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Using Research into the Human Dimensions of Natural Resource Management to Enhance Science-Informed Decisions

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Session overview

In an era of rapid environmental change and uncertain futures, context-specific information about how stakeholders relate to resources and resource management will become increasingly important in designing effective and durable natural resource management strategies. In this session, invited panelists provided examples of contributions from various social science disciplines to natural resource management. Discussion with the audience emphasized the social nature of preferences for park resources and management actions, potential to integrate disciplines beyond the social sciences to better understand human dimensions of natural resource issues, and future directions for human dimensions research.

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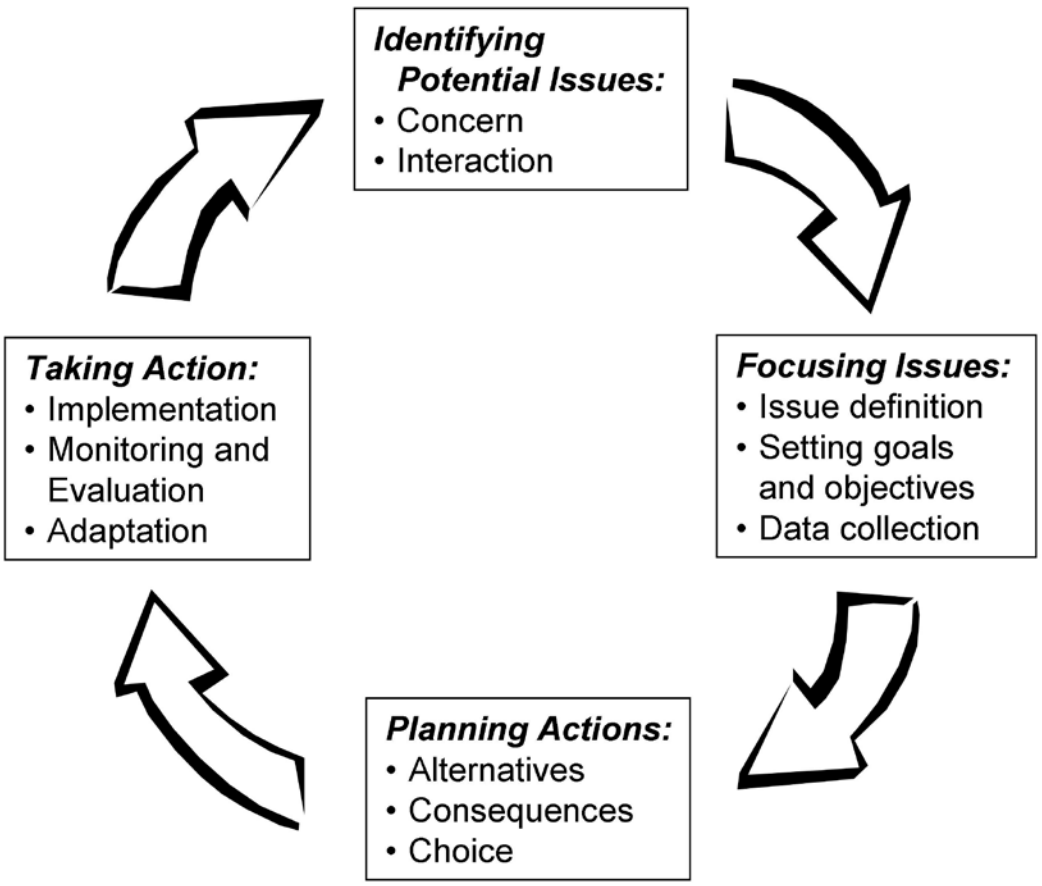
Introduction

Human dimensions are the aspects of resource management and decision-making that involve value judgments, especially around: how and why people value resources, the benefits people seek and derive from them, and how people affect and are affected by resources and their management. Human dimensions practitioners work at two main levels. They conduct research to empirically understand audiences and management contexts, drawing from an array of social science disciplines, including: sociology, anthropology, psychology, geography, and economics. In addition, they utilize this knowledge to assist in designing management interventions directed towards people, such as problem analysis, public engagement processes, and communication or behavior change strategies. To effectively diagnose and address issues and connect managers with the appropriate disciplinary experts, human dimensions specialists in natural resource management agencies must be conversant in the range of social science disciplines, methods, and how they relate to the evolution of management issues (Figure 1). Panelists represented three areas of applied disciplinary expertise to provide examples of the range of contributions from various social sciences at all stages of natural resource issue-evolution (Leong et al. 2006).

Katherine McComas: Risk perception and communication

Risk communication can take place in many venues—from the front page of the New York Times, to the Centers for Disease Control and Prevention (CDC) website, to local public meetings, the

Figure 1. The Issue-Evolution Model (reprinted with permission from Leong et al. 2006) can help guide practitioners in addressing natural resource issues as they evolve from vague concerns to full-blown issues. Human dimensions research and practice can enhance management at all stages of issue-evolution.



doctor's office, or trailheads in a national park. To better develop risk communication, it is essential to understand how risk communication influences people's attitudes and behaviors, as well as incentives and barriers people face in the context of risk communication.

One example is a current effort to develop risk messages that encourage greater awareness of the public health implications of climate change, species conservation, and biodiversity. Some of this research examines the "One Health" approach that advocates greater understanding of the linkages among human, environment, and wildlife health and well-being. One particular study that highlights how social science methods were used to examine One Health communication in national parks involved an investigation into the death of an NPS wildlife biologist in the Grand Canyon National Park (GCNP), Eric York, who died from the pneumonic plague, which he contracted from a mountain lion that he had necropsied a few days earlier (Wong et al. 2009). Soon after York's death, NPS officials began concerted efforts to communicate with GCNP employees, local residents, visitors, and media outlets about the risks of contracting plague and other zoonotic diseases at GCNP, as well as to describe efforts of NPS to protect employee, visitor, and wildlife health. No one was subsequently diagnosed with plague. Upon recommendations from epidemiological investigations, NPS enacted system-wide measures to modify employee policies, including those related to the safe handling of wild animals.

This incident identified a potential issue. In an effort to learn from it, and to improve communication to employees and visitors during future zoonotic disease-related emergencies, NPS initiated a collaborative effort with social scientists from Cornell University to understand the nature of risk communication throughout the York case. The overall goal was to analyze NPS's risk communication surrounding York's death, guided by principles and best practices outlined in the risk and crisis communication literature. To address this goal, the research team sought to understand the role of communication from the perspective of key participants. Desired outcomes were to examine communication in light of the One Health Initiative, which recognizes that animal, human, and ecosystem health are inextricably linked and should be addressed as one, and to offer guidance to park managers at GCNP and other park units for handling communication in similar incidents in the future.

To focus the issue, multiple methods were used to collect data on communication and related activities that occurred before and after York's death. These included interviews (n = 27) with individuals involved in the case, including GCNP employees, CDC officials, and journalists; media content analysis (n = 46 newspaper articles) to examine how local and national media portrayed the incident, such as whether these accounts tended to exaggerate or minimize the risk of humans contracting plague; review of internal and public NPS documents related to the case, including press releases, talking points, and investigation reports; and a two-day workshop held at GCNP to further understand the case from the perspective of those involved. Attendees were six Cornell researchers and 11 NPS affiliates representing a variety of GCNP park divisions and Washington Office programs. All were invited to recount their experiences and share their perspectives on the case.

Among outcomes of the collaborative effort were a checklist of "best practices" in communication for national park units to consider when preparing for or responding to a health risk event affecting humans and wildlife. These best practices integrated experiences from NPS with recommendations for risk communication available in the literature (especially those offered by the CDC). In addition, the results were published in the scientific literature to advance current scholarship on crisis communication offer guidance for future research (Rickard et al. 2012).

Robert Manning: Outdoor recreation management

The Park Studies Laboratory at the University of Vermont conducts a long-term program of re-

search for the NPS and other agencies. Most of this program of research employs social science theory and methods, though many studies are collaborative with natural scientists. Social science can be important in managing parks and protected areas because these areas accommodate millions of recreational visits each year, they are often embedded in or near local communities, they have important economic implications, and they are highly valued by the public. The program of research conducted by the Park Studies Laboratory is highly diverse, addressing the carrying capacity of parks and protected areas, management of outdoor recreation, analysis of trade-offs related to park management, environmental values and ethics, transportation in parks, and issues of social and environmental justice.

The Issue Evolution Model (IEM) in wildlife management is a useful conceptual framework for illustrating the ways in which social science research can contribute to park and protected area management (Hahn 1988; Leong et al. 2006). A program of social science research at Arches National Park, Utah conducted by the Park Studies Laboratory and collaborators (Manning et al. 1996; Manning 2007; Manning 2011; Manning and Anderson 2012) supported management of the park for outdoor recreation at all four "stages" of issue evolution. For example, a series of qualitative and quantitative surveys of visitors and other stakeholders helped Identify Potential Issues, the first stage of the model. These surveys asked respondents what they enjoyed most and least about their visits to Arches and to rate the importance of a number of potential issues in the park. A series of indicators of quality for the park experience were identified, including crowding at attraction sites and impacts to fragile soils and vegetation from visitors walking off maintained trails.

A subsequent survey of visitors was conducted to support the Focusing Issues stage. The objective of this survey was to develop standards of quality for the indicators of quality noted above. For example, visitors were presented with a series of visual simulations that portrayed a range of visitor use levels at park attraction sites such as Delicate Arch. At Delicate Arch, aggregate ratings of acceptability crossed into the unacceptable range at 30 people-at-one-time (PAOT) at Delicate Arch, and this was subsequently set as the minimum acceptable condition for crowding at this site.

The third stage, Planning Action, was addressed through a survey of visitors to Delicate Arch. Given that use limits were needed to maintain the standard of quality of 30 PAOT at Delicate Arch, respondents were asked to rate the acceptability of a series of management actions, such as requiring a permit to hike to Delicate Arch and limiting parking at the Delicate Arch trailhead. Ultimately, the National Park Service sized the parking lot at the trailhead to help ensure that there were never more than 30 PAOT at Delicate Arch.

The final study supported the fourth stage, Taking Action. A computer-based simulation model of visitor use of the park was developed to monitor the number of visitors at Delicate Arch and to estimate the maximum number of visitors that could be accommodated in the park per day without violating the crowding standard of quality at Delicate Arch. The model was constructed using visitor observations and counts and maps provided by visitors of their route of travel through the park.

Joe McCarter: Traditional ecological knowledge

Traditional ecological knowledge (TEK) is the cumulative body of environmental knowledge, belief and practice, held by indigenous and local people around the world (Berkes 2012). TEK accumulates over time in close contact with the environment, and as such represents the intersection between social and ecological systems. TEK can represent a deep and locally adapted source of knowledge, guides resource management over much of the world, and may be an important source of adaptive capacity to the future environmental change. Indeed, much of the world's bio-

diversity is in areas inhabited and managed by indigenous people, so TEK will continue to be critical over the coming decades (Gorenflo et al. 2012).

Social and natural scientists have used a variety of ethnographic and interview-based methods to research and describe TEK across the globe. These data, in general, show that TEK may be applicable to each stage of the Issue Evolution Model (Leong et al. 2006). In the first two stages (identifying and focusing issues), TEK may be valuable in a number of ways. For example, TEK can help to identify issues because it may encompass a rich body of knowledge about the environment, which can surpass and/or complement scientific understanding. One of the best examples comes from Micronesia, where Johannes described the rich TEK of Palauan fisherman and later demonstrated its usage for the management of marine resources (c.f., Johannes 1998). Moreover, TEK may be a useful means of re-framing issues and engaging with alternative worldviews, because it is rooted in indigenous understandings of the environment. In this context, TEK represents a "diversity of ways of thinking about problems" (Ford and Martinez 2000, 1250).

TEK can also be critical at the project planning and implementation stages. Because TEK often includes locally adapted governance mechanisms, it may be an efficient and effective means of affecting a variety of management outcomes. This has resulted in rapid growth of protected area strategies that include local and indigenous people, such as IUCN Categories V and VI and Indigenous and Community Conserved Areas. There are myriad examples of TEK being used in project planning and implementation: in one such instance, the US Fish and Wildlife Service has been working closely with indigenous elders in Alaska to form adaptive management plans for polar bears (*Ursus maritimus*) amid environmental change (Rinkevich, Greenwood, and Leonetti 2011).

TEK will be an important dimension of ongoing global conservation efforts and has a demonstrated value at each stage of the IEM. It remains to note two final points. First, any engagement with TEK from resource managers should be underpinned by a commitment to long-term and respectful partnership with TEK holders. In many indigenous communities, there are long histories of colonization and significant intellectual property concerns, and resource managers who seek to 'utilize' TEK without planning for long-term engagement may do significant harm. Second, the various strengths of TEK are inherently context specific and will be different across the globe. Therefore, engagement with TEK should be premised on deep local understanding and adjusted to the social and ecological context in which any management plan is situated.

Discussion

Presentations prompted a spirited discussion, with questions ranging from philosophical to specific resource topics. The first question asked whether all issues and threats to protected areas were ultimately social in nature. Panelists explained that while the biophysical components of protected areas are real, tangible objects, the fact that we draw boundaries around them and refer to them as "parks" is a profoundly social process that reflects conditions that society is trying to preserve. In that sense, all threats to parks are social because we define them as threats.

Audience members also were interested in the scope of disciplines covered by human dimensions, and questioned the focus on the social sciences. They asked about the role for philosophy, ethics, and analytical history in helping to think about how protected areas are valued, how those values change over time, who is included in the discussion, and potential risks of participants sharing knowledge and that knowledge being exploited (especially in the context of TEK, e.g., sharing spawning information and then being denied access to it). Panelists agreed that these disciplines bring additional insights that help us appropriately understand and incorporate different worldviews in natural resource management. But they also expressed that even the social sciences

are not yet fully integrated into management; while NPS employs natural scientists with expertise in a wide range of disciplines, it is often assumed that all social scientists are sociologists.

There were also logistical questions about conducting social science in parks, namely emerging technologies and processes for information collection approval by the Office of Management and Budget (OMB). New technologies (e.g., GPS tracking devices, internet surveys, apps, or tablets for data collection) may bring new insights, but they also may raise ethical, privacy, and policy questions. For example, is it appropriate to use technology to collect data in wilderness or with indigenous cultures? What considerations should be included to asses whether benefits outweigh costs? Emerging technologies also may not be allowed under the current OMB approval process, which was seen by session attendees to be a real barrier to conducting high quality and innovative social science research in parks. Panelists believed that legislative reform may be needed to see any change in the OMB approval process, although they recognized that the role of OMB is to ensure that data collected is necessary and serves parks.

At the same time, a number of suggestions were offered for research approaches that are under-utilized in parks. These include longitudinal studies, field experiments testing cause-and-effect relationships, and attention to relationships across or outside park boundaries. With global change, habitat fragmentation, pollution, and species migration, these trans-boundary relationships may be the biggest human dimensions problems faced by the NPS in the twenty-first century. We hope this session contributes by broadening awareness of the range of disciplines and expertise available to bring insight to these types of problems, at all stages of issue-evolution.

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