habitat and diminish atmospheric carbon dioxide (Spurr and Barnes, 1980). There are additional positive externalities provided by rapid replanting of temperate zone forests, including increased water quality from diminished sediment loads in runoff (Spurr and Barnes, 1980; Donahue *et al.*, 1983; Ribaudo, 1989).

Increased water quality in streams and rivers from diminished sediment loads can sharply increase the quality of aquatic habitat, particularly for salmonids and other anadromous species (Ribaudo, 1989). The increased aquatic habitat can provide increased sportfishing opportunities, non-market benefits from aquatic habitat (Loomis *et al.*, 1990) and commercial fish harvests that generate billions of dollars per annum in social benefits (Ribaudo, 1989). Increased tourism from angling trips can increase regional employment levels (Reisner, 1988, 1990; Cordell *et al.*, 1990). Hence, protecting jobs and the environment are compatible goals for agents who place a high social value on the marginal product of certain renewable natural resources.

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Use Patterns and Solitude Preferences of Shelter Campers in Great Smoky Mountains National Park, U.S.A.

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Visitor use management in wildland recreation areas depends on visitor use and preference information about various types of users. This study reports on the user characteristics, use patterns and encounter preferences of backcountry shelter campers, a type of user little studied in the past. In 1987, 252 backpackers to shelters in Great Smoky Mountains National Park (GSMNP) were surveyed on-site and by a mail questionnaire. Only one person per party was sampled, resulting in a final response rate of 73%. Results indicated the "typical" shelter user averaged 33 years of age, was college educated ($\bar{X}=15{\cdot}6$ years of education) and came from urban areas of nearby states. Eighty-four per cent had previous backpacking experience, averaging 6·8 total years of experience. Most backpackers (59%) took three or fewer trips per year ($\bar{X}=3{\cdot}9$ trips/year). Backpacking experience restricted to only GSMNP showed 65% repeat users, averaging 5·4 years of previous use and 3·1 trips per year in the study area. Trips in the study area consisted of 3-day hikes ($\bar{X}=3{\cdot}2$ days), with 94% of users backpacking less than 5 days. Distance hiked ranged from 3 to 80 miles ($\bar{X}=24$ miles), and 73% of the parties contained 2–4 individuals. Encounter levels were highest on trails ($\bar{X}=10{\cdot}2$ parties/trip), with shelter encounters ($\bar{X}=2{\cdot}7$ parties/trip) being less. A third of users reported that they felt the number of encounters detracted from their solitude experience. Results are discussed and compared with similar data reported for backcountry areas in the south-east and western U.S.

Keywords: wilderness, wildland recreation, use characteristics, behavior, shelter users.

1. Introduction

Wilderness areas are to provide "outstanding opportunities for solitude or a primitive and unconfined type of recreation", according to the Wilderness Act (PL 88-577).

Managing wilderness and other roadless areas for these benefits requires a knowledge of wildland recreation users, their use patterns and interactions with other users in the field. "Understanding wilderness use and users is essential for effective wilderness management, most of which is management of recreational use" (Roggenbuck and Lucas, 1987). Management of wildland recreational use translates, for the most part, into management of visitor use.

While visitor use management is an essential element of effective wilderness management, the field of wilderness management still suffers from the lack of information on visitor use and encounters for many areas (Lucas, 1985; Roggenbuck and Lucas, 1987). Compared to most types of outdoor recreationists, wilderness visitors are more widely dispersed, use relatively remote areas and have more limited observations and contacts with researchers and managers. Furthermore, the wilderness solitude experience is complex and subtle. For example, what levels of visitor encounters do users experience and what effect do they have on visitor evaluations of level of solitude?

Information on visitor use and use patterns is particularly lacking for the Southern Appalachian Mountain Region of the U.S. Past studies have been concentrated in the Northern Rockies, the Pacific North-west and Northern Minnesota (Roggenbuck and Lucas, 1987). However, recent congressional designation of new wilderness areas in the Southern Appalachian Region has greatly increased the need for visitor management information in the region. As of 1989, 42 areas in the National Wilderness Preservation System existed in the five Appalachian states of West Virginia, Virginia, North Carolina, Tennessee and northern Georgia (The Wilderness Society, 1989). The majority of the areas have been in the System only since 1984. Many of these areas receive considerable overnight use, since they are within a day's drive of over one-half of the U.S. population. In addition to the officially designated wilderness areas, other roadless recreation areas in the region, such as the Great Smoky Mountains National Park, also receive heavy backcountry overnight use.

While the number of both wilderness areas and users have increased in the Southern Appalachian Mountain Region during the last decade, a wilderness use and user characteristics "State-of-Knowledge Review" in 1987 showed only six study areas appear in the published literature (Roggenbuck and Lucas, 1987). Murray (1974) conducted one of the first studies, researching the characteristics and management preferences of Appalachian Trial users in Southern National Forests. In 1977, Echelberger and Moeller reported on the use and users of the Cranberry Backcountry in West Virginia. Roggenbuck and colleagues have surveyed visitor use and perceptions of recreational carrying capacity in the Shining Rock, Linville Gorge and Joyce Kilmer–Slickrock Wildernesses of North Carolina (Roggenbuck *et al.*, 1982). The backcountry users of Great Smoky Mountains National Park (GSMNP) have been studies from the perspectives of winter backcountry use (Hammitt and Hughes, 1984), and user perception of backcountry management policies (Burde and Curran, 1985).

The purpose of this paper is to supplement the scanty information base concerning user characteristics and use patterns in Southern Appalachian roadless recreation areas. Specifically, the paper reports on backcountry overnight campers to shelters in GSMNP, their encounters with other users and the influence of encounters on the wilderness solitude experience and its management.

2. Methods

2.1. STUDY AREA

The 500 000-acre Great Smoky Mountains National Park, located in the center of the Southern Appalachian Region, was the study area. It is one of the most heavily used wildland recreation areas in the U.S. Although it is not currently in the National Wilderness Preservation System, congressional designation is pending, and 90% of the 500 000 acres is managed as roadless backcountry. Eighty-two undeveloped campsites and 18 three-sided shelters are available for backcountry camping. Each shelter can accommodate 10–14 campers.

2.2. SAMPLING PROCEDURE

On-site contact card and mail-questionnaire procedures were used to sample backcountry overnight users. Only one respondent, 16 years of age or older, was surveyed per party of users. Sampling was focused primarily at shelters and on trails leading to shelters. Thus, only 3·8% of respondents used non-shelter campsites. Both weekend and weekdays were sampled, but weekend use was heavier and thus led to more weekend use respondents. We do not pretend that our sample was a random selection of shelter users. A total of 252 backpackers were sampled on-site from July to September, 1987.

When contacted, backpackers were asked to complete a one-page contact card. Later, they were sent a nine-page mail-back, postage-paid questionnaire. An initial mailing and three follow-up reminder procedure (Dillman, 1978) resulted in a final response rate of 73%.

2.3. DATA COLLECTION AND ANALYSIS

The mail questionnaire contained variables concerning visitor characteristics, past use experiences, trip characteristics and number of user encounters. Visitor characteristics examined included age, gender, education level, occupation, total household income and residence. Past experiences data were collected at two levels, overall backpacking experience and backpacking experience specific to the Great Smoky Mountains National Park. Trip characteristic variables measured were group composition, hiking party size, length of trip, preferred season of use, preference for weekend or weekday trips and distance typically hiked before setting up camp for the first night's stay. Items concerning respondent encounters with other visitors in the backcountry concentrated on respondent recall of total visual encounters, and visual encounters at trail versus campside locations. Respondents were also asked about their expectations and preferences for the number and size of parties encountered. Finally, respondents were asked to rate how number and size of parties encountered affected the wildland recreation experience. Data analysis consisted of descriptive measures of use and comparisons for selected variables using cross tabulations and chi-square tests.

3. Results

3.1. VISITOR CHARACTERISTICS

3.1.1. *Socio–economic profile*

The idea that roadless recreation areas are largely inaccessible to older people and serve only as playgrounds for the young (under 20 years age group) is commonly mentioned

(Lucas, 1980). The average age of our respondents was 33 years, with a range of 16 to 64 years. The most prevalent age group (19%) was 36–40 years. Eighty-three per cent of the backcountry users were male (Table 1).

Higher educational levels are the most distinguishing socio–economic characteristics of wilderness recreationists, as compared to the general U.S. population. Backcountry users of GSMNP averaged 15·6 years of education. Eight out of every 10 users (84%) had attended college, and nearly a third had pursued graduate school. Other studies of wilderness users typically show that the proportion of visitors going beyond a baccalaureate college education is greater than the proportion of the United States population that goes beyond high school (Lucas, 1980).

Occupation, but not necessarily income, is closely associated with the high education level of respondents. One-half of the visitors were classified as professionals, meaning that a college degree was probably necessary for their work. Another 20·1% were students still pursuing an education. Only 12% of respondents had blue-collar occupations. Income level demonstrated a bimodal distribution typical of the professional–student dominance among shelter users. Approximately 22% of them had a total household income of $50 000–$79 000, while 19·3% had an income less than $20 000.

3.1.2. *Residence*

Although the GSMNP is the most heavily used of the U.S. major national parks and is commonly considered a "national" resource, it functions predominately as a "regional" resource with respect to backcountry overnight use. While backpackers in our study came from 18 states, 65% of them came from the following regional states: Tennessee (29%), Florida (14%), North Carolina (13%) and Georgia (9%). Most of the backpackers are urbanites, with 46·2% living in large metropolitan areas of more than 100 000 residents and another 31% living in smaller cities of 10 000–100 000 residents.

3.1.3. *Past experience level*

Previous participation in backpacking can influence the type and amount of information individuals have about the activity and the environment where it occurs. It can influence the frame of reference used in determining future use patterns and in evaluating quality of recreational experiences (Schreyer, 1982; Hammitt and McDonald, 1983).

Eighty-four per cent of the users had previous backpacking experience. They averaged 6·8 total years of experience (Table 1). Most backpackers (59%) took three or fewer trips per year and only 5% took more than 10 trips annually ($\bar{X} = 3{\cdot}9$ trips/year). Backpacking experience restricted to the GSMNP showed 65% of respondents repeat users. They averaged 5·4 years of previous use and 3·1 trips per year in the study area (Table 1).

3.2. TRIP CHARACTERISTICS AND USE PATTERNS

3.2.1. *Party composition and size*

Although privacy was an important aspect of the backpacking experience for our respondents, only about 5% hiked alone. Most users apparently prefer to experience the privacy of wilderness through the intimacies of a small group of close friends (Hammitt, 1982). Friends were the most common companions on backpacking trips in GSMNP

TABLE 1. Characteristics and backcountry camping experience of shelter users, Great Smoky Mountains National Park (GSMNP), 1987

Age (mean)	33·3 years
Sex	
Male	83·2%
Female	16·8%
Education (mean)	15·6 years
Post high school	84·0%
Occupation	
Professional	49·6%
Students	20·1%
Managerial/clerical	14·1%
Service workers	6·0%
Other	10·2%
Backpacking experience (general)	
Total years (mean)	6·8 years
Trips/year (mean)	3·9 trips/year
Backpacking experience in GSMNP	
Total years (mean)	5·4 years
Trips/year (mean)	3·1 trips/year

(50%), followed by parties of family and friends (21·7%), and family (10·9%) (Table 2). Nearly three-quarters (73%) of respondents hiked in small parties of 2–4 individuals.

3.2.2. *Length of stay*

Trip duration averaged 3·2 days (2·2 nights), with 94% of users staying less than 5 days. No one stayed over 10 days. The idea that wilderness can only be visited by people with large amounts of free time because visits in remote, roadless areas are necessarily long is not supported. Average length of stay appears to be following the national trend of getting shorter (Roggenbuck and Lucas, 1987).

3.2.3. *Distance hiked*

Trip duration and miles hiked are obviously related. Distances hiked during backpacking trips ranged from 3 to 80 miles, with 11–30 miles being most common (59% of users). The average distance traveled was 24·0 miles (Table 2).

Distance traveled into the wilderness before the first night's camp serves as an indicator of just how removed users typically get from the trailhead. Distances traveled to the first campsite ranged from 1 to 35 miles ($\bar{X} = 6{\cdot}6$ miles).

3.2.4. *Period of use*

Weekend use was most common, with 67% of respondents' trips beginning on Friday through Sunday. Summer was the most preferred season, with 69% of users' annual trips taking place during the summer (Table 2). As in most wilderness and roadless areas (Lucas, 1980), fall was the second most heavily used period. Backpacking trips per person averaged 2·2 trips during the summer months of June–August and 2·1 trips

TABLE 2. Trip characteristics and use patterns of backcountry shelter campers in Great Smoky Mountains National Park, 1987

Party type	
Friends	50·1%
Family and friends	21·7%
Family	10·3%
Alone	5·4%
Organized clubs	12·5%
Party size (individuals)	
1	4·9%
2	35·9%
3–4	37·0%
5+	22·2%
Length of stay (days)	
1	1·1%
2	35·3%
3–4	48·9%
5+	14·7%
Mean	3·2 days
Distance hiked (miles)	
1–10	19·3%
11–20	37·6%
21–30	21·5%
31+	21·6%
Mean	24·0 miles
Use period (month, day)	
Summer (J, J, A)	68·5%
Fall (S, O, N)	17·9%
Winter (D, J, F)	8·2%
Spring (M, A, M)	5·4%
Weekday (Mon–Thurs)	32·8%
Weekend (Fri–Sun)	67·2%

during fall (September–November). Spring was the least-used season ($\bar{X} = 1{\cdot}8$). However, annual records of backcountry overnight total use for GSMNP indicate that spring is the most heavily-used period. This would *infer* that our July through September sample is somewhat season-specific, since a small percentage of our users typically backpack in the Park during spring.

Season of sampling may be a limited factor in our study of shelter users and of other studies in the south-east region that receive year-around use. For example, an earlier study of winter backpackers in GSMNP revealed that these users preferred winter over summer backpacking by a margin of nearly two-to-one (Hammitt and Hughes, 1984). Sampling of users in all seasons is needed to document to what degree season-specific use occurs.

3.3. USER ENCOUNTERS

Backpackers were asked to report the actual number of encounters they experienced with other parties, the number of parties they expected to encounter, their preferences with regard to encounters with other parties and, finally, the effects of these encounter

variables on their wildland recreation experience. Encounters were defined as visual contact with others, and were differentiated as to place of occurrence: trailhead, trail and campsite. Encounters were reported for the trip, not per day.

3.3.1. *Actual encounters*

Most encounters occurred on the trail ($\bar{X} = 10{\cdot}2$ parties/trip). On average, backpackers in GSMNP met 4·3 parties at campsites and 2·7 parties at the trailhead (Table 3). The size of the parties encountered for all locations ranged from 1 to 10 individuals ($\bar{X} = 3{\cdot}0$). Eighty-eight per cent of the backpackers in the survey encountered parties engaged in activities other than backpacking. Of these other activities, dayhikers accounted for over two-thirds of the encounters.

3.3.2. *Expected number of encounters*

In terms of solitude, one's reaction to the actual number of parties encountered is often predicated on how many parties one expected to encounter. For example, if people encountered more parties than they expected, then it is more likely that they would be negatively affected by the encounters, and vice versa. Most of our respondents (68%) encountered as many or fewer parties than they originally expected to meet. The remaining one-third of users actually met more parties than expected, meaning they should be more likely to be negatively affected.

3.3.3. *Effects of encounters on the recreational experience*

The backpackers' opinions varied greatly when asked about how the number of encounters effected their wildland recreation experience (Table 4). Almost 42% of respondents reported that the number of parties encountered enhanced the experience, while 32% felt the number of encounters detracted from the experience. The remaining backpackers felt the encounters had no impact on their experience.

Respondents showed greater consensus when asked about the effect of party size on the trip experience. Sixty-three per cent stated that the size of parties encountered did not influence the experience. However, 23% did feel that the size of the parties encountered detracted from their recreation experience.

TABLE 3. Reported number of other parties encountered by shelter backpackers at various site locations in Great Smoky Mountains National Park, 1987

Location of encounters	Per cent of backpackers encountering at least one other party	Average No. of encounters/trip
Trailhead	47	2·66
Entire trail	99	10·17
First mile	49	1·47
First 5–10 miles	72	2·68
Junctions	58	1·65
Campsites	97	4·28

TABLE 4. Effect of number of encounters on shelter backpackers' recreational experience in the Great Smoky Mountains National Park, 1987

Effect on experience	*N*	Per cent of backpackers who expressed response
Number of encounters added greatly to experience	21	11·5
Number of encounters added a little to experience	55	30·2
Number of encounters neither added nor detracted from experience	47	25·8
Number of encounters detracted a little from experience	47	25·8
Number of encounters detracted greatly from experience	12	6·7

3.3.4. *Tolerance for encounters*

The maximum number of encounters that backpackers are willing to accept are interpreted as the upper tolerance limits or encounter standards that management needs to know, and, perhaps, not allow to be exceeded. The maximum number and size of any party encounters which respondents said they could tolerate before recreational solitude reached unsatisfactory levels are presented in Table 5. Tolerance was greatest for encounters along the trail and at the trailhead, and lowest for campsites ($\bar{X} = 2{\cdot}7$ parties/trip). The average limits of the maximum acceptable party size (3–4 people) did not vary greatly on the basis of location of encounters. In addition to tolerance limits, respondents were asked about "ideal" encounter standards. Managers are interested in managing conditions close to the ideal or preferred, if possible, rather than just not exceeding user tolerance limits. The average "ideal" number of total encounters for an entire trip was 4·1 parties and 2·6 people per party.

4. Discussion and implications

Because our sample of wildland recreation users consisted primarily of backpackers using shleters in a heavily used eastern wildland area, one might suspect the users to be dissimilar from users of more remote wilderness areas and campsites. However, comparison of characteristics of GSMNP shelter users with those of other wilderness overnight user studies reviewed by Roggenbuck and Lucas (1987) show few differences. For example, Roggenbuck and Lucas reported that most wilderness users were under 35

TABLE 5. Maximum number and size of parties that backcountry backpackers could tolerate before recreational solitude reached unsatisfactory levels, Great Smoky Mountains National Park, 1987

Location of encounters	Number of parties	Size of parties
Trailhead	3·77	3·95
Along trail	5·53	3·95
Campsite	2·77	3·24

years old but that the 36–45 age group was over-represented in most areas, were well educated with about 40% having completed college, were male (70–85%), were professionals (40%) with somewhat above average incomes or students (20–30%) with less than average incomes and mostly urban residents (60% in most studies) from local or regional surroundings. A user profile summary of our respondents reads similarly, where the typical user was 33 years of age, but 44% of them were over the age of 36 years, were well educated with an average of 15·6 years of education (over a third had pursued graduate school), over one-half held professional positions and 20% were students, nearly equal proportions had household incomes of $50 000–$75 000 and $20 000 or less and 65% of users came from the nearby states. Based on the degree of similarity of user profiles between our respondents and those of other roadless areas, management is serving similar clientele. However, this is not to say that the motivations, commitment and use standards are likewise similar, and these variables are more likely to influence variation in visitor reaction to recreation management conditions than demographic characteristics.

In a study of nine wilderness areas in the western U.S., Lucas (1980) reported that 73 to 89% of visitors had visited wilderness-type areas before, and 39 to 70% had visited the specific study area before. Again, GSMNP shelter users are similar, with 84% having previous backcountry experience and 65% being repeat users of the GSMNP backcountry. Average number of trips per year and total days per year spent in wilderness were also very similar to the western areas. The similarity of user characteristics and the overwhelming past experience of most wilderness users in areas implies that reasonable uniformity in basic use regulations, permit forms and recommended management practices is desirable (Lucas, 1980). "Frequent trips, often to the same area, suggest the possibility of carryover experiences in influencing later behavior" (p. 54).

The backpacking itinerary of the typical GSMNP shelter user could be summarized as follows: a small group of 2 to 3 friends staying in the backcountry an average of a little over 3 days and hiking an average distance of 24 miles, primarily during the summer weekend period. While party size and length of stay are quite similar to results from other portions of the country, period of use shows some variational trends. In 1980, Lucas found that from two-thirds to three-fourths of all visitors entered the wilderness on weekends, primarily during summer holidays. More recent studies of eastern users in Great Gulf Wilderness, three National Forest Wildernesses in North Carolina, and the GSMNP, show that 40 to 68% of backcountry use occurred during summer weekends (Roggenbuck and Lucas, 1987). While it is true that most use still occurs on summer weekends, recent years have shown a change in use distribution across time, with a little more use distributed to weekdays of other seasons (Roggenbuck and Lucas, 1987). This seems particularly true in areas like California and the south-eastern U.S. Some of the most heavily used (total use) or most intensively used (density of use) areas occur in these two portions of the country, perhaps resulting in more non-peak use to avoid visitor encounters and crowding (Cole, 1990; Roggenbuck and Lucas, 1987).

Visitor reaction to number of parties encountered and location of encounter is a *perceptual matter of personal judgement* that might vary across wilderness areas, even though user characteristics and use patterns may be relatively similar. Lucas (1980) found that the degree of solitude visitors experienced and how they felt about the numbers of other parties they met on their trips varied sharply among nine study areas. Encounter levels for Shining Rock and Joyce Kilmer–Slickrock Wilderness Areas in the Southern Appalachians show similar party encounter levels as GSMNP ($\bar{X} = 3{\cdot}2$ parties/day for GSMNP). Roggenbuck *et al.* (1982) reported that wilderness users in North

Carolina who encountered an average of 0 to 2 parties per day saw somewhat fewer than expected, seeing three to five groups per day about equalled expectations and more than five groups exceeded expectations. One-third of our users reported more encounters than they expected and about an equal number (32%) felt the number of encounters detracted from the wildland recreation experience. Users reported that they preferred to meet an average of 4·1 parties for an "entire trip" and an average encounter party size of 2·6 people.

Whatever *encounters* visitors actually had, expected or found ideal is of little management significance if not related to *degree of solitude received*, for providing opportunities for solitude is an ultimate goal of wilderness and roadless area management. Overall, 81% of the backpackers in the study encountered more parties than they stated they could tolerate before solitude reached unsatisfactory levels in at least one of three encounter locations (trailhead, campsite or trail). However, only 32% of users reported that the number of encounters detracted from the solitude experience. Thus, it appears that user encounter standards do not coincide very well with user reaction to the actual number of encounters (Patterson and Hammitt, 1990).

Despite this discrepancy, there is a subgroup of GSMNP shelter backpackers for whom a lack of encounters was an important part of the solitude experience. For example, 93% of those users who stated that the number of encounters detracted from the solitude experience ($N=57$) also had their limits for the acceptable number of encounters exceeded ($N=53$). This was a *statistically more significant amount* than for those individuals who said that encounters had no effect or added to the experience ($\chi^2=7{\cdot}88$, $P=0{\cdot}02$). The affected individuals also tended to encounter more parties than expected. Sixty-two per cent of the backpackers in this group met more parties than expected while only 9% encountered fewer parties than expected. For these individuals, stated tolerance limits for encounters have real significance for roadless area management. Their tolerance limits for encounters can serve as reliable encounter standards for managing solitude opportunities in wilderness and other roadless recreation areas.

5. Conclusion

Wilderness and roadless area management for recreation purposes cannot exist on a sound basis without a thorough understanding of the characteristics of wildland recreation users, their use patterns and interactions with other users in the field. The lack of studies and visitor behavior information for the many newly created wilderness areas in the Southern Appalachian Region will continue to be an immediate concern for managers. While information from western U.S. wilderness and roadless areas is helpful to Southern Appalachian area managers, it is not the complete answer. For example, two studies in the GSMNP suggest that the majority of users of this heavily used area may be season-specific, and that meaningful differences may exist for users of the various seasons. Second, variation among individual differences and orientations of users within a wilderness or roadless area is likely to be greater than that across different areas. Thus, there will continue to be a need for more information on Southern Appalachian roadless recreation area users until an adequate database is generated.

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