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The Challenge of Doing Science in Wilderness: Historical, Legal, and Policy Context

Lands designated by Congress under the Wilderness Act of 1964 (Public Law 88-577) offer unique opportunities for social and biophysical research in areas that are relatively unmodified by modern human actions. Wilderness designation also imposes a unique set of constraints on the methods that may be used or permitted to conduct this research. For example, legislated restrictions on mechanical transport potentially make access difficult in large and remote wildernesses, while restrictions on motorized equipment and installations may prevent use of certain tools, data loggers, standard monumentation methods, and other routinely used scientific techniques. Wilderness is also managed by four federal agencies in two departments (the Forest Service in the Department of Agriculture and the National Park Service, Bureau of Land Management, and Fish and Wildlife Service in the Department of the Interior) that may interpret wilderness legislation differently, and have different policies regarding scientific activities in wilderness (Butler and Roberts 1986). Legal restrictions and agency differences, combined with a general lack of effective communication between managers and scientists, have led to increasing concern among wilderness managers (Bayless 1999; Barns 2000) and scientists (Franklin 1987; Bratton 1988; Peterson 1996; Eichelberger and Sattler 1994; Stokstad 2001) over lost opportunities for advancing science and improving wilderness protection.

Differences in perspective and motivation between scientists and managers are well known (e.g., Huenneke 1995; Bradshaw and Borchers 2000; Wilson and Lantz 2000), and may cause each to not consider the context, needs, and constraints of the other. For example, natural resource scientists may not fully understand the philosophical and legal basis, or policies, that are used to

manage wilderness, nor the impacts their activities may cause to a wide range of social and experiential values in wilderness (Underwood 1995). Commenting on these problems, Franklin (1987) suggested that "scientists can be arrogant and cryptic in their relations with managers and ... some may feel that research gives them a license to do whatever they please." Similarly, wilderness managers may

not fully understand or consider the potential benefits of a proposed activity to the local wilderness, or to the broader system of natural areas nationwide and to society at large.

The purpose of this paper is to improve the understanding of both managers and scientists about scientific activities in wilderness by selectively reviewing key aspects of the historical, legislative, and policy and management context for conducting scientific activities in wilderness. Throughout this paper, we refer to “scientific activities” as all activities related to the collection of natural, cultural, and social resource data, including research or inventory and monitoring activities, conducted by academic, private, or agency personnel. While the legal mandate for wilderness is unique, the challenges and concerns discussed in this paper may also apply to other areas similarly managed for their natural values. This paper is based on the premise that mutual understanding will lead to improved communication between managers and scientists, in turn improving the likelihood that science will be one of the “principal tools in assuring the future preservation of wilderness” (Parsons and Graber 1991)—a goal common to both groups.

Historical Context for Science in Wilderness

The contribution of natural areas such as national parks and wilderness to science, and the contribution of science to the long-term preservation and stewardship of these areas, is reviewed by Stankey (1987), the National Research Council (1992), Parsons

(2000), and Graber (2002). This mutually beneficial relationship was recognized early on by Albright (1933), who described the contribution of science to improving management of the national parks, as well as the “incalculable value of the national parks and monuments as research laboratories.” Several of Aldo Leopold’s writings speak to the importance of science in wilderness (Nash 1982). For example, Leopold (1941) commented that “all wilderness areas ... have a large value to land science.... [R]ecreation is not their only or even their principal utility.”

Howard Zahniser, principal author of the Wilderness Act of 1964, demonstrated his support for the scientific value of wilderness in several ways. He wrote that “the wilderness has profoundly important scientific values” for both education and research, and that wilderness provides two research uses: “they afford the scenes for fundamental investigations of the natural world of living creatures unmodified by man” and “they afford also ‘check’ areas where none of the factors being compared in a particular study (land-use research, for example) have been operative” (Zahniser 1956). Zahniser also expressed concern that the scientific purposes of wilderness might be compromised by recreation use (Leopold 1960). In congressional hearings on the proposed Wilderness Act, Zahniser (1962) commented that “the scientific potentials in wilderness preservation should be strongly emphasized. This was well done in the statement presented by Ernest Dickerman.... I should like to be associated with his brief but urgent presen-

tation of the scientific, or research, values of wilderness.” In these hearings, Dickerman (1962) stated that “it is entirely possible that the sort of scientific study which can be conducted only in wilderness ... will yield knowledge concerning the laws of nature that will become one of the greatest values derived from wilderness.” Later, Zahniser (1963) commented that “it may be that the scientific values will come to be considered the greatest of all the values of wilderness and wildland natural areas.”

Legislative Context for Science in Wilderness

The Wilderness Act of 1964 recognizes the scientific value of wilderness in two ways: by defining wilderness in Section 2(c) as an area that may also contain scientific value, and by stating in Section 4(b) that wilderness “shall be devoted” to a variety of “public purposes,” including scientific use. In Section 4(c), the act also lists specific activities that are prohibited in wilderness, stating that “except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act ... there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.” In other words, *if* a proposed activity is “necessary” for the “minimum requirements for the administration of the area for the purpose of this Act,” *then* these prohibitions may be relaxed. However, “necessary” and “minimum requirement” are not defined in the Wilderness Act

or in other wilderness legislation, leading to different criteria used by different people in different situations for defining which types of scientific activities are appropriate in wilderness. Anderson (1999) offers an example of how this phrase from the 1964 Wilderness Act was interpreted in evaluating a proposal for theoretical geological research in Death Valley Wilderness in California. In this case, the administering office determined that the project fulfilled the “necessary for the administration of the area” mandate of the Wilderness Act, and negotiations with the researcher led to extensive modifications in the proposed methods to protect the wilderness resource.

The phrase “for the purpose of this Act” in Section 4(c) is also interpreted differently by different people. Some consider the “purpose” of the Wilderness Act to be the protection and preservation of the “wilderness character” of the area. This notion is reinforced by the testimony before Congress of Zahniser (1962), who stated that “[t]he purpose of the Wilderness Act is to preserve the wilderness character of the areas to be included in the wilderness system, not to establish any particular use.” Others consider this “purpose” to be much broader: to secure “the benefits of an enduring resource of wilderness,” and that these benefits are “recreational, scenic, scientific, educational, conservation, and historical use” (Sections 2(a) and 4(b), respectively, of Wilderness Act of 1964). This broader view considers scientific activities to be an integral part of wilderness. Recent wilderness legislation, such as

the California Desert Protection Act of 1994, supports this latter interpretation by stating that one of the goals of this Act is to “retain and enhance opportunities for scientific research in undisturbed ecosystems” (Public Law 103-433, Section 2(1)E).

Policy and Management Context for Science in Wilderness

In keeping with the broad legislative intent of the Wilderness Act of 1964, the four wilderness agencies developed policies that generally support the conduct of scientific activities in wilderness. These policies also contain specific constraints on research and other scientific activities (Parsons 2000). The Forest Service manual (Section 2324.4), for example, states that Forest Service policy is to “encourage research in wilderness that preserves the wilderness character of the area,” and then directs managers to “review proposals to conduct research in wilderness to ensure that research areas outside wilderness could not provide similar research opportunities.” These policies and constraints have been translated into a few formal and many informal procedures for evaluating whether scientific activities should be approved or denied.

Currently, only the National Park Service has a formal agency-wide permit system for research and collecting specimens (Bayless 1999). This permit system (accessible over the internet; National Park Service 2003) contains guidelines to researchers for submitting proposals, asking them to describe how the project adheres to wilderness “minimum requirement” and “minimum tool” concepts. None

of the other agencies have agency-wide guidelines, leaving evaluation procedures to the individual, often local, administrative offices. While such practice allows local flexibility, inconsistent evaluation procedures may lead to the perception of arbitrary and capricious decisions in approving or denying proposals for scientific activities in wilderness. Eichelberger and Sattler (1994), for example, discuss their frustration with the administrative process for reviewing their proposal, which took three years and cost \$1 million, to study volcanic features in the Katmai Wilderness in Alaska. They conclude that the review process was so difficult because “there is no clear policy on research in parks and wilderness,” and that “although it was clear from the outset that [our] proposal raised major policy issues, these were not addressed until years into the [review] process.”

Despite differences in interpreting legislative intent and policies among and within agencies, the following three questions, in various forms, are common to nearly all evaluations of proposed scientific activities in wilderness:

- Is the scientific activity necessary for the management of the area as wilderness?
- Is it necessary to conduct the scientific activity in wilderness?
- Will the scientific activity cause unacceptable impacts to wilderness?

The first question is based on wording in Section 4(c) of the Wilderness Act (“except as necessary to meet minimum requirements for the

administration of the area for the purpose of this Act”) and has already been discussed.

The second question is largely based on the assumption that scientific activities are an intrusion and sometimes a threat to wilderness, and if the activity *could* be conducted outside wilderness, then it *should* be. While a valid consideration, exclusive emphasis on minimizing impacts may also lead to a lack of information about biophysical conditions, the meanings people derive from their wilderness experiences, and the effectiveness of management decisions and actions. In the long term, this lack of information may hinder protection and stewardship of wilderness, and make it more difficult to plan for its future.

Both Graber (1988) and Bratton (1988) argue that scientific activities that cause no more harm to wilderness than permitted recreation activities should be allowed. Bratton goes on to suggest that “wilderness managers should in some cases try to attract projects that could be done elsewhere so they obtain basic data on the wilderness site. Wilderness managers should consider the potential long-term benefits of gathering scientific information, even if it does not appear to be immediately useful; we are, after all, frequently short-sighted about what will be ecologically useful in two or three decades.” In other words, what information might be lost if the proposed activity was *not* conducted inside the wilderness? Graber’s and Bratton’s arguments are based on the premise that designated wilderness provides an increasingly unique opportunity to learn about the compo-

sition, structure, and functioning of relatively unmodified natural ecosystems, and that scientific activities clearly fit under the “recreational, scenic, scientific, educational, conservation, and historical” uses described in the Wilderness Act of 1964.

The third question is perhaps the most difficult since nearly all human activities cause impacts to wilderness. Acceptability of this impact, however, varies from one activity to another, from one situation to the next, and from one person to another, often with little consistency and without adequately defining what is meant by “acceptability” or “impact.” Acceptability can also change over time. For example, relatively pristine wilderness conditions are increasingly unique, and many scientists believe that ecological and social science activities within wilderness are of increasingly greater value beyond the boundaries of the wilderness to society at large. Many managers, however, are unwilling to accept impacts to an individual wilderness from scientific activities that provide only broad-scale and more loosely defined or potential societal benefits.

In addition, agency policies may direct managers to consider wilderness values first and foremost in deciding what types of activities are appropriate. For example, Forest Service Wilderness Manual direction (Section 2320.6) states that “where a choice must be made between wilderness values ... or any other activity, *preserving the wilderness resource is the overriding value*. Economy, convenience, commercial value, and comfort are not standards of management or use of

wilderness” (emphasis added). Under this policy, it is appropriate for management staff to question all scientific activities that may adversely affect the ecological or social values of wilderness, and to place wilderness values above other values.

This question about unacceptable impacts may lead to further questions about the appropriateness and acceptability of the methods used in the scientific activity. Scientific activities may be done in a variety of ways, each with specific trade-offs. Fire chronologies, for example, are needed to understand if current fire activity is within the natural fire regime of the wilderness. A fire chronology may be derived using a chain saw, but this approach clearly violates the motorized equipment prohibition of the 1964 Wilderness Act, and likely violates visitors’ sense of what is appropriate in wilderness. On the other hand, chain saws allow more precise cuts which damage the tree less, and a greater number of high-quality samples can be taken allowing more accurate and precise understanding of historic fire regimes. Hand saws are more appropriate in wilderness, but typically hand saws result in more tree damage and fewer, lower-quality samples resulting in less understanding of historic fire regimes. Oelfke et al. (2000) discuss these trade-offs regarding wolf research in the Isle Royale National Park wilderness, asking whether the ends (in this case, the restoration of wolf populations) justify the means (the handling and radio collaring of wolves). In such cases as this, decision-makers must weigh their need for information against the impacts caused by gather-

ing the information.

Conclusions

The clash between the cultures of management and science presents a formidable obstacle to using science to its maximum potential in protecting wilderness and in developing new knowledge about the functioning of natural and social systems in wilderness. The historical context shows that two leaders of the wilderness movement, Aldo Leopold and Howard Zahniser, clearly supported the scientific value and the scientific use of wilderness. The legislative context codifies this support for science in the Wilderness Act of 1964. The Wilderness Act also allows scientific activities that would otherwise be prohibited in wilderness, if these activities are “necessary to meet minimum requirements for the administration of the area for the purpose of this Act.” Based on this historical and legislative context, we conclude that there is an active and positive role for science in wilderness. The policy and management context, however, shows that there are several opportunities for ambiguity and differences in interpretation, and therefore confusion and frustration regarding the conduct of scientific activities in wilderness.

To help reduce confusion and frustration, and improve communication between managers and scientists, we suggest that guidelines be developed for evaluating proposals for scientific activities in wilderness. These guidelines would explicitly address the contextual issues raised in this paper, and provide a structured process to comprehensively and systematically evalu-

ate the benefits and impacts of proposed scientific activities. Such guidelines would provide the means for documenting the many assumptions and judgments inherent in the evaluation process. Importantly, a structured process would provide managers the means to explain and defend their decision regarding a proposed scientific activity. Such a process would also provide scientists the means for understanding how their proposal would be evaluated. When both managers and scientists understand and

use such a process, there is strong incentive for both to communicate and negotiate with one another: for the scientist, to improve the likelihood of the proposal being approved; for the manager, to maximize benefits and minimize impacts of the proposed study. Adopting such guidelines across all four wilderness-managing agencies would be a small, yet important step towards greater integration and consistency in stewardship across all units of the National Wilderness Preservation System.

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