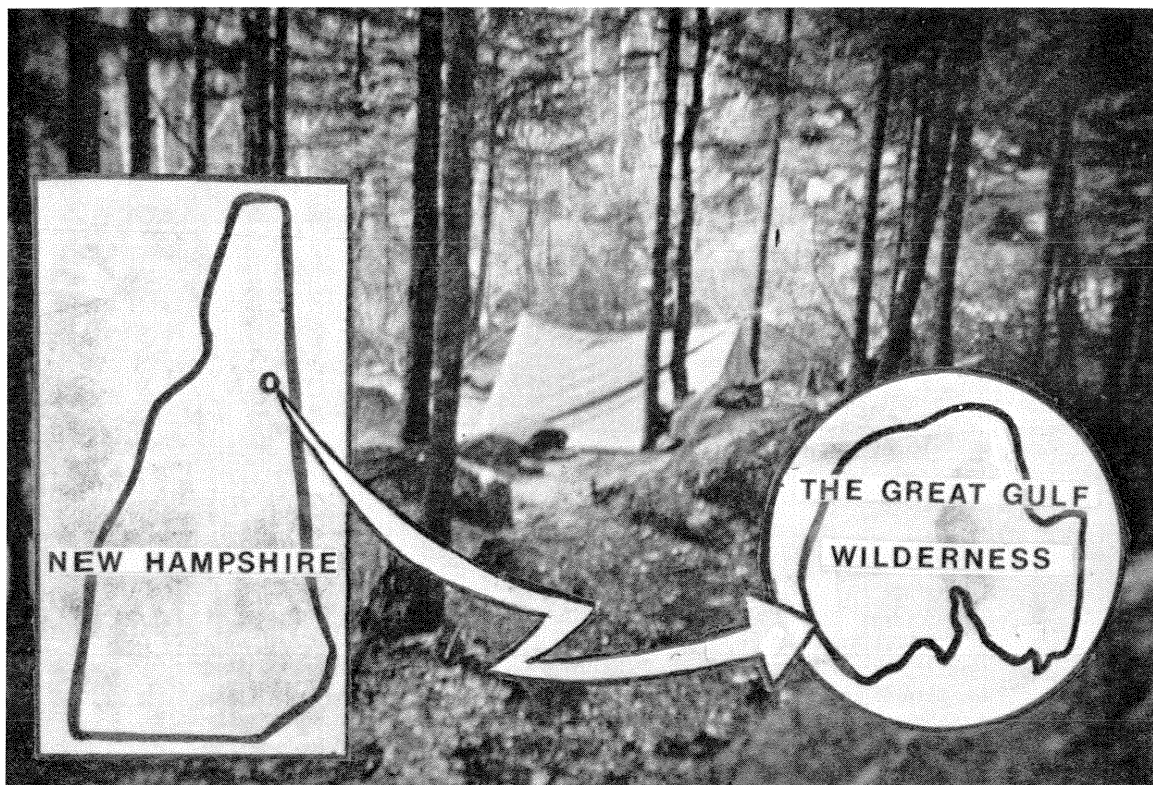


by R. E. Leonard, H. E. Echelberger, and M. Schnitzer

USE CHARACTERISTICS OF THE GREAT GULF WILDERNESS



FOREST SERVICE RESEARCH PAPER NE-428

1978

FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE
NORTHEASTERN FOREST EXPERIMENT STATION
370 REED ROAD, BROOMALL, PA. 19008

The Authors

R. E. LEONARD is Project Leader with the Northeastern Forest Experiment Station's Backcountry Research Project at Durham, N.H.

H. E. ECHELBERGER is a Research Forester with the Northeastern Forest Experiment Station's Backcountry Research Project.

M. SCHNITZER, at the time the field work was conducted, was a forestry aide in the Backcountry Project.

MANUSCRIPT RECEIVED FOR PUBLICATION 6 JUNE 1978

Abstract

Three use characteristics were studied in the Great Gulf Wilderness of the White Mountain National Forest in 1976: (1) use quantity; (2) use distribution; (3) overnight use patterns. Pressure-plate counters, in conjunction with use permits and site observations, were used to acquire data. Approximately 4,000 people visited this area during the 56-day study period; 75 percent were day users and 25 percent were overnight users. Trail use ranged from 50 hikers per day to negligible use. Overnight users tended to concentrate in the upper portion of the Great Gulf. Actual overnight use was significantly lower than permitted use. On some nights, more than half of the users who obtained overnight permits did not use them.

THE PROBLEM

TWO IMPORTANT FACTORS that affect management of dispersed recreation areas are patterns of current and expected use of an area. This information is especially critical in management planning for wilderness areas in the East where current user densities are high and well-established use patterns are dominant.

In general, use volume alone does not provide sufficient information to develop effective management strategies. A knowledge of use patterns and user behavior is necessary to relate current use to management goals.

For example, Lime and Buchman (1974) described how summaries of use patterns and user behavior can help determine if, where, and when regulation of visitors is needed. The wilderness permit is one tool that they and others (Hendee and Lucas 1973; Lime and Lorence 1974; Fazio and Gilbert 1974) advocated. The information available from permits can be helpful in planning work schedules, selecting locations for public meetings, distributing news releases, and conducting search and rescue operations.

Three major use characteristics needed to develop management strategies are: (1) use quantity, including the number of day and overnight users; (2) use distribution, including average trail use, use by day of week, and popular hiking routes; and (3) overnight use patterns, including user preferences and frequency of overnight use at specific sites.

Wilderness permits would provide this information if all visitors who enter an area obtained a permit. In most cases, a high proportion of visitors do obtain permits before entering a wilderness area. However, in areas where permits have not previously been required, compliance rates may not be high. Godin and Leonard (1977) reported that the compliance rate for one trail in the Presidential Range-Dry River Wilderness was only 55

percent. Also, the validation of trip itineraries, which are written on wilderness permits, is not well documented in the East.

The purpose of this paper is to describe use characteristics for the Great Gulf Wilderness Area of the White Mountain National Forest of New Hampshire and to discuss methods used in acquiring information. The "visitor-day" nomenclature used in Forest Service Recreation Information Management (RIM) calculations was not used in this study. All data in this paper represent actual visits.

THE STUDY AREA

The Great Gulf Wilderness Area in the White Mountain National Forest is a 5,500-acre tract bounded on the south by the Mt. Washington auto road, on the west and north by the northern Presidential Range (Mts. Washington, Clay, Jefferson, Adams, and Madison), and on the east by the Osgood Ridge (Fig. 1). The area, located on the edge of the popular Presidential Range, is a traditional access point for day hikers visiting the summit of Mt. Washington. It is also often used as a starting point for longer backpack trips.

The Wilderness Area includes 10 access points and a total of 18 miles of trail. One major trail follows the valley bottom of the Great Gulf and seven branch trails ascend steeply to the ridges on either side.

Visitor use permits have been required in the Great Gulf since the summer of 1975. Day use is unlimited and permits are available at many nearby locations. Overnight use is limited to 60 persons per night and permits are issued at only two locations.

Dispersed camping is encouraged in this area to promote a sense of solitude for the camper and to help correct resource damage. Camping is prohibited within 200 feet of trails and streams, except at a few designated sites. Wilderness patrolmen

hike the trails to provide information and assistance to visitors, and to ensure that overnight users are camped legally.

VARIABLES STUDIED

Quantification of use

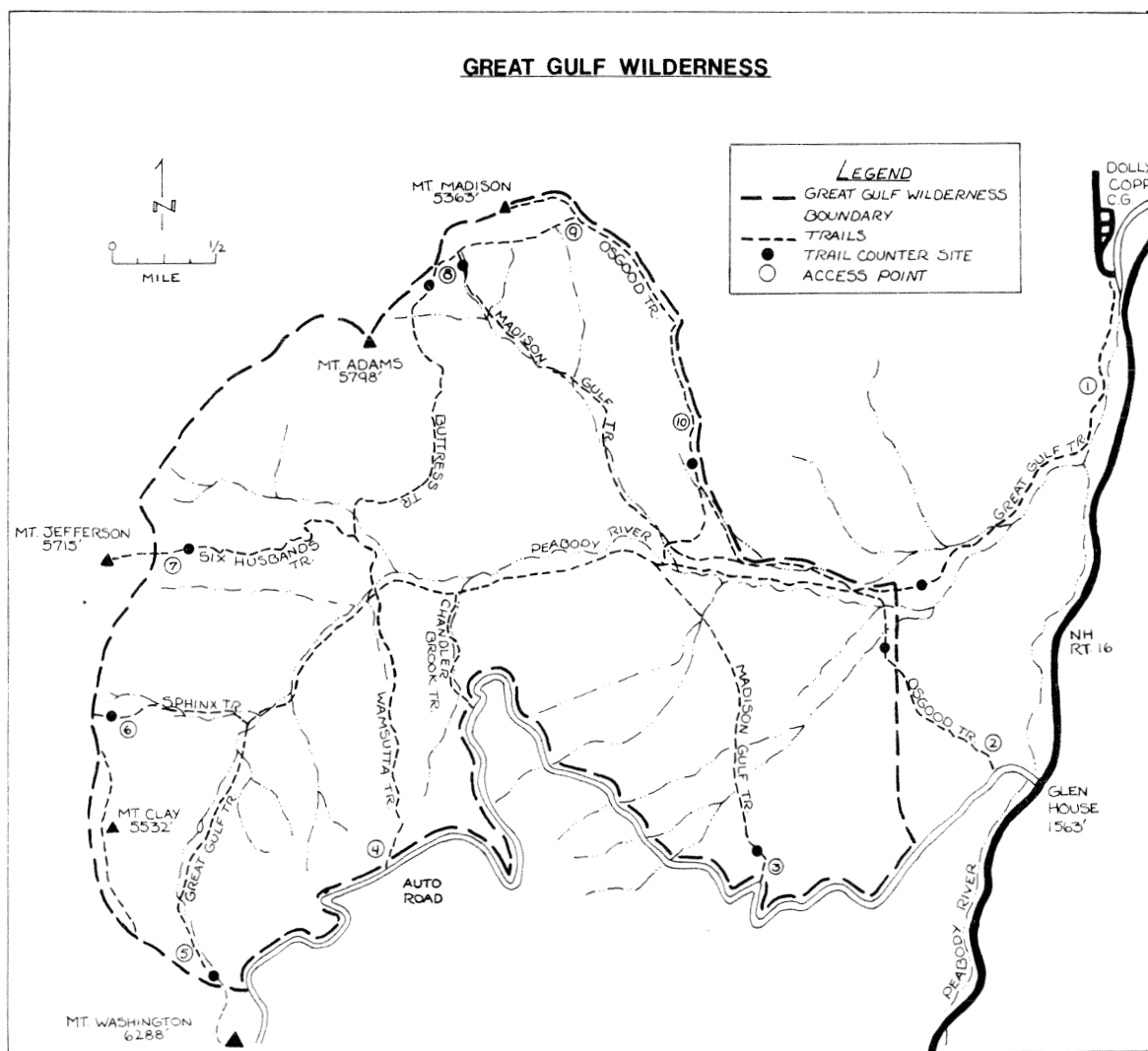
Three methods were used to estimate the number of day and overnight users in the Great Gulf; pressure-plate trail counters, mandatory use permits, and field observation.

Pressure-plate trail counters were installed at eight trail access points in the Great Gulf; two ac-

cess points where use was negligible were omitted. Each counter consisted of a pressure switch buried a few inches deep in a narrow section of the trail. The switch was connected to a battery and digital counting mechanism concealed in a waterproof container nearby. Each counter was checked twice a week.

Data from wilderness use permits included group size, date of entrance and exit, and entrance and exit points. Field observations were made periodically by personnel stationed at each trail-head; they recorded the permit numbers and the size and direction of each hiking party. Data from all methods were then compared.

Figure 1.—The Great Gulf Wilderness.



[illegible]

The primary source of user travel information was the wilderness permit. Use type and entrance and exit data were used to generate frequencies of day and overnight trail use. Popular itineraries were identified by origin and destination.

The objective of this portion of the study was to determine the extent and nature of overnight use. On 15 selected nights, patrolmen recorded permit number, site location, type of use, and group size of campers at 20 sites along the Great Gulf Trail (Fig.2). Although truly dispersed use could not be

Site use frequencies

Schematic maps showing the location of the 20 established sites were prepared for field use by researchers and backcountry patrolmen. Schedules were arranged to facilitate data collection on two to three evenings a week. Permit number, group size, and use types were used to generate average

use frequencies, average group size, compliance rates, and number of groups camped at specific sites. Data on average length of stay, and zip code information were obtained from use permits. Computer analysis yielded aggregate statistics, as well as the relation of group size and zip code origin to use type.

RESULTS

Area use

Total use was determined for the period July 3 through August 27, 1976 (Table 1). The trail counters recorded 7,677 entrances and exits, or 3,838 visitors; the permits show 5,956 entrances and exits, or 2,978 visitors. This difference of 1,721 entrances and exits, 22 percent of the counter total, can be attributed to counter inaccuracy, permit inaccuracy (noncompliance), or both.

The accuracy of individual counters was monitored frequently by observers throughout the summer. In every case, the counter use figure was within 10 percent of the observed value, and

frequently within 5 percent. These figures are substantially lower than the 22 percent difference between counter and permit use estimates

Permit error, or noncompliance, is more difficult to measure (Godin and Leonard 1977). However, using the counter figures as a standard, the average permit compliance was 78 percent. This average varied considerably for the 12 intervals observed (Table 1), suggesting that permit data may not accurately reflect actual fluctuations in use. Thus, the permit data may be more useful in providing other kinds of information.

Field observations show the compliance rate for use permits is "apparent" rather than "actual." In the Great Gulf, observers found that many hikers who obtained permits never used them. Most of these users seemed to be overnight visitors who camped outside the wilderness, or who cancelled their trips. Thus, "actual" compliance, those who did use the wilderness and who did have permits, was approximately 65 percent of the total use, substantially lower than the "apparent" value.

Also, the use of adjustment multipliers to compensate for noncompliance can result in inflated figures because these multipliers are predicated on the assumption of 100 percent permit use, an assumption which appears questionable in view of this research.

In summary, there were about 4,000 visitors to the Great Gulf Wilderness Area from July 3 through August 27. Day users accounted for 70 percent to 75 percent of this total; the day users' compliance rate was about 60 percent and overnight compliance was 80 to 90 percent. Trail counters coupled with observational validation provided the best use estimates.

Table 1.—Visitor use and permit compliance in the Great Gulf Wilderness during the summer of 1976, by time interval

Time interval	Entrances and exits		Permit compliance
	Counter recorded	Permit recorded	
	-- Number --		Percent
7/3-7/6	700	500	71
7/7-7/9	420	228	54
7/10-7/13	582	345	59
7/14-7/16	464	485	104 ^a
7/17-7/21	672	521	77
7/22-7/23	220	174	79
7/24-7/27	497	317	64
7/28-7/30	475	311	65
7/31-8/6	548	447	81
8/7-8/13	548	454	83
8/14-8/20	957	1,027	107 ^a
8/21-8/27	1,594	1,147	72
Total	7,677	5,956	78

^a Compliance rates exceeding 100 percent result from issued permits that were not used, counter error, and permits issued with the wrong date.

Travel patterns

Travel statistics useful to managers include: average trail use, area use by day of the week, and popular hiking routes. Counter data and permit data were useful in assessing average trail use; permit data was the only source of information for assessing the other travel statistics.

Trail use. Counter and permit figures for average trail use differ considerably (Table 2). For example, access point 8 has an average daily use of 23 and ranks third according to counter data; however, access point 8 has an average daily use of 14 and ranks sixth according to permit data. We

Table 2.—Comparison of trail counter and permit data, Great Gulf Wilderness, summer 1976.

Trail	Access No.	Counter data		Permit data	
		Hikers/day	Rank	Hikers/day	Rank
Great Gulf	1	17.2	5	20.5	2
Osgood	2	48.8	1	27.7	1
Madison Gulf	3	22.6	4	16.9	5
Great Gulf	5	7.2	8	19.0	3
Sphinx	6	10.2	6	3.4	8
Six Husbands	7	8.0	7	6.5	7
Buttress	8	22.9	3	13.8	6
Osgood	10	29.1	2	17.2	4

feel that the figures derived from permit data are less reliable than those from counter data because noncompliers are not reflected in permit data, and information from patrolmen indicated that approximately one-third of the groups in the Gulf did not enter or exit at the point indicated on their permit.

From the counter use data, four levels of trail use can be identified. Access point 2, the lower end of the Osgood Trail, had very high use—approximately 50 hikers per day. Access point 10, the upper end of the Osgood Trail, had the next highest use, about 30 hikers per day. Access points 1, 3 and 8, the lower end of the Great Gulf Trail, and the lower and upper ends of the Madison Gulf Trail, respectively, each had about 20 hikers per day. The remaining access points averaged 10 or less hikers per day.

Figure 1 shows that access points 1, 2, and 3 are in the valley while points 8 and 10 are in the Northern Presidentials. This information suggests substantial day traffic along the floor of the Gulf, but that traffic to the ridge along the Wamsutta, Great Gulf Headwall, Sphinx, and Six Husbands Trails is minimal.

Use by day of the week. Permit data can be used to assess daily travel frequencies. Although actual use figures are inaccurate, these data are probably a reasonable estimate. Table 3 shows the proportion of day, overnight, and total use for entrances and exits, respectively, based on permit data. Entrances and exits for day and overnight use were fairly evenly distributed through the week. Overnight use showed small weekend peaks, Saturday for entrance and Sunday for exit. Daily entrances and exits ranged from 11.6 percent to 18.4 percent of the weekly total, a net range of 6.8. Thus, while

Table 3.—Proportion of trip beginnings and endings for day and overnight visitors, by day of the week^a

Day	Visitor use		Total
	Day	Overnight	
-----Percent-----			
<i>Sunday</i>			
Entrances	16.5	12.1	14.6
Exits	16.3	19.9	17.9
<i>Monday</i>			
Entrances	11.4	11.9	11.6
Exits	11.2	13.5	12.2
<i>Tuesday</i>			
Entrances	14.3	14.6	14.4
Exits	14.4	10.9	12.9
<i>Wednesday</i>			
Entrances	11.7	15.2	13.2
Exits	11.6	11.5	11.7
<i>Thursday</i>			
Entrances	13.2	12.9	13.1
Exits	13.3	16.6	14.6
<i>Friday</i>			
Entrances	15.4	13.8	14.7
Exits	15.5	14.0	14.8
<i>Saturday</i>			
Entrances	17.5	19.6	18.4
Exits	17.7	13.7	15.9

^a Based on permit data.

small weekend peaks can be identified, entrances and exits during the peak season were quite uniform from day to day.

Popular hiking routes. Although noncompliance and changes in visitor itineraries affect the reliability of route frequency data, this information still may be valuable as a rough indication of day and overnight hiking patterns. On the basis of

Table 4.—Popular hiking routes of day and overnight campers in the Great Gulf Wilderness Area, by entrance and exit and percent of total use^a

Day users			Overnight users		
Travel route		Percent of total day use	Travel route		Percent of total overnight use
Entrance	Exit		Entrance	Exit	
10	3	12.6	2	2	14.7
8	3	7.1	1	1	11.6
3	8	6.7	1	5	6.3
3	3	6.6	5	3	6.2
1	1	5.5	3	5	5.0
10	2	4.7	5	5	4.9
3	10	4.6	2	5	4.9
2	2	3.9	5	1	3.5
8	2	3.3	5	2	3.0
2	5	2.3	10	5	2.8
2	10	2.3	10	1	2.7
5	1	2.3	3	3	2.6
5	2	2.3			

^a Based on permit data.

use permits, Table 4 shows the popular itineraries planned for day and overnight users. Of the most popular day routes, eight were “through trips” from valley to ridge or vice versa, and five were “loop” trips. Most of this information is consistent with counter data; however three of these top routes included access point 5, the top of the Great Gulf Headwall on Mt. Washington. Counter data in Table 2 suggest that while people may originally have intended to follow that route, their plans somehow changed.

Of the top overnight routes, eight routes either began or ended at point 5. This figure also seems unreasonable in view of counter data and may have resulted either from changed itineraries or from the observed high percentage of overnight no-shows.

At first glance it seems that the Great Gulf may be a conduit to the Presidential Range; however, this is not the case. Only 42 percent of the day users and less than 10 percent of the overnight users planned to travel routes that provided quick access to or from the Presidential Range:

The remaining routes were loops beginning and ending at the same point or on the same side of the Wilderness Area. For most visitors, the Great Gulf is probably more often considered a destination in itself.

Overnight use characterization

A total of 45 percent of the permitted overnight use was observed at the 20 known trailside sites along the Great Gulf Trail. The standard deviation was 15 percent.

A number of factors must be evaluated before this figure can be used. First, the effect of non-compliers on the observed population must be assessed. For the 15 nights surveyed, compliance was 96 percent, so noncompliance had a very small effect. If the data are adjusted to reflect only overnight compliers, 43 percent of the permitted use was observed.

Second, it was not possible to monitor all 20 trailside sites on a given night.

Third, observational data suggest that many overnight use permits were never used; actual

Route (Entrance-exit)

Use Permit	2-8	2-10	3-8	3-10	8-2	8-3	10-2	10-3	Total
	Percent								
Day	1.2	2.3	6.7	4.6	3.3	7.1	4.7	12.6	42.5
Overnight	1.2	0.6	0.8	1.3	0.5	0.8	0.4	0.6	6.2

overnight use was as low as 50 percent of the permitted overnight use for some nights. That actual overnight use is lower than permitted overnight use means that the trailside component of this reduced use figure is greater than 45 percent.

From the theoretical perspective, then, up to 55 percent of the overnight use in the Great Gulf may be truly dispersed. Practically, however, given that actual overnight use is less than permitted overnight use, the truly dispersed component of the actual use is probably much lower, perhaps as low as 30 percent.

Overnight use dispersal in the Great Gulf was a new management policy in 1976; hence, this large trailside component is not surprising. It is reasonable to expect that a transition to dispersed use will take some time to achieve. As users become more familiar with the new management scheme, and user education efforts intensify, the dispersed component of overnight use in the Great Gulf will probably increase.

Site use frequencies

The 20 sites were split into two groups (Fig. 2). Sites 1 through 11, which comprised Group A, are the most easily reached from the road. Sites 12 through 20 (Group B) are more remote. Within each group, several sites accounted for most of the use:

Site	Occupancy rate Percent	Groups per Group occupied night - - - -Number-	Group Size	People per night
<i>Group A</i>				
1, 3, 4, 5	28	4.8	3.1	4.2
<i>Group B</i>				
14, 17, 19, 20	53	6.1	3.0	9.7

Overnight use in the upper Gulf (Group B) was significantly greater than use in the lower Gulf (Group A). The four sites in the upper Gulf averaged about 10 people per night, while those in the lower Gulf averaged only four people each night.

In the upper Gulf, Site 14, at the junction of the Great Gulf and Six Husbands Trails, was occupied on 92 percent of the surveyed nights, and averaged more than two groups each night. Site 19, at the junction of the Great Gulf and Sphinx Trails, was also heavily used. Only one site in the lower Gulf approached the use levels of sites in the upper

Gulf—Site 4, near the Old Bluff Shelter Site. When the Gulf is viewed as a whole, though, it appears that overnight use concentrates principally in eight specific sites.

Overnight permit compliance was higher in the upper Gulf than in the lower Gulf. Compliance averaged 95 percent at Group B sites, 77 percent at Group A sites, and 84 percent throughout the Gulf.

Descriptive factors

The average group size was 3.03 for day use and 2.96 for overnight use. Over half the visitors traveled in groups of two or less. Beyond this equivalence in group size, the shapes of the respective group size distribution curves are also similar. For day and overnight use alike, 70 percent of the groups had six members or less, and 95 percent of the groups had eight members or less.

The average length of stay for overnight users was approximately two (1.99) nights per group. Overnight use in the Great Gulf is limited to a maximum of four nights, but the preponderance of one-, two- and three-night visits indicates that this regulation is not overly restrictive.

Finally, zip codes on permits indicated that Eastern Massachusetts accounted for 24.9 percent of the day use and 21 percent of the overnight use (Table 5). New Hampshire, Connecticut, and New York each accounted for approximately 10 percent of both day and overnight use.

Table 5.—Origins of Great Gulf Wilderness users.

Region	Percent of day use	Percent of overnight use
Eastern Massachusetts	24.9	21.0
New Hampshire	14.9	11.9
Connecticut	10.7	11.1
New York	8.5	11.0
New Jersey	6.3	5.9
Canada	5.6	5.9
Western Massachusetts	4.6	5.0
Pennsylvania	4.1	5.9
Maine	3.6	3.7
Rhode Island	2.6	1.5
Vermont	1.6	2.7
Other	12.7	14.3

There is additional evidence that most people who seek a wilderness experience in the East do so in small groups (two to three people), that their trips are of short duration (over half are day users and most overnight users spend only one to three nights), and that travel from residence to destination is not lengthy—usually about a half day or less (Echelberger and Moeller 1977).

Furthermore, these characteristics are similar to those for people who seek a wilderness experience in the West. Hendee et al. (1968) found that wilderness trips in the Pacific Northwest lasted for about 2.3 days, though length of stay probably varied by size and accessibility of areas. While sampling users of randomly selected wilderness areas in California, Vaux (1975) found that 96 percent lived less than a day's drive from where they were interviewed.

SUMMARY

A comprehensive use inventory to monitor key facets of backcountry use can be generated using existing or easily developed techniques. Trail counter data coupled with those from observations provided good use estimates. Permit estimates suffer from the effects of noncompliance and trip cancellations (predominantly overnight), but provide other information not available from counter and observations.

Although use permits were used extensively in this analysis, use can be characterized by other techniques. In fact, this study demonstrates that trail counters can provide better use estimates than wilderness permits. In either case, observations are necessary to verify the accuracy of the data.

Area use

- There were approximately 4,000 visitors to the Great Gulf during the study period. About one-quarter were overnight visitors.

- Actual permit compliance was 60 percent for day use, 85 percent for overnight use, and 65 percent overall.

Travel patterns

- Trail use ranged from 50 hikers per day to negligible daily use.
- Hiker travel was fairly evenly distributed throughout the week.
- The most popular hiking itineraries involved “loop” trips along the Gulf floor or “through” trips to the northern peaks. Comparison of permit and counter data indicated that actual hiking patterns differed significantly from planned itineraries.

Overnight use patterns

- An average of 45 percent of the permitted overnight use was observed in the trailside sites. Observational data suggest that actual overnight use was substantially lower than permitted use due to a large number of visitors who did not stay in the Great Gulf overnight, that 70 percent to 100 percent of the actual overnight use may have been concentrating along the trails, and that the “dispersed” component of overnight use was relatively small.
- Most of the overnight use was in the upper Gulf, where four sites were popular. Overnight users in general had a high permit compliance rate and tended to camp in 8 to 10 popular sites.

Other factors

- Average group size was approximately three people; 95 percent of all groups had eight members or less.
- About 60 percent of the Great Gulf users live in New England. The largest percentage came from Eastern Massachusetts, followed by New Hampshire, Connecticut, and New York.
- The average length of stay for overnight users was two nights.

LITERATURE CITED

- Echelberger, H. E., and G. H. Moeller.
1977. **Use and users of the Cranberry Backcountry in West Virginia: Insights for eastern backcountry management.** U. S. Dep. Agric. For. Serv. Res. Pap. NE-363. 8 p.
- Fazio, J. R., and D. L. Gilbert.
1974. **Mandatory wilderness permits: Some indications of success.** J. For. 72:753-755.
- Godin, Victor, and Raymond Leonard.
1977. **Permit compliance in eastern wilderness: Preliminary results.** U. S. Dep. Agric. For. Serv. Res. Note NE-238. 3 p.
- Hendee, J. C., W. R. Catton, Jr., L. D. Marlow, and C. F. Brockman.
1968. **Wilderness users in the Pacific Northwest—their characteristics, values, and management preferences.** U. S. Dep. Agric. For. Serv. Res. Pap. PNW-61. 92 p.
- Hendee, J. C., and R. C. Lucas.
1973. **Mandatory wilderness permits: A necessary management tool.** J. For. 71(4):206-209.
- Lime, D. W., and R. G. Buchman.
1974. **Putting wilderness permit information to work.** J. For. 72:622-626.
- Lime, D. W., and G. A. Lorence.
1974. **Improving estimates of wilderness use from mandatory travel permits.** U. S. Dep. Agric. For. Serv. Res. Pap. NC-101.
- Vaux, H. J., Jr.
1975. **The distribution of income among wilderness users.** J. Leisure Res. 7(1):29-37.

Headquarters of the Northeastern Forest Experiment Station are in Broomall, Pa. Field laboratories and research units are maintained at:

- Beltsville, Maryland.
 - Berea, Kentucky, in cooperation with Berea College.
 - Burlington, Vermont, in cooperation with the University of Vermont.
 - Delaware, Ohio.
 - Durham, New Hampshire, in cooperation with the University of New Hampshire.
 - Hamden, Connecticut, in cooperation with Yale University.
 - Kingston, Pennsylvania.
 - Morgantown, West Virginia, in cooperation with West Virginia University, Morgantown.
 - Orono, Maine, in cooperation with the University of Maine, Orono.
 - Parsons, West Virginia.
 - Princeton, West Virginia.
 - Syracuse, New York, in cooperation with the State University of New York College of Environmental Sciences and Forestry at Syracuse University, Syracuse.
 - University Park, Pennsylvania.
 - Warren, Pennsylvania.
-