

**Brian Glaspell
Alan Watson
Katie Kneeshaw
Don Pendergrast**

Selecting Indicators and Understanding Their Role in Wilderness Experience Stewardship at Gates of the Arctic National Park and Preserve

Introduction

The Limits of Acceptable Change (LAC) and other indicator-based planning frameworks (e.g., VERP, Visitor Experience and Resource Protection; VIM, Visitor Impact Management) have been widely adopted by wilderness managers. A central feature of these frameworks is the selection of indicators of conditions that influence experience quality, and which managers can efficiently monitor. However, identifying meaningful influences on visitor experience quality and selecting appropriate indicators remains a persistent challenge. Managers often have little knowledge of which indicators are most significant at their respective areas, and, as a result, they sometimes choose indicators simply because they have been used elsewhere (Watson and Roggenbuck 1997). Moreover, research designed to support the selection of indicators has often failed to uncover the predictable relationships between social setting conditions and experiences that the notion of an indicator presupposes (Cole 2001).

At Alaska's Gates of the Arctic National Park and Preserve ("Gates" for short), unique conditions exacerbate this challenge and highlight the need for a better understanding of the nature of wilderness experiences and the various factors that threaten or facilitate them. Wilderness visitor studies have typically focused on participants' evaluations of pre-determined dimensions (such as solitude) by using surrogate measures (such as perceived crowding). In contrast, the project described here began with a qualitative investigation that allowed



visitors to describe in their own words the important dimensions of their experiences and the factors that influenced them. A second phase of the project measured the distribution and saliency of those dimensions across the Gates visitor population, and the significance of various potential factors of influence. Results from this study point toward experience indicators that managers at Gates may choose to monitor, and they also provide insight into the role of indicator-based planning frameworks with respect to protecting wilderness experience opportunities.

Gates of the Arctic National Park and Preserve

Gates represents the culmination of a long history of wilderness advocacy in northern Alaska. The region first began to receive national attention when Robert Marshall identified two peaks on the southern flanks of the Brooks Range as the “gates to the arctic” in his 1933 book, *Arctic Village* (Glover 1986). In 1980, after almost 50 years and numerous proposals for permanent protection of its wilderness character had come and gone, Gates of the Arctic National Park and Preserve was finally established with passage of the Alaska National Interest Lands Conservation Act (ANILCA). Referring to the park’s unique history and founding purposes spelled out in ANILCA, the 1986 Gates general management plan states: “Within the broad spectrum of resources and opportunities reserved in national parks, only Gates of the Arctic was established with such strong emphasis on wilderness purposes” (NPS

1986:3).

Consistent with those purposes, Gates is currently managed as a single vast wilderness area. The park encompasses over 8 million acres of rugged mountains and Arctic tundra. There are no roads leading into it, no maintained trails or campsites, and no permanent NPS facilities located on park lands. Beyond the park boundaries to the east and west is a series of other protected areas. With Gates in the middle, these areas form an almost contiguous collection of undeveloped wildlands stretching from the Canadian border westward to the Arctic Ocean. For visitors, primary access is by air, and travel within the park is by foot, raft, canoe, or kayak. Most visitation occurs during the four-month period from June through September, with July and August being the busiest months. Overall recreation use numbers have been assumed to be fewer than 2,000 visitors per year. A recent attempt to systematically estimate 2002 summer use (as part of the study reported here) produced a 95% confidence interval of between 336 and 424 visitors emplaning in Fairbanks (the primary park portal) and between 64 and 174 visitors entering from the Dalton Highway (a secondary portal). Visitors are encouraged to practice minimum impact camping techniques, but there are no regulations regarding campfires, campsites, or length of stay.

At present, Gates represents what some people consider to be a nearly ideal setting for visitors to enjoy wilderness experiences. The challenge for managers is to describe those experiences in sufficient detail to know

when they are at risk of changing or degrading, and to develop methods for monitoring conditions and assuring that unacceptable changes do not occur.

Approaches to Understanding Wilderness Experiences and Selecting Indicators of Quality

The 1964 Wilderness Act famously defines wilderness as a place where “man is a visitor who does not remain” and where “outstanding opportunities for solitude or a primitive and unconfined type of recreation” exist. From these phrases, solitude has emerged as the dominant criterion for evaluating wilderness visitor experiences. Few studies, however, have attempted to measure solitude directly; instead, most researchers have focused on surrogate measures such as perceived crowding. Although crowding (or the lack thereof) is rarely

mentioned in the philosophical or popular wilderness literature, it has been the most studied aspect of wilderness experiences. Hypothesized crowding influences, such as inter-visitor encounter rates, are regarded as being among the primary threats to wilderness solitude, and have been widely adopted as indicators of experience quality.

Studies of crowding and crowding influences have yielded useful findings, but they have significant limitations with respect to developing a deeper understanding of the overall nature or quality of wilderness experiences. (To be fair, many of these studies were never intended to address the overall nature of experiences.) It is important to note that solitude is only one of many potential dimensions of wilderness experiences and crowding may, in fact, influence other dimensions in complex ways (Watson and



Roggenbuck 1997). Borrie and Roggenbuck (2001) suggest that the writings of wilderness philosophers reference numerous important experiential dimensions other than solitude, including primitiveness, timelessness, oneness, humility, and care. They further suggest that “[t]he ideas of these writers not only heavily influenced the authors of wilderness legislation, but also continue to play a guiding role in the management of wilderness; they likely also influence how current users construct the meaning of the wilderness” (2001:211).

The last part of the preceding quotation points toward a second limitation of previous wilderness-experience studies. Those investigations have typically viewed wilderness experience as a kind of response by a goal-directed individual to a collection of objective setting attributes. A common purpose of research adopting this perspective is to identify and quantify levels of setting attributes (e.g., visitor density, encounter rates) that elicit consistent responses from visitors (e.g., perceived crowding, behavioral responses). Emphasis on generalized site attributes and consistent responses may obscure or simply fail to capture what is uniquely valuable about a particular wilderness place or an individual’s experience of it. In the alternative perspective implied by Borrie and Roggenbuck, wilderness experiences are viewed as windows into participants’ on-going constructions (emergent stories) of the world and their places in it. Rather than responding in predictable fashion to site attributes, wilderness visitors in this latter perspective are understood to *relate* to

places, which are geographic spaces imbued with personal and cultural meanings (Williams and Patterson 1999). Researchers adopting this perspective usually gather, analyze, and report on data in qualitative (narrative) form.

The goal-directed perspective on experience is understandably attractive because it purports to link the nature of wilderness experiences to objective setting conditions, some of which might be easily monitored and manipulated by managers. However, with respect to crowding influences in particular, research has so far shown few consistent relationships between setting conditions and visitors’ evaluations of the overall nature or quality of their experiences (Cole 2001). It may be that further methodological refinements will tease out these relationships, but it might also be argued that, in order to understand the full range of wilderness experience dimensions, a wholly different perspective is called for, one capable of capturing “the depth and durability of the meaning of wilderness in [visitors’] lives” (Dustin 2000:55). An expanded perspective on wilderness experience research seems particularly appropriate at a place like Gates, where extremely low use numbers mean that crowding is unlikely to be a salient experience dimension for most visitors, and a long history of wilderness advocacy has resulted in a rich layering of landscape meanings.

Unfortunately, qualitative knowledge from studies of the deeper meanings of wilderness experiences has not typically been incorporated into management planning efforts. Almost by

definition, a perspective that emphasizes the emergent and deeply personal nature of experiences is at odds with indicator-based planning frameworks, which call for “knowledge that is prescriptive and predictive” (Borrie and Birzell 2001). However, the study described in this paper was developed from the perspective that the application of multiple approaches can yield greater understanding, and ultimately better stewardship, of wilderness and wilderness experiences (Borrie et al. 2001; Watson and Roggenbuck 1997).

Qualitative approaches are useful for exploratory research, when little is known about the nature of experiences or significant influences on them. More importantly though, qualitative approaches can be used to understand the meanings that visitors associate with a given place and the experiences they receive there, and how wilderness and wilderness experiences fit into the larger context of their lives. Traditional quantitative approaches, on the other hand, have typically focused on the events of a trip—what visitors encounter, rather than what they take home with them. While qualitative approaches are important for understanding the nature and significance of experiences, quantitative approaches are invaluable for developing the kind of generalizable, predictive knowledge that indicator-based planning frameworks call for. With these respective strengths and weaknesses in mind, the Gates study was conducted in two separate phases: the first relying on qualitative visitor interviews, and the second on quantitative data gathered

via a mail-back questionnaire.

Study Methods

Thirty-two separate interviews were conducted with a total of 94 visitors during the 2001 summer season (June–August). Visitors were purposefully selected to represent different combinations of several stratifying variables (exit location, guided/independent travelers, activity, time of season) in an effort to capture a range of different types of experiences. All interviews were conducted in one of three park access points, immediately following the completion of participants’ trips. Interviews were open-ended and flexible. However, the interviewer employed a written guide that included a series of themes and lead-in questions to assure that interviews produced relevant and comparable information (Patterson and Williams 2002). All interviews were tape-recorded and transcribed verbatim. A rigorous interpretive analysis produced a list of experience elements and factors of influence that were prevalent within the collection of interview texts. The experiential elements were then organized into hypothesized dimensions of visitor experiences to facilitate discussion and presentation.

The experience elements and factors of influence identified in the first phase of research were used to develop a questionnaire, which was the primary data collection tool used in Phase II of the study. Two hundred forty-two questionnaires were mailed to the homes of visitors who had been contacted in park gateways at the beginning of their visits. A total of 201



Kobuk River at Walker Lake.

questionnaires were completed and mailed back (83% response rate). Common factor analysis was used to identify dimensions (factors) of wilderness experiences at Gates, based on visitors' indications of agreement with each of 41 experience statements (responses could range from "strongly disagree" (-2) through "not applicable" (0) to "strongly agree" (+2)). Common factor analysis was also used to identify general groups of factors of influence from a list of 26 potential influences on visitors' experiences that was included in the questionnaire. In addition to these items, trust in the National Park Service—

assessed via a scale created from six questionnaire items—was examined as a potential factor of influence on experience dimensions at Gates. Next, a series of regression models was used to assess the relationship between specific dimensions of visitors' experiences, and grouped factors of influence. Finally, results from the factor and regression analyses were used to inform the discussion of potential experience indicators.

Study Findings

Phase 1. Over 1,000 pages of transcription were produced from the Phase I qualitative interviews. In the

process of analyzing these texts, a number of prevalent experience elements were identified (Table 1). Visitors described their experiences in terms that reflected some of the central themes within the Wilderness Act, but the exact nature of the themes they described, and the relationships between them, are not wholly captured in that legislation. For instance, solitude was not a prevalent theme in visitors' narratives, but the related feeling of remoteness was frequently described. Seeing few other people was clearly important to visitors' experiences of remoteness, but at the same time, actual encounters were often mediated by the perception of shared values, and some visitors described their encounters with others as highlights of their trips. For example, Paul and George had this to say:

P: And the human encounters were actually very much more pleasant and personable and even intimate than you would have with a stranger in the city....

G: Out here, the few experiences we had with other people had kind of like a caring aspect. Like, are you doing OK? Do you need anything clean or dry?

Like solitude, relative freedom from management influence (“unconfined recreation”) is often interpreted from the Wilderness Act as an important element of wilderness experiences. Visitors at Gates enjoyed the lack of access restrictions, and their many opportunities to freely make and change plans, and practice self-reliance. However, as the following interview excerpt illustrates, they did not always view the lack of management influence in a positive light.

Troy: Most places we've ended up going I've noticed that the Park Service at least keeps track of how many people go in or out, as a minimum [by requiring visitor registration]. That was not apparent here ... it was unclear to me whether Gates was well enough watched over.

Table 1. Prevalent experience elements identified within Gates of the Arctic visitor interviews

Contrast to Other Parks or Wildernesses	Far from Help	Changing Plans
Remoteness	Risk	Freedom
Far North	Navigating	Feeling of Being the First Visitor
Timelessness/Arctic Time	Physical Challenge/Facing Adversity	Interaction with Wildlife
Large Scale	Scenic Beauty	Visiting as a Statement of Values
Human History	Wildlife	Perception that Visitors Share Similar Values
Weather	Little Evidence of Humans	Preserving Wilderness Qualities
Mosquitoes	Uncertainty/Limited Information	Management

Space limitations preclude a more complete discussion of the various experience elements that emerged from the visitor interviews. However, the preceding short excerpts illustrate a few of the complexities inherent to wilderness experiences, and the ways that visitors embed their experiences in the larger context of their lives. For Paul and George, encounters were highly positive precisely because of the contrast they offered to daily life in the city. Similarly, Troy's experiences at other parks influenced his interpretation of regulations as signs of good stewardship rather than as restrictions on his personal freedom.

Phase II. Common factor analysis with oblique Varimax rotation was used to assess patterns across visitors' responses to the experience statements that were included in the Phase II questionnaire. Five underlying factors (dimensions) of visitors' experiences were identified. All of the items (experience statements) within each of the five dimensions loaded significantly on only that dimension. The five dimensions and the statements they represent (verbatim from the questionnaire) are presented in Table 2.

The remoteness, similarity of values, and stewardship themes briefly described in the preceding section are all captured within the "Taste of Gates" experience dimension. Almost the entire sample of visitors (98.5%) agreed or strongly agreed that they experienced this particular dimension. Similarly, the vast majority of respondents agreed that they experienced the "Untrammelled Wildlife" dimension (94.5%), and the "Freedom from Rules and

Regulations" (93.5%) dimension as well. Just over half of respondents (58.5%) agreed with having experienced the "Challenge of Access" dimension, and one-third of them (32.5%) agreed with having experienced the "Risk and Uncertainty" dimension.

After the broad experience dimensions were identified, mean influence scores were calculated for each of the different potential items of influence. Visitors were asked to indicate how each item affected their Gates experience, and responses were converted to a metric three-point scale with values of (-1) representing "negative," (0) for "both negative and positive" or "no influence," and (1) for "positive." Common factor analysis with orthogonal Varimax rotation was used to assess patterns across visitors' responses to the influence items. Five general factors of influence were identified, and are presented with their significant component items (factor loading scores >0.40) and mean influence scores in Table 3.

With the addition of the trust scale that was also included in the questionnaire, a total of six factors of influence (out-group interaction, management interaction, wildlife presence, air flight, human behavior, trust) and five experience dimensions were identified. Regression modeling showed that the "Taste of Gates" experience dimension was significantly influenced by the factors "management interaction" and "trust in the NPS." The "Freedom" dimension was also significantly influenced by "management interaction." At current levels, management interaction and trust

Table 2. Factors (dimensions) of visitor experiences at Gates of the Arctic, with corresponding significant items (factor loading scores >0.40)

Factor and Items ^a	Factor Loading
Factor 1: "A Taste of Gates"	
<i>The managers at Gates are doing a good job.</i>	0.644
<i>Most Gates visitors are concerned about limiting their impacts.</i>	0.545
<i>The landscape felt big.</i>	0.489
<i>Management practices at Gates are effective at protecting wilderness qualities.</i>	0.489
<i>I felt a sense of discovery.</i>	0.488
<i>My visit says a lot about my personal values.</i>	0.477
<i>I felt that I was free from the clock.</i>	0.446
<i>In some places I felt like I might have been the first visitor.</i>	0.430
<i>I felt that I was far from civilization.</i>	0.413
Factor 2: "Freedom from Rules and Regulations"	
<i>I did not feel constrained by park management practices.</i>	0.916
<i>I did not feel constrained by regulations.</i>	0.616
Factor 3: "Challenge of Access"	
<i>It was difficult to find information about the destination or travel route I had planned.</i>	0.777
<i>It was difficult to find information about Gates.</i>	0.749
<i>Getting to Gates was difficult.</i>	0.424
Factor 4: "Untrammeled Wildlife"	
<i>I saw a lot of wildlife.</i>	0.798
<i>I saw a lot of evidence of wildlife.</i>	0.683
<i>I enjoyed seeing animals in their natural habitat.</i>	0.518
<i>The animals were not used to seeing people.</i>	0.494
<i>Seeing animals in Gates was different than seeing them in other places.</i>	0.419
Factor 5: "Risk and Uncertainty"	
<i>I often felt my safety was at risk.</i>	0.614
<i>I was frequently uncertain about what would happen next.</i>	0.508
<i>I encountered challenging weather conditions.</i>	0.461

a. Common factor analysis with generalized least squares extraction and oblique Varimax rotation was used to identify experience factors (dimensions).

both influence these dimensions in a positive manner. There were no major factors of influence that significantly affected the "Challenge of Access" dimension; however, the "air-flight" factor combined with the individual item "physical development by humans" did have a significant nega-

tive influence on this dimension. The "Untrammeled Wildlife" dimension was significantly influenced by the "wildlife presence" factor. Lastly, the "Risk and Uncertainty" dimension was significantly influenced by "management interaction" and "out-group interaction." For the one-third of visi-

Table 3. Factors of influence on visitor experiences at Gates of the Arctic, with corresponding significant items (factor loading scores >0.40) and mean influence scores

Factor and Items ^a	Factor Loading	Mean Influence ^b
Factor 1: “Out-group interaction”		0.30
<i>Encountering groups of more than 6 people</i>	0.909	0.13
<i>Encountering guided commercial groups</i>	0.882	0.16
<i>Being aware of other visitors camping nearby</i>	0.637	0.01
<i>Number of other visitor groups encountered</i>	0.537	0.39
Factor 2: “Management Interaction”		0.41
<i>Receiving a backcountry orientation from a park ranger</i>	0.923	0.34
<i>Registering with the Park Service</i>	0.685	0.40
<i>Receiving information about Leave-No-Trace techniques</i>	0.644	0.49
<i>Interaction with park employees in the office or town</i>	0.544	0.65
<i>Availability of free bear-barrels from the Park Service</i>	0.444	0.45
Factor 3: “Wildlife Presence”		0.90
<i>Observing behavior of wildlife</i>	0.988	0.90
<i>Seeing animals in their natural habitat</i>	0.803	0.92
<i>Seeing evidence of wildlife</i>	0.601	0.93
Factor 4: “Air Flight Influences”		-0.21
<i>Seeing or hearing scheduled commercial planes</i>	0.878	-0.27
<i>Seeing or hearing other types of aircraft</i>	0.772	-0.18
<i>Seeing or hearing bush planes</i>	0.736	-0.13
Factor 5: “Human Behavior Influence”		0.16
<i>Behavior of other visitors</i>	0.724	0.16
<i>Encountering subsistence activities</i>	0.537	0.05

a. Common factor analysis with generalized least squares extraction and orthogonal Varimax rotation was used to identify factors of influence.

b. Means represent influence on overall experiences, based on a metric three-point scale with values ranging from (-1) to 1. Both the direction and magnitude of influence may differ for specific experience dimensions.

tors who experienced this dimension, the effect of management interaction was positive and the effect of out-group interaction was negative.

Discussion and Conclusions

This study began with an expanded perspective, one that was relatively unconstrained by the Wilderness Act or previous research that has typically focused on a few selected aspects of the wilderness experience. Visitors

were allowed to describe their experiences in their own words, and what they described were events made meaningful by comparison and contrast with a variety of other life situations. Findings from the first, qualitative phase of this study allow managers to see beyond mere trip characteristics to understand the deeper nature of Gates visitor experiences, as well as their own stewardship roles relative to those experiences.

In the second, quantitative phase of this study, certain experience dimensions were found to be widely distributed across the Gates visitor population. Any attempt to select indicators that are relevant to current experiences at the park clearly needs to address these dimensions, described here as “A Taste of Gates,” “Freedom from Rules and Regulations,” and “Untrammelled Wildlife.” While not as broadly distributed, “Challenge of Access” and “Risk and Uncertainty” are also important dimensions of current park experiences that managers may choose to protect. In fact, these dimensions may represent what is most unique about the experience opportunities available at Gates.

Measuring the distribution of experience dimensions is useful for assessing the relevance of potential indicators, but relevance is just one of the numerous desirable characteristics of indicators that have been identified. Previous literature (e.g., Stankey et al. 1985; Merigliano 1990) has suggested that indicators also be measurable, reliable, cost-effective, significant, sensitive, responsive, and efficient. Roggenbuck et al. (1993) focused on the efficiency criterion (ability to capture or reflect multiple conditions in order to reduce the number of parameters that must be monitored) by using factor analysis to group items that may influence wilderness experiences. The study reported here builds on that work by similarly determining groups of influence items (factors), and then going a step further to link those factors with experience dimensions that are specific to Gates. Combined with the deep understanding developed in

the first, qualitative phase of investigation, knowledge generated from this quantitative work provides managers with a solid foundation for selecting indicators that are both relevant and efficient. Actual selection of indicators might occur as follows.

Regression modeling determined that the multifaceted “Taste of Gates” experience dimension was positively influenced by the “management interaction” factor. A closer examination of the items included in this factor shows that the highest-loading item was “receiving a backcountry orientation from a park ranger” (Table 3). From the qualitative interviews, it is known that at least some visitors regard management actions and interactions as signs of good stewardship. Therefore, it makes sense that this item would positively influence visitors’ experiences—or, conversely, that lack of management interaction could negatively affect experiences. The high factor-loading score indicates that this item is strongly correlated with the other items in the group. In other words, it could serve reasonably well as a surrogate for any of the other items. Therefore, based on Phase I qualitative data and this quantitative analysis, “the proportion of visitors receiving a backcountry orientation” would be a relevant and efficient indicator of the “Taste of Gates” experience dimension. This indicator would differ from more common LAC-type indicators in that it calls for setting some minimum standard (e.g., “at least xx percent of visitors receive an orientation”) rather than establishing a standard of maximum acceptable impact as a means of balancing con-

flicting objectives.

This potential indicator, and any others selected in a similar manner, would all share the desirable characteristics of relevancy and efficiency. However, it is important to remember that monitoring indicators such as these would tell only part of the story about wilderness experiences at Gates. The LAC and other indicator-based planning frameworks focus attention on visitor responses to on-site conditions, but, as visitors' own words reveal, the full story of a wilderness experience necessarily extends

beyond the spatial and temporal boundaries of an individual wilderness visit. Expanded conceptual and methodological approaches to studying wilderness experiences are clearly useful for informing the selection of indicators, but their real value may be found in helping managers to identify what is uniquely valuable about wilderness experiences and to understand the emerging and evolving relationships that visitors share with wilderness places.

References

- Borrie, W.T., and R. Birzell. 2001. Approaches to measuring quality of the wilderness experience. In *Visitor Use Density and Wilderness Experience Proceedings*. W.A. Freimund and D.N. Cole, eds. Proceedings RMRS-P-20. Ogden, Ut.: U.S. Department of Agriculture–Forest Service, Rocky Mountain Research Station, 29–38.
- Borrie, W., W. Freimund, M. Davenport, and R. Manning. 2001. Crossing methodological boundaries: assessing visitor motivations and support for management actions at Yellowstone National Park using quantitative and qualitative research approaches. *The George Wright Forum* 18:3, 73–83.
- Borrie, W.T., and J.W. Roggenbuck. 2001. The dynamic, emergent, and multi-phasic nature of on-site wilderness experiences. *Journal of Leisure Research* 33, 202–228.
- Cole, D.N. 2001. Visitor use density and wilderness experiences: a historical review of research. In *Visitor Use Density and Wilderness Experience Proceedings*. W.A. Freimund and D.N. Cole, eds. Proceedings RMRS-P-20. Ogden, Ut.: U.S. Department of Agriculture–Forest Service, Rocky Mountain Research Station, 11–20.
- Dustin, D.L. 2000. Mapping the geography of hope. In *Wilderness Science in a Time of Change Conference, Volume 2: Wilderness within the Context of Larger Systems*. D.N. Cole, S.F. McCool, W.A. Freimund, and J. O'Loughlin, comps. RMRS-P-15-VOL-2. Ogden, Ut.: U.S. Department of Agriculture–Forest Service, Rocky Mountain Research Station, 55–57.
- Glover, J.M. 1986. *A Wilderness Original: The Life of Bob Marshall*. Seattle: The Mountaineers.
- Merigliano, L.L. 1990. Indicators to monitor the wilderness recreation experience. In *Managing America's Enduring Wilderness Resource: Proceedings of the Conference*. D.W. Lime, ed. Minneapolis: Tourism Center–Minnesota Extension Service, and Minnesota Agricultural Experiment Station–University of Minnesota, 156–162.
- National Park Service. 1986. *General Management Plan/Land Protection Plan/Wilderness Suitability Review: Gates of the Arctic National Park and Preserve*. Fairbanks, Ak.: United States Department of the Interior, National Park Service.
- Patterson, M.E., and D.R. Williams. 2002. *Collecting and Analyzing Qualitative Data: Hermeneutic Principles, Methods, and Case Examples*. Chicago: Sagamore.
- Roggenbuck, J.W., D.R. Williams, and A.E. Watson. 1993. Defining acceptable conditions in wilderness. *Environmental Management* 17, 187–197.
- Stankey, G.H., D.N. Cole, R.C. Lucas, M.E. Peterson, and S.S. Frissell. 1985. *The Limits of Acceptable Change (LAC) System for Wilderness Planning*. General Technical Report INT-176. Ogden, Ut.: U.S. Department of Agriculture–Forest Service, Intermountain Forest and Range Experiment Station.
- Watson, A.E., and D.N. Cole. 1992. LAC indicators: an evaluation of progress and a list of proposed indicators. In *Ideas for Limits of Acceptable Change Process: Book Two*. L. Merigliano, ed. Washington D.C.: U.S. Department of Agriculture–Forest Service, Recreation, Cultural Resources, and Wilderness Management Staff, 65–84.
- Watson, A.E., and J.W. Roggenbuck. 1997. Selecting human experience indicators for wilderness: different

approaches provide different results. Pp. 264-269 in *Wilderness and Natural Areas in Eastern North America: Research, Management, and Planning*. D.L. Kulhavy and M.H. Legg, eds. Nacogdoches, Tex.: Stephen F. Austin State University, Center for Applied Study in Forestry, 264-269.

Williams, D.R., and M.E. Patterson. 1999. Environmental psychology: mapping landscape meanings for ecosystem management. In *Integrating Social Sciences with Ecosystem Management*. H.K. Cordell and J. Bergstrom, eds. Champaign, Ill.: Sagamore, 141-160.

Brian Glaspell, U.S. Fish and Wildlife Service, 1011 East Tudor Road, Anchorage, Alaska 99503; brian_glaspell@fws.gov

Alan Watson, Aldo Leopold Wilderness Research Institute, P.O. Box 8089, Missoula, Montana 59807; awatson@fs.fed.us

Katie Kneeshaw, Aldo Leopold Wilderness Research Institute, P.O. Box 8089, Missoula, Montana 59807; kkneeshaw@fs.fed.us

Don Pendergrast, Gates of the Arctic National Park and Preserve, 201 First Avenue, Fairbanks, Alaska 99701; don_pendergrast@nps.gov



Made available by permission of The George Wright Forum, Volume 20, Number 3.
Copyright © 2003 The George Wright Society. All rights reserved.