Defining Acceptable Conditions in Wilderness

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ABSTRACT / The limits of acceptable change **(LAC)** planning framework recognizes that forest managers must decide what indicators of wilderness conditions best represent resource naturalness and high-quality visitor experiences and how much change from the pristine is acceptable for each indicator. Visitor opinions on the aspects of the wilderness that have great impact on their experience can provide valuable input to selection of indicators. Cohutta, Georgia: Caney Creek, Arkansas; Upland Island, Texas: and Rattlesnake, Montana, wilderness visitors have high shared agreement that littering and damage to trees in campsites, noise, and seeing wildlife are very important influences on wilderness experiences. Camping within sight or sound of other people influences experience quality more than do encounters on the trails. Visitors' standards of acceptable conditions within wilderness vary considerably, suggesting a potential need to manage different zones within wilderness for different clientele groups and experiences. Standards across wildernesses, however, are remarkably similar.

The Wilderness Act of 1964 (PL88-577) calls upon resource managers to administer wilderness areas "for the use and enjoyment of the American people in such a manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character. . . ." Further, the act specifies that wilderness "generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable, and has outstanding opportunities for solitude or a primitive and unconfined type of recreation." Thus, human use of wilderness is not only acceptable, it is part of the wilderness mandate. With human use comes unavoidable impacts. The Wilderness Act allows a limited amount of change from the pristine with its use of such terms as "generally," "primarily," and "substantially" (Hendee and others 1990). The challenge for managers is to determine how much change is acceptable and to intervene as necessary to protect wilderness and the wilderness experience within the bounds of acceptable change.

Traditionally, resource managers have tried to protect the wilderness resource and experience through efforts to define the area's carrying capacity. This sometimes resulted in estimates of appropriate use levels and in efforts to limit use. These actions may, however, alienate the wilderness visitor, and may not protect the wilderness or the experience. The relationship between recreational use and both visitor experiences and site impacts is exceedingly complex. Many variables such as type of use, visitor behavior, and site durability are often better predictors of impact than amount of use.

Recognizing the limitations of the carrying capacity model, Stankey and others (1985) developed the limits of acceptable change (LAC) planning framework, a management planning system currently being adopted by many wilderness managers (McCool and Lucas 1990.) This planning approach focuses on system outputs, i.e., defining appropriate wilderness conditions and opportunities. The wilderness resource is, of course, very complex, and a host of resource and experience parameters might be identified as defining wilderness quality. Monitoring all of these parameters is both managerially unfeasible and unnecessary. Instead, LAC calls for identifying and monitoring a small number of wilderness quality indicators. The best indicators are those that reflect the degree of naturalness of the wilderness ecosystem and the quality of wilderness experiences. Stankey and others (1985) suggested that indicators should relate to amount and type of wilderness use, permit measurement in cost-effective ways at acceptable levels of accuracy, and be potentially responsive to managerial intervention. Once indicators of wilderness natural-

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ness and quality wilderness experiences have been identified and current inventories of the indicators established, the LAC process then establishes acceptable levels or standards for these indicators. The definition of different opportunity zones within a wilderness is based upon varying standards across the selected indicators.

The Wilderness Act defines appropriate indicators in a very general sense. For example, wilderness is to provide opportunities for solitude. But what is solitude? Is it being alone on the trail, alone in the camp site, traveling in small groups, or the absence of noise? If it means wilderness travel in small intimate groups, what is the standard which distinguishes small groups from large groups? These judgments that the manager must make are largely value judgments. Current LAC applications recognize that these judgments can be made more defensible through public input from clientele groups who have knowledge and interest in the wilderness resource and the wilderness experience (McCool and others 1986.) Such clientele groups might include wilderness area visitors, wilderness interest groups, wilderness outfitters and guides, and research scientists.

In the LAC process, wilderness managers retain the authority, responsibility, and accountability for decision making (Stankey and others 1985, Stokes 1990.) They do not necessarily select the indicators and standards that are preferred by current area visitors or wilderness interest groups. They must also consider legal and policy mandates, environmental processes, and the feasibility of achieving any desired condition. Nevertheless, the views of clientele groups are critically important because wilderness is largely a cultural resource. It is more than a collection of natural objects; it is instead a perceived reality or state of mind (Nash 1982, Driver and others 1987).

Major problems in implementing the LAC process currently include the lack of knowledge about the level of concern wilderness visitors have for various aspects of the resource and social setting that potentially affect experiences (to aid in selecting indicators), what visitors consider to be acceptable levels or standards for experience indicators (Lucas and Stankey 1985), and the extent to which wilderness experience indicators and standards selected for one wilderness are generalizable to the more than 400 other areas in the National Wilderness Preservation System. The best indicators may be those that are unique to the specific characteristics of the individual wilderness (Merigliano 1990). Indeed, Stokes (1990) and Stankey and others (1985) suggest that different indicators are often appropriate for different zones of a single wilderness. This suggestion would appear to require separate visitor studies on all wildernesses, a task that seems potentially redundant and likely unfeasible. A search for commonality in visitor opinions is needed. The study of visitors to the Cohutta, Georgia; Caney Creek, Arkansas; Upland Island, Texas; and Rattlesnake, Montana, wilderness areas reported here represents an initial effort to compare user perceptions of appropriate indicators and standards across varied wilderness areas. Better understanding of the influence various factors have on visitor experiences will provide valuable input to indicator selection.

Study Areas

Three study areas were selected in the South because several Forest Service wilderness managers in the region are currently considering adopting the LAC process. In addition, an effort was made to include wilderness areas in the major physiographic units of the region: Southern Appalachian mountains (Cohutta), Ozark highlands (Caney Creek), and Coastal Plain-Piedmont (Upland Island). The Rattlesnake Wilderness, located near Missoula, Montana, was included as a point of comparison between the East and West.

The Cohutta Wilderness lies in northern Georgia, about 2.5 h north of Atlanta, and at just over 37,000 acres is the largest Forest Service wilderness in the Southeast. Use levels are high, exceeding 71,000 recreation visitor days (RVDs) each year, or about 1.92 visitor days per acre. Caney Creek is a 14,460-acre wilderness in the Ouachita National Forest of Arkansas. Visitation rates are moderate at 11,400 RVDs per year, or 0.79 visitor days per acre. Most use appears to occur during the spring and fall months. Upland Island at 12,562 acres is the largest Forest Service wilderness in Texas. The area is trailless, but contains old roads, and use is very light. It's estimated 2500 RVDs (or 0.20 RVDs per acre) occur primarily during October to February, and hunters are the predominant users. Finally, the 33,000-acre Rattlesnake Wilderness lies within the boundaries of the 61,000 acre Rattlesnake National Recreation Area, an area of high mountain streams, deep canyons, and remote lakes on the Lolo National Forest of Montana. Use of the wilderness portion of the area is light at about 1800 RVDs (or 0.05 RVDs per acre).

Study Methods

Visitors to the Rattlesnake Wilderness were sampled from May through September, 1990. For the

Cohutta and Caney Creek wildernesses, the study season was extended through November 1990. An effort was made within each area to select a sample large enough to permit estimates of population parameters within 5% of the true value at a 95% confidence interval, assuming maximum variation on the study's categorical rating scales, During the study season, two weekend (Friday-Sunday) and two weekday (Monday-Thursday) sampling clusters were randomly chosen each month. Within clusters, visitor contact personnel were assigned daily to an area trailhead on a random basis.

During sampling, all parties entering or leaving the wilderness were contacted, and a short interview was conducted to obtain names and addresses of group members and to determine basic visitor use and user characteristics. A mailback questionnaire was sent to study participants to determine how influential each of 19 potential indicators of social and physical resource conditions were to defining the quality of their wilderness experience. In addition, to determine visitor standards for indicators, respondents were asked to specify their preferred level and their range of acceptable and unacceptable levels. Since this task required three judgments about standards for each indicator, the indicators were divided between two questionnaire forms. Respondents were systematically assigned to form A or form B after a random start.

Upland Island Wilderness users responded to comparable on-site and mailback questions. However, because Upland Island has no trailheads and has frequent use by hunters, including nighttime raccoon hunters, a slightly different sampling strategy was used. Sampling was conducted from October through February, the primary use season. One weekday and two weekend sampling clusters were selected each month. During sampling periods, a field technician drove along the roads that surround the wilderness searching for parked vehicles. An attempt was made to contact all groups as they left or returned to their vehicles. If the group was spotted, members were interviewed as described for the other study areas. If no one was found at the parked vehicle during the sample period, the technician left a mailback postcard on the vehicle requesting the names and addresses of all party members and group use and user data. Groups returning the postcards along with individuals interviewed on-site were then sent the mailback questionnaire:

There were almost no trailhead refusals to participate in the study, and response rates to the mailback questionnaire were generally high: 67%, 82%, and 73% for Cohutta, Caney Creek, and Rattlesnake Wildernesses, respectively. Upland Island's response rate was only 47% and is likely a reflection of the high proportion of hunters and, for some, the lack of an on-site contact with study personnel.

Results

Relative Influence of Potential indicators on Wilderness Experience

Table 1 provides a breakdown of the reported influence of 19 indicators of wilderness condition on the quality of the visitor experience at the four study wildernesses. There was high agreement in mean visitor ratings across the areas. Indeed, for the Cohutta, Caney Creek, and the Rattlesnake wilderness areas, Pearson's *r* correlations between mean ratings were equal to or greater than 0.92 (Table 2). Correlations between Upland Island visitor ratings and the remaining three areas were substantially lower, ranging from 0.67 to 0.79. Upland Island differed from the other areas by having few campers and having hunters as the predominant user group. These dissimilar characteristics likely explain the differences in indicator ratings, and these distinguishing features are probably more important than any East-West differences.

The most influential indicators of wilderness quality for the Cohutta, Caney Creek, and Rattlesnake wildernesses were the amount of litter and the number of trees around a campsite that have been damaged by people. These two indicators were very important for Upland Island visitors also, but the number of wild animals seen was also very influential. This likely reflects the large proportion of hunters (85%) in the area's sample. The amount of noise, either coming from within or outside the wilderness, was rated next most influential on the wilderness experience across all four areas. Highly important too for Cohutta, Caney Creek, and Rattlesnake wilderness visitors were the number of wild animals seen, amount of vegetation loss and bare ground around a campsite, and the number of other horse or hiking groups camping within sight and sound of the respondent's campsite. Interestingly, the number of trail encounters with hiking groups, an indicator that has frequently been used in wilderness social carrying capacity assessments (Stankey 1973, 1980) and in LAC planning (USDA Forest Service 1987) was rated among the least important influences in this study. Finally, the presence of two wilderness conditions, i.e., visibility of lights originating from outside the wilderness and the amount of time spent traveling on old roads in the wilderness, which were once thought

Table 1. Visitor ratings of relative influence of site indicators on quality of wilderness experience[a]

Indicator[b]	Cohutta (N = 439)[c]			Caney Creek (N = 148)[c]			Upland Island (N = 71)[c]			Rattlesnake (N = 207)[c]		
	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank
Amount of litter I see	5.60	1.00	la	5.69	.80	la	4.92	1.65	2a	5.68	.80	la
Number of trees around campsite that have been damaged by people	5.22	1.09	2b	5.32	1.07	2b	4.61	1.69	3b	5.14	1.09	2b
Amount of noise associated with human activities within the wilderness	4.86	1.41	3c	4.95	1.45	4c	4.32	1.94	4b	4.86	1.27	4c
Amount of man-made noise originating from outside the wilderness	4.80	1.52	4c	4.99	1.50	3c	4.15	2.04	5bcd	4.60	1.35	5de
Number of wild animals I see	4.68	1.52	5cd	4.61	1.56	7d	5.22	1.33	la	4.90	1.21	3c
Amount of vegetation loss and bare ground around a campsite	4.64	1.39	6d	4.62	1.34	6d	3.78	1 .88	12defgh	4.53	1.33	7de
Number of horse groups that camp within sight or sound of my campsite	4.57	1.60	7d	4.64	1.80	5d	3.93	1.92	6cfgh	4.48	1.52	8ef
Number of hiker groups that camp within sight or sound of my campsite	4.53	1.48	8d	4.59	1.47	8d	3.75	1.94	14gij	4.55	1.44	6df
Number of horse groups that travel past my campsite while I am there	4.36	1.61	9d	4.37	1.50	10de	3.82	1.88	10fgh	4.3 1	1 .50	10gh
Number of campfire rings that people have made	4.27	1.45	10ef	4.42	1.43	9df	3.84	1.73	9dfhik	4.44	1 .29	9deh
Number of hiker groups that walk past my campsite	4.21	1.45	11f	3.96	I.51	14fg	3.80	1.86	11ghj	4.27	1.42	11gh
Number of large group that I see along the trail	4.19	1.55	12f	3.91	1.69	15gh	3.76	1.84	l3fj	4.10	1.54	12g
Number of horse groups I see along the trails in a day	4.12	1.64	13fg	4.15	1.76	12f	3.58	1.68	16ejk	3.82	1.52	14ij
Percent of time other people are in sight when I'm along the trail	4.02	1.52	14g	4.11	1.45	13fg	3.86	1.76	8dfghk	3.99	1.38	13gj
Visibility of light originating from outside the wilderness	3.98	1 .65	15g	4.37	1.76	11f	3.43	1.78	18efg	3.45	1.64	17kl
Total number of people I see hiking along the trail	3.81	1.49	16h	3.75	1.62	16hi	3.48	1.53	17ei	3.68	1.37	15ik
Number of groups of hikers I see along the trail	3.79	1.50	17h	3.66	1.55	17hi	3.39	1.77	19e	3.62	1.38	16k
Amount of time I spend traveling on old roads in the wilderness	3.28	1.50	18i	3.48	1 .46	18hi	3.88	1.70	7befgh	3.27	1.53	181
Number of miles of gravel road I travel to get to the wilderness	2.93	1.60	19j	2.82	1.58	19j	3.59	1.68	15efgh	3.00	1.55	19m

[a]Items with different letters are statistically different from each other at $P = 0.05$ level (paired t test).

[b]Possible response categories on degree of influence: 1 = not at all; 2 = slightly; 3 = somewhat; 4 = moderately; 5 = very much; 6 = extremely.

[c]All items in the table have at least the N size listed. Because of differing item response rates, some of the items have a few more responses than indicated for the area.

Table 2. Pearson's r correlation of mean visitor influence ratings of 19 indicators of wilderness condition across four study areas (N = 19)

Area[2]	Cohutta	Caney Creek	Upland Island	Rattlesnake
Cohutta		0.97	0.70	0.97
Caney Creek			0.67	0.92
Upland Island				0.79
Rattlesnake				

All correlation coefficients are statistically different from zero at $p = 0.0$ 1 level of significance.

to eliminate an area from consideration for inclusion in the National Wilderness Preservation System (Roth 1984), were generally rated as having little influence on the wilderness experience. Upland Island again represents an exception, where old roads are used as the only "trails" and as corridors for hunting. For this study area, time spent on old roads was rated moderately important.

Selecting Indicators for the IAC Process

The LAC planning guidelines call for the selection of indicators that singly, or in combination, best reflect the quality of the wilderness condition or wilderness experiences (Stankey and others 1985). Lucas and Stankey (1985) suggest selecting "a few" important indicators to represent the many dimensions of resource and social conditions in wilderness. Just how many is "a few" is not specified, but the Bob Marshall Wilderness Complex LAC plan (USDA Forest Service 1987) includes five indicators of important experience and site conditions. If about five indicators were selected for the four study areas included here, which should they be?

As indicated earlier, public input is a necessary but insufficient condition for decision making in the LAC

process. The task of incorporating public opinions is not a simple one. For example, managers might decide to select the five or so indicators that are rated most highly. For the Cohutta, Upland Island, and Rattlesnake wilderness areas, these would be amount of litter, number of trees damaged in the campsite, noise originating inside and outside the wilderness, and number of wild animals seen. In Caney Creek Wilderness, the indicators would be the same, except that the number of horse groups camped near the respondent's campsite would substitute for number of wild animals seen.

There are, however, at least five problems with this simple decision rule. First, as Table 1 indicates, indicators ranked in the top five are frequently not significantly different in a statistical sense from those items rated somewhat lower. For example, at the Cohutta, the indicator ranked fifth (number of wild animals seen) cannot be distinguished from the item ranked eighth (number of hiker groups camped nearby). For the other areas, the overlap is even greater. Second, differences among indicator items are often so small as to be meaningless in a practical sense, and a large number of items are rated at least moderately important. For example, Cohutta Wilderness users assigned this level of importance to 14 of the study's 19 indicators. For Caney Creek and Rattlesnake wilderness users, the number was 13 and 12, respectively. Third, some of the indicators rated important might be highly intercorrelated in their occurrence in the wilderness. This is likely the case for such items as the number of horse groups that camp nearby and the number of horse groups that travel past the campsite. In instances such as this, it is probably an inefficient use of the manager's resources to monitor both indicators. Fourth, some of the items rated most important to the wilderness experience are largely beyond the manager's control. Manmade noise, especially that originating outside the wilderness, and number of wild animals seen are critical to the experience, but they are influenced little by current management practices. Finally, the wilderness experience is a multidimensional experience and is shaped by a diversity of wilderness attributes. Manfredo and others (1983) found that wilderness users seeking different experiences varied in the importance they assigned to clusters of resource, social, and managerial attributes representing wildlife, ruggedness of terrain, access, recreational development, number of people seen, group size, noise, litter, campfire rings, amount of user regulations, and degree of enforcement of regulations. If wilderness managers seek to provide and protect diversity, a common goal of recreation resource management, then important (i.e., those rated highly) indicators selected for monitoring should represent a diversity of wilderness conditions. If a large number of indicators are rated as important, simply selecting the top five or so may not assure the required diversity.

One possible way to address many of the difficulties in indicator selection mentioned above is to examine the variation contained in visitor ratings of the indicators and to select those that best cover the range of variation and that are also highly valued. Factor analysis is a mathematical routine that examines the correlation among a set of items, and identifies a reduced number of unique dimensions or factors that explain the most overall variance. It then identifies the items that "load highly" on or define each dimension. From such an analysis, one or two indicators might be selected that are highly important and that best represent each dimension. This would potentially make the task of LAC management more responsive to the range of users' concerns, and reduce the set of indicators to a number for which it is feasible to set standards, monitor, and take actions to protect.

When Caney Creek visitors' evaluations of the influence of indicators upon wilderness experiences were factor analyzed, the following unique dimensions were rated at least moderately important: site impacts, sound and sight intrusions, seeing wild animals, horse encounters, and people encounters (Table 3). The factor structure of importance of indicators for the Cohutta Wilderness users was similar; the only difference was that the site impact and sound and sight intrusion factors were combined as one dimension (Table 4). The Rattlesnake area users' response to the importance of indicators followed a pattern similar to the Cohutta visitors. Like the Cohutta, site impacts and sound and sight intrusions were combined as one factor. However, unlike the other two areas, Rattlesnake users had distinctive responses to trail encounters versus campsite encounters with people. In addition, the Rattlesnake visitors demonstrated similar response patterns to encounters with horses, wherever they occurred, and encounters with people at the campsite (Table 5). This supports the common finding that horse encounters have a different (and greater) influence upon experiences than do people encounters, and that people have different responses to contacts at the campsite than on the trail (Stankey and Schreyer 1987). Upland Island visitor ratings of importance of indicators were not factor analyzed because of insufficient sample size. Gorsuch (1983) calls for a minimum of 100 subjects and at least

Table 3. Factor names, items, loadings, and importance of wilderness indicators for Caney Creek Wilderness users (N = 141)

Factor and items[a]	Factor loading	Mean importance (overall factor) and items
Site impacts		(5.00)
Amount of litter I see	0.454	5.67
Number of trees around a campsite that have been damaged by people	0.822	5.29
Amount of vegetation loss and bare ground around a campsite	0.664	4.62
Number of campfire rings that people have made	0.711	4.43
Sound and sight intrusion		(4.78)
Amount of noise associated with human activities within the area	0.735	4.98
Amount of man-made noise originating from outside the area	0.722	4.99
Visibility of lights originating from outside the recreation area	0.587	4.38
Wild animals		(4.59)
Number of wild animals I see a day		4.59
Horse encounters		4.46
Number of horse groups that camp within sight or sound of my campsite	0.856	4.73
Number of horse groups that travel past my campsite while I am there	0.870	4.45
Number of horse groups that 1 see along the trails in a day	0.834	4.21
People encounters		(3.99)
Number of groups of hikers I see along the trail	0.872	3.60
Total number of people, I see hiking along the trail	0.909	3.72
Number of large groups (more than 6 people) that I see along the trail	0.800	3.91
Number of hiker groups that camp within sight or sound of my campsite	0.628	4.62
Number of hiker groups that walk past my campsite	0.688	3.96
Percent of time other people are in sight while I'm along the trail	0.611	4.12

[a]Factor analysis was principal factoring with iteration and orthogonal varimax rotation.

five respondents for each variable included in the factor analysis for reliable results.

Tables 3-5 also list the items, item loadings, and mean importance of items that represent each factor. All the items in the site impacts factor (e.g., Caney Creek) were rated as at least moderately influential, and all appear to meet desired LAC criteria of being measurable, related to amount or type of use, and responsive to managerial intervention. The analysis also shows that these items have highly correlated influences on visitor experiences. Therefore, inventorying and monitoring all the items may be unnecessary, especially if there is some covariance of the occurrence of the indicators in the wilderness. The item, "the number of trees around a campsite that have been damaged by people," is rated very influential on wilderness experiences and has the highest factor loading. It thus best represents the factor and might be selected as the site impact indicator. However, if a cost-effective method of inventorying and monitoring campsite tree damage does not exist or if resources are available to monitor two indicators from this cluster, then the manager has the option of moving to the remaining factor item that best represents the dimension (i.e., the number of campfire rings that people have made) or the item of greatest influence on experiences (i.e., the amount of litter seen). Any decision is made with the knowledge that the selected indicator (or indicators) represents an identifiable and important dimension of visitor experiences.

Caney Creek's sound and sight intrusion factor has three highly correlated items (Table 3), but the "amount of noise associated with human activities within the wilderness" is the only one that can likely be influenced by management. It also represents the dimension well. If a method of inventory and monitoring can be agreed upon, it represents an important dimension of the wilderness experience that is not commonly addressed in LAC standards.

For the Cohutta Wilderness and the Rattlesnake area, the site impact and the sound and sight intrusion factors were combined into one. However, the importance of indicators within the factor is similar to those of Caney Creek. Managers might monitor tree damage in the campsite, because of its high factor loadings, and litter, because of its high importance

Table 4. Factor names, items, loadings, and importance of wilderness indicators for Cohutta Wilderness users (N = 423)

Factor and items[a]	Factor loading	Mean importance (overall factor) and items
Site impact/sound and sight intrusion		(4.77)
Amount of litter I see	0.647	5.61
Number of trees around a campsite that have been damaged by people	0.780	5.23
Amount of vegetation loss and bare ground around a campsite	0.697	4.66
Number of campfire rings that people have made	0.652	4.30
Amount of noise associated with human activities within the area	0.564	4.85
Amount of man-made noise originating from outside the area	0.584	4.80
Visibility of lights originating from outside the recreation area	0.48 1	3.97
Wild animals		(4.70)
Number of wild animals I see in a day		4.70
Horse encounters		(4.37)
Number of horse groups that camp within sight or sound of my campsite	0.859	4.58
Number of horse groups that travel past my campsite while I am there	0.817	4.38
Number of horse groups that I see along the trails in a day	0.725	4.14
People encounters		(4.11)
Number of groups of hikers I see along the trail	0.855	3.83
Total number of people I see hiking along the trail	0.865	3.83
Number of large groups (more than 6 people) that I see along the trail	0.773	4.20
Number of hiker groups that camp within sight or sound of my campsite	0.584	4.55
Number of hiker groups that walk past my campsite	0.539	4.21
Percent of time other people are in sight while I'm along the trail	0.634	4.04

[a]Factor analysis was principal factoring with iteration and orthogonal varimax rotation.

to the visitors' experience. If additional resources are available, vegetation loss in the campsite represents the factor well and has high visitor importance ratings.

The "number of wild animals I see" is apparently a very influential factor in visitors' evaluations of the quality of the wilderness experience across all study areas. However, the density of wildlife in wilderness and the number of wild animals people see there are largely beyond the manager's control. Thus, its use as an indicator of wilderness quality in the LAC framework is limited. We do, however, recommend that managers remain vigilant in protecting wilderness wildlife from human impacts originating within and outside the wilderness.

The horse encounter factor of Caney Creek and Cohutta might best be represented by one or other of the items: "the number of horse groups that camp within sight or sound of my campsite" and "the number of horse groups traveling past my campsite" (Tables 3 and 4). These items do not differ significantly in influence rating in a statistical sense (see Table 1); both are likely highly correlated in their occurrence, and both have extremely high factor loadings. However, these indicators address only overnight horse use. If day use by horses is high, the "number of horse groups seen along the trail in a day" may also be used.

The people encounter factor at Caney Creek and Cohutta has apparently the least influential impact on wilderness experiences among the factors examined. Nevertheless, mean ratings of items suggest that certain kinds of people encounters are moderately influential. "The number of hiker groups that camp within sight or sound of my campsite" influences experiences the most, and has reasonably high factor loadings (Tables 3 and 4). The on-trail encounter items came close to being a separate factor among the Cohutta and Caney Creek visitor evaluations and actually did load higher on a separate factor for the Rattlesnake. Of the trail encounter items, "The number of large groups (more than six people) that I see along the trail" had a high factor loading and moderately high visitor ratings, and it represents an important aspect of day use.

In the Rattlesnake area, it is important for managers to monitor horse and camp encounters; the people on trails factor is less important. The number of horse groups and the number of hiker groups that camp

Table 5. Factor names, items, loadings, and importance of wilderness indicators for Rattlesnake users (N = 193)

Factor and items[a]	Factor loading	Mean importance (overall factor) and items
Site impact/sound and sight intrusion		(4.72)
Amount of litter I see	0.556	5.73
Number of trees around a campsite that have been damaged by people	0.790	5.21
Amount of vegetation loss and bare ground around a campsite	0.682	4.59
Number of campfire rings that people have made	0.695	4.51
Amount of noise associated with human activities within the area	0.482	4.90
Amount of man-made noise originating from outside the area	0.577	4.64
Visibility of lights originating from outside the recreation area	0.419	3.45
Wild animals		(4.95)
Number of wild animals I see in a day		4.95
Horse and camp encounters		(4.32)
Number of horse groups that camp within sight or sound of my campsite	0.906	4.54
Number of horse groups that travel past my campsite while I am there	0.887	4.35
Number of horse groups that I see along the trails in a day	0.774	3.90
Number of hiker groups that camp within sight or sound of my campsite	0.740	4.55
Number of hiker groups that walk past my campsite	0.725	4.27
People on trails encounters		(3.91)
Number of groups of hikers I see along the trail	0.759	3.67
Total number of people I see hiking along the trail	0.720	3.73
Number of large groups (more than 6 people) that I see along the trail	0.579	4.18
Percent of time other people are in sight while I'm along the trail	0.550	4.06

[a]Factor analysis was principal factoring with iteration and orthogonal varimax rotation.

Table 6. Defining acceptable standards for indicators: Highest level of change from pristine that 50% and 75% of area visitors will accept

	Cohutta			Caney Creek			Rattlesnake			Upland Island		
Indicator	N	50%	75%	N	50%	75%	N	50%	75%	N	50%	75%
Number of pieces of litter I can see from my campsite	179	0	0	53	1	0	76	0	0	22	2	0
Percent of trees around a campsite that have been damaged by people	183	4	0	54	4	0	76	5	0	23	0	0
Number of horse groups that camp within sight or sound of my campsite	154	1	0	53	1	0	87	2	0	27	2	0
Number of hiker groups that camp within sight or sound of my campsite	359	3	1	112	3	1	166	3	1	50	3	1
Number of large groups (more than 6 people) that I see along the trail	173	5	3	60	5	2	98	5	2	31	3	1
Percent of vegetation loss and bare ground around the campsite	172	20	10	61	20	10	94	17	10	30	16	4

within sight or sound appear to be the best indicators of the horse and camp encounter factor (Table 5). The numbers of people and groups seen hiking along the trail best represent the people-trail encounter factor, but these items are not even rated moderately important to the experience. Instead, the indicator "number of large groups (more than six people) seen along the trail" might be selected.

Defining Acceptable Standards for Indicators

Once appropriate indicators of wilderness quality have been selected, managers must decide what are acceptable conditions for the indicators. Managers must decide how much change from the pristine due to human use they will accept. This decision is again largely a value judgment. The Wilderness Act does set broad guidelines that managers must follow, but the law leaves much to the manager's discretion. The range in current conditions, planning group or focus group discussions, interest group opinions, visitor preferences, and research to identify thresholds of rapid change or decline in the indicator can all help the manager establish specific and defensible standards. These standards can then guide management within the LAC framework.

When responding to visitor preferences, the manager's task is made easier if there is broad agreement, or consensus, on what are acceptable conditions. If there is large variation in opinions, then the manager might try to meet different visitor needs in different zones of the wilderness, work with the clientele groups to foster consensus through discussion and compromise, or decide what proportion of the clientele groups he or she will seek to satisfy. Table 6 provides a description of the highest level of change from the pristine condition that 50% and 75% of the Cohutta, Caney Creek, Upland Island, and Rattlesnake visitors will accept for important indicators of wilderness quality. We have focused upon the 50% and 75% levels because it is impractical to please all visitors and because past carrying capacity research has recommended managing for the median or 50% standard (Shelby 1981). We believe the manager should and could please more than half of the visitors, and so have included the 75% level. Furthermore, the size of the difference between standards at the 50% and 75% levels is a measure of the extent of agreement in the visitor population; the greater the difference, the less is the agreement.

Table 6 indicates that there is surprisingly broad agreement across areas on what are acceptable wilderness conditions. The only differences of consequence are the more restrictive acceptance standards of Upland Island users about number of large groups on trails and tree damage and vegetation loss in the campsites, and their greater acceptance of litter. In contrast, there is far greater variation in user standards within wilderness. For almost all indicators, the manager would have to reduce the acceptable impact by more than half to meet 75% instead of 50% of the visitors' preferences. This suggests little shared agreement on appropriate conditions within a wilderness. (The widely shared levels of agreement within the Cohutta, Caney Creek, and Rattlesnake user groups about litter, within Cohutta and Caney Creek users about horse groups camped nearby, and within Upland Islands users about tree damage in campsites represent exceptions.)

Visitor standards regarding acceptable conditions are in many cases not as restrictive or as "pure" as expected. For example, camping out of sight and sound of other groups has been considered a pervasive norm among wilderness users (Lucas 1980). For our study areas, visitors would accept camping near zero to two horse groups, and one to three hiking groups. Past research indicates that wilderness users do not expect to see groups larger than six people, and they react negatively to such encounters (Roggenbuck and others 1982). Respondents at three of the study areas would accept from two to five such encounters on the trail per day. Tree damage has a great influence on visitor experiences, yet half of all study participants (except for Upland Island users) would accept damage to 4% or 5% of the trees in a campsite. Amount of man-made noise--a highly disruptive condition in wilderness--may have restrictive standards. However, since we do not know if negative reactions are due to the frequency, type, or loudness of the noise, we were unable to define a standard in this study.

Management Implications

Visitor opinions about acceptable wilderness conditions represent an important input to LAC decision making. This study of Cohutta, Caney Creek, Upland Island, and Rattlesnake wilderness users has several important and surprising implications for managers. While it is often thought that wilderness users do not care about site impacts, visitors across all four study areas rated these impacts as most influential upon their experience. Site impacts were considered far more influential than encounters with others on the trails. Noise and numbers of wild animals seen also are critically important variables that have seldom been recognized in past applications of the LAC planning framework. Managers need to work toward representing these dimensions of the wilderness experience with appropriate indicators and to work with clientele groups and researchers to define acceptable standards and monitor conditions.

This study represents one of the first efforts to include as many as four areas in a simultaneous survey of wilderness user opinions related to LAC applications. While more such studies are needed, our

findings suggest that there is considerable agreement across areas in both the indicators of wilderness quality that are considered important and in conditions that are considered acceptable for the indicators. When we found differences, those differences seem not a reflection of the regional location of the study site or of East versus West location, but seemed instead to be related to the type of use the area receives. This commonality in the pattern of response across areas suggests that not all or even most wildernesses need intensive visitor surveys to implement LAC management. What is needed is to study intensively a few areas with great diversity in use and user characteristics, in order to cover the typically high range in visitor opinions about acceptable conditions, and ap ply these findings to comparable user groups in other areas.

The wide range of visitor opinions about acceptable conditions within wilderness is a critically important finding for managers. Responding to this diversity makes the management task much more complex. Managers might respond, as suggested by LAC authors (Stankey and others 1985), by zoning the wilder-- ness for different experience opportunity classes and establishing different condition standards within each. Managers could then provide information to potential visitors to help them find the zone that best meets their experience requirements. If the wilderness area is so small that defining and managing for distinct experiences in separate zones within the wilderness is unfeasible, as might be the case for many eastern areas, then the manager might attempt to shape user definitions of appropriate wilderness conditions through consensus-building or small group discussions. Another strategy might be to manage a wilderness for one clientele group, use that group's standards for acceptable conditions, and provide information on nearby wildernesses and backcountry areas where other clientele groups could go to find their desired conditions.

When selecting indicators that best represented experience dimensions of wilderness, the importance of the campsite was striking. Wilderness visitors told us that horse and hiker group contacts at the campsite were much more important than on the trail. Tree damage and vegetation loss at the campsite were also critical variables. These findings suggest that managers with scarce resources might best enhance the quality of the wilderness and wilderness experiences by focusing on the campsite. However, at this time we do not recommend abandoning concern for the trail environment. We did not ask our subjects to respond to such impacts as trail erosion or to give us specific standards about litter on the trail. Moreover, a separate analysis of day users, who typically comprise about half of all wilderness visitors (Roggenbuck and Lucas 1987), might suggest different indicators and different standards.

Finally, and perhaps most importantly, this study suggests that some of the wilderness conditions that most influence perceptions of wilderness quality are little related to amount of wilderness use. For example, litter, noise, tree damage, and probably number of wild animals seen are much more related to behavior of people than to total numbers. Thus, managers might better protect the wilderness and provide wilderness experiences for more people by shaping behavior than by limiting use. Through appropriate ap plication of education, persuasion, and rewards and incentives, managers can reduce such behavior problems as littering and noise in the wilderness (Roggenbuck and Manfredo 1990). Managers will then be seen as helpful guardians rather than restrictive policemen.

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