the highest use in July and August, and then decreasing in mid-September (figure 1). Also, there is a noticeable pattern of more recreational use on weekends than weekdays and the highest weekend use occurs on holiday weekends like July 4th and Labor Day (figure 1). However, when the data exclude the early and late season (e.g., Labor Day) then the differences between days of the week are not as strong a difference as it was in 1989; 1999 users are most similar to the patterns of use per day of the week as reported in 1976 (table 1).

Figure 1. Temporal distribution of recreational use on weekends (labeled above) and weekdays during June 2 through September 11, 1999 in the Great Gulf Wilderness.

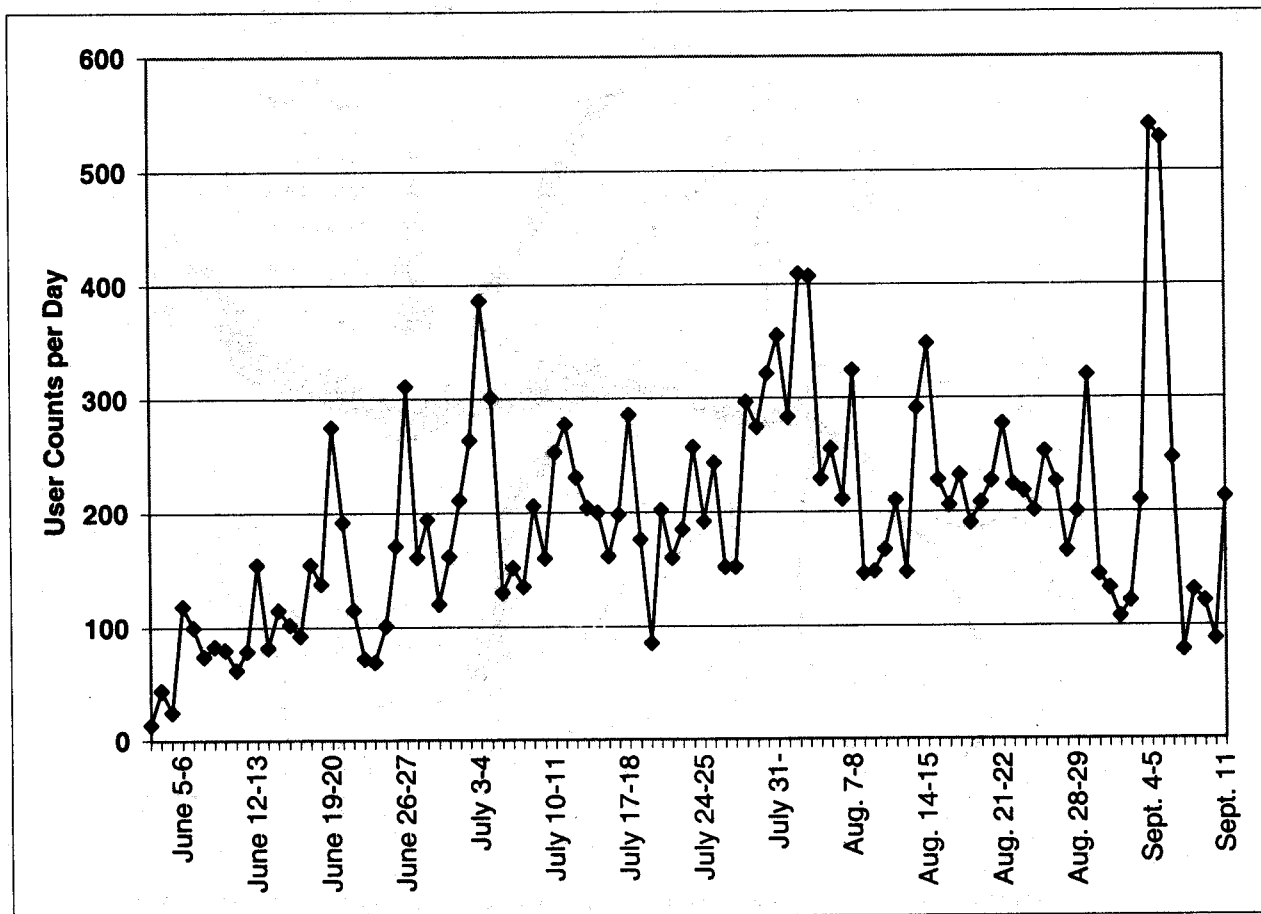


Table 1. Percent visitor entrances by day of week in 1976, 1989 and 1999 for the Great Gulf Wilderness from July 2 through September 3.

Day of Week	1976	1989	1999 ^a
Sunday	14.6	14.9	15.4
Monday	11.6	10.9	12.1
Tuesday	14.4	6.2	12.9
Wednesday	13.2	12.7	12.5
Thursday	13.1	14.9	12.5
Friday	14.7	15.6	16.1
Saturday	<u>18.4</u>	<u>24.8</u>	<u>18.5</u>
Total	100.0	100.0	100.0

Includes entrances and exits for 1999.

The geographical distribution of wilderness recreational use is similarly uneven with many people in a few places and relatively few in many other locations in the Great Gulf Wilderness (figure 2). For many reasons (e.g., ease of access, guidebook descriptions), some trailheads and popular destinations attract more use than others. Examples in the Great Gulf Wilderness include hikers following the Appalachian Trail through the area, day hikers going to a well known vista point (Lowe's Bald Spot), and the best parking area for wilderness

access being developed at one point off Route 16. The geographic concentration of use, when combined with the tendency for use to concentrate during the summer and high use weekends, can contribute to the perception of crowding among users. The tendency for a large percentage of users to access the Great Gulf Wilderness from the Great Gulf parking area on Route 16 is more evident in the 1999 study than the 1989 study (table 2).

Figure 2. Geographic distribution of recreational use during June 2 through September 11,1999 in the Great Gulf Wilderness.

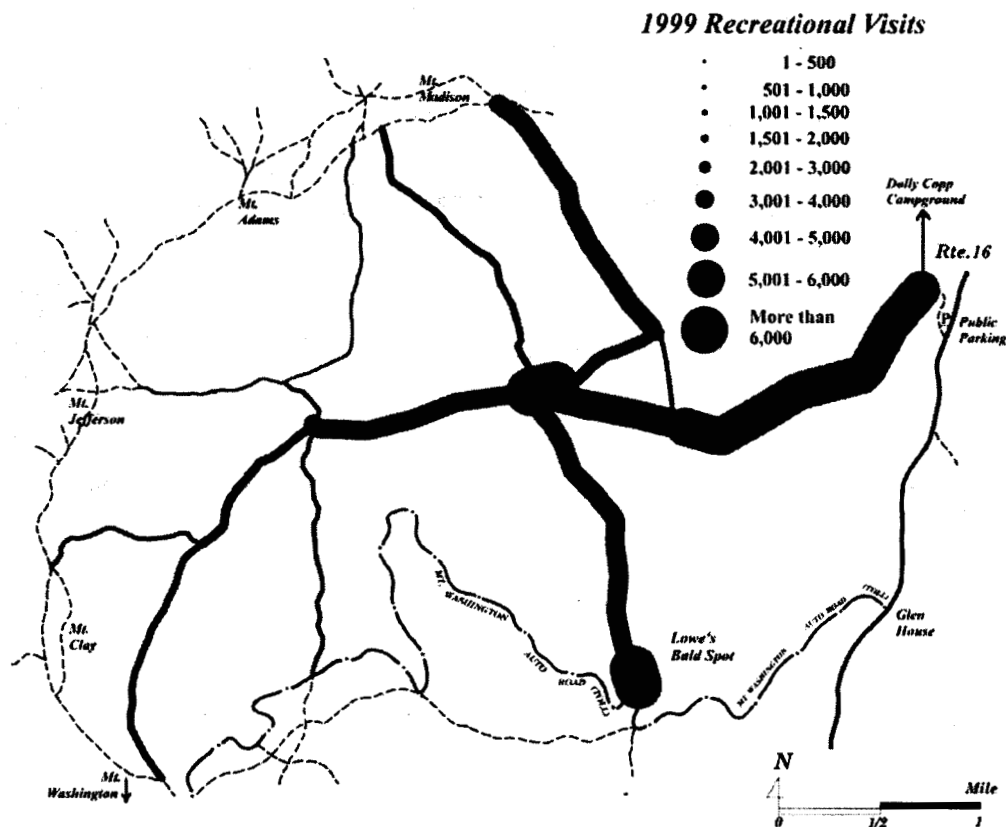


Table 2. Percentage of hiker entries based on trail interview data during July 1 through September 4, 1989 and June 2 through September 11,1999 in the Great Gulf Wilderness.

Entry Point	1989	1999
Great Gulf Parking (route 16)	34.3	55.2
Madison Gulf-Auto Road	25.2	22.3
Osgood Ridge	12.0	16.0
Dolly Copp Campground	9.1	0.0
Great Gulf Headwall	6.6	1.9
Wamsutta	3.0	2.5
Madison Gulf-Summit	3.0	1.2
Spinx trail	2.6	0.6
Buttress	2.4	0.0
Six Husbands	1.8	0.3
Total	100.0	100.0

Trips vary in length and most use is on the central Great Gulf Trail and Appalachian Trail or trails that branch out from those main trails. The same amount of use on every acre or of every mile of the trail system is not realistic nor desirable from either a user or a manager perspective for two reasons. First, different parts of a wilderness vary in their capacity to sustain use while maintaining good solitude and environmental conditions. Second, with evenly distributed use, users who really value solitude, and are willing to hike a long way to find it, would not be satisfied.

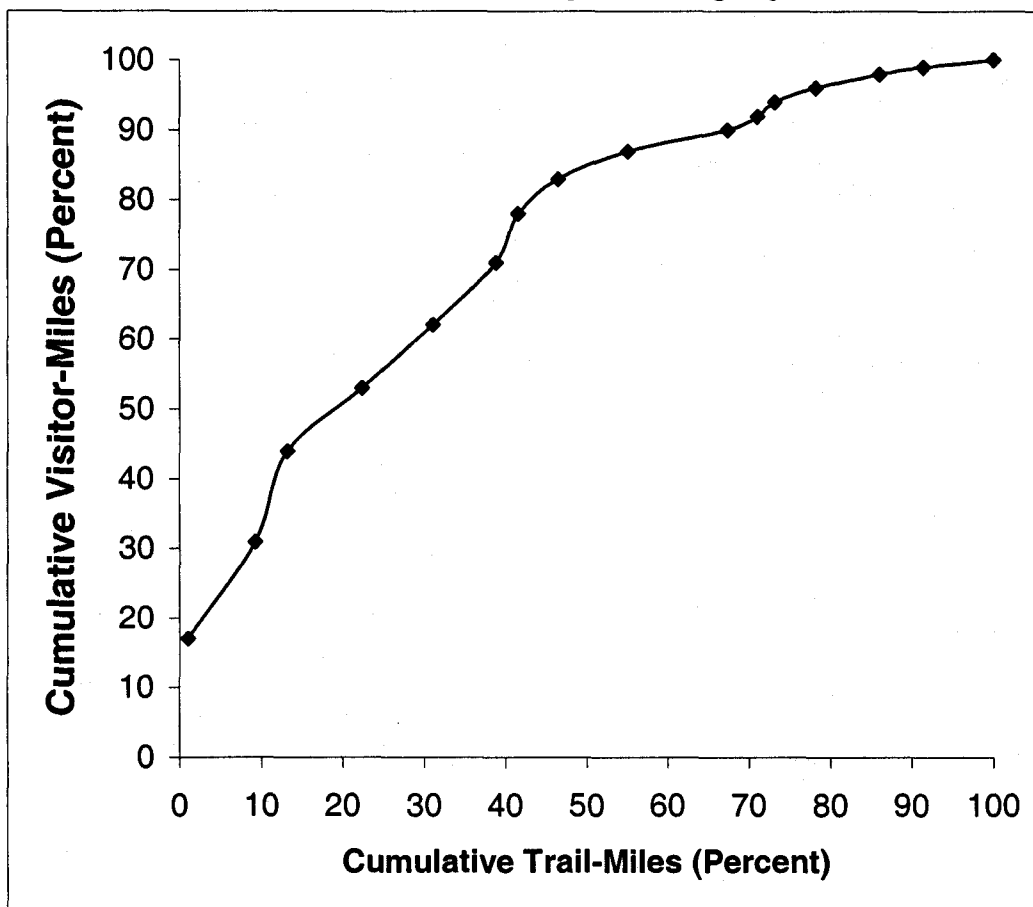
Estimates of visitor use, by themselves, provide little information regarding pressure on the resource because areas vary in size. Acreage and use figures can be expressed in terms of visitor-days per acre (about 2.4 in the Great Gulf in 1999), but such comparisons do not include adjustments for the length of use season nor the proportion of usable acreage. The 5,550 acre Great Gulf Wilderness has about 2 entry points per 1,000 acres and about 4.5 miles of trail per thousand acres. All wilderness acreage is available as a setting and space for solitude, but only a portion is used directly by visitors. The amount of land available for use in the Great Gulf is mostly affected by

steepness of slope and dense vegetation. Miles of trail per thousand acres and numbers of entry points per thousand acres may relate better to use capacity than does total wilderness area. Historically within the NWPS, the "Great Gulf Wilderness has about 60 times as many entry points per 1,000 acres and more than 8 times as dense a trail network as does the Teton Wilderness" (Hendee and others 1990).

Use distribution can vary both within and between wilderness areas of the NWPS. The 1999 use pattern in the Great Gulf Wilderness is representative of the uneven spatial distribution of use in many wilderness areas. The use data for the Great Gulf Wilderness indicates a pattern of uneven hiking use on some trail segments, particularly those associated with the Appalachian Trail and the summits of the Presidential Mountain range. The heavy concentration of use along only a few trail miles is shown in figure 3. Trail segments are ranked from the most to the least used. Total travel, in cumulative visitor-miles,

is graphed against cumulative trail miles. The percentage of total use concentrated on any proportion of the trail network can be seen in figure 3 — for example, 20 percent of the trail miles received 50 percent of all trail use in 1999 in the Great Gulf Wilderness. The trail use concentration index (from 0 to 100) measures how much of the curve is above the 45-degree diagonal, which represents an even use distribution along all trail miles. Higher index numbers mean the use is more concentrated. For example, in the Spanish Peaks, the use was relatively concentrated in 1970 (index number 53), but two larger areas reported (Lucas 1980) even more concentrated use; the Bob Marshall Wilderness had an index of 85 and the Selway-Bitterroot Wilderness had an index of 67. In 1999, the Great Gulf Wilderness had a concentrated index number of 48 (figure 3) which is moderately high for a small wilderness. This confirms the visual analysis of figure 2 which suggested that visitor use was concentrated on some trails more than others in the Great Gulf Wilderness.

Figure 3. Recreational use concentration on trails during June 2 through September 11, 1999 in the Great Gulf Wilderness.



Management Implications

The high concentrations of wilderness visitors in the Great Gulf Wilderness pose a challenge for managers. The tendency of recreation use to concentrate in time and space within the Great Gulf Wilderness provides management the opportunity to focus their efforts and resources on these locations and time periods. However, some of the alternative management approaches to

minimize impacts could be redirecting visitor use to other areas, dispersing some use within the area, limiting use on high use weekends, or rerouting the Appalachian Trail outside the Great Gulf Wilderness boundaries. The areas within the Great Gulf Wilderness probably vary in their capacity to absorb the social and environmental impacts of use and some of the most popular trails and destination locations (such as the riparian zones near streams and waterfalls) may be sensitive to physical impacts

from use and intrusions on solitude. Monitoring recreational visits over many years with trail counters and brief onsite interviews provides managers with some of the information necessary to make visitor management decisions.

The use of counters or interviews alone will provide limited information (e.g., total visits or trail segments used), but the two techniques together increase the value of the monitoring information and allow for simple comparative analyses that can be used over time or between different wilderness areas. Future use monitoring and user environmental impact research could be combined to evaluate campsite and trail condition changes within the Great Gulf Wilderness. Similarly, future use monitoring and user social impact research could be combined to evaluate solitude and user perceptions of crowding changes within the Great Gulf Wilderness.

Acknowledgements

This project was supported by the Aldo Leopold Wilderness Research Institute, a McIntire-Stennis Research Grant, the White Mountain National Forest, and the SUNY College of Environmental Science and Forestry. The cooperation of the Mount Washington Auto Road Company in providing access is acknowledged. The encouragement and support of Alan Watson from the Aldo Leopold Wilderness Research Institute is especially appreciated.

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