

## Barriers to Science-based Management: What Are They and What Can We Do About Them? (Session Summary)

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### Introduction

The George Wright Society (GWS) was founded in part to promote the application of knowledge to the protection, preservation, and management of parks and reserves. Recognizing that much of the knowledge needed for sound resource stewardship comes from science, the 1998 National Parks Omnibus Management Act (P.L. 105-391) directed the secretary of the interior “to assure that management of units of the National Park System is enhanced by the availability and utilization of the highest quality science and information” (quoted in Harmon 1999). Attendees at the GWS/CR2003 conference expressed interest in a variety of talks and sessions that addressed the role of science in management. In fact, the high level of interest in a workshop focused on barriers to the use of science was unanticipated. Approximately 50 workshop participants crowded into a small room so that many were standing, and those near the doors commented that a number of people were turned away because they could not physically fit into the room. This paper summarizes the workshop presentations and discussions.

Acknowledging that science is a process used to develop knowledge, the workshop was focused on scientifically derived knowledge and systematically collected data. Vita Wright, research application program leader at the Aldo Leopold Wilderness Research Institute, began the workshop with an overview of barriers identified during recent discussions with U.S. Forest Service recreation, fire, and invasive plant resource specialists and local decision-makers with wilderness responsibility. Personal barriers to the access and use of science include time management skills and habits, personal pressures, preferences, and attitudes toward science. Organizational barriers, those beyond the control of individuals, include funding, delegated workloads, training, and agency practices. Finally, barriers that are beyond the control of both the management agency and individuals include the availability and quality of information produced by the research community (Kearns and Wright 2002).

During the introduction, Wright also reviewed the “diffusion of innovation” theory as it applies to research application. Dependent on a “condition of receptivity” to new ideas, this theory describes the stages people go through when adopting innovations. These stages are: awareness, under-

standing, ownership, and then fitting the innovative idea or technique into an individual’s current understanding (Muth and Hendee 1980, as cited in Bunnell 1988). Understanding barriers as perceived by members of the management community can help managers and researchers prioritize technology transfer and research application efforts. This will be most effective when coupled with an understanding of social science theories, especially those addressing how people learn, make decisions, and adopt innovations.

Following the introduction, representatives from the National Park Service (NPS) and Bureau of Land Management (BLM) discussed efforts in which they have been involved that highlight the value of science and/or reduce barriers to using science.

### National Park Service

In fall 1999, NPS began implementing the Natural Resource Challenge (NRC). Under a multi-year plan, the Challenge provides new base funding targeted at promoting scientifically sound management of parks, increasing the scientific community’s involvement in providing information and in using the parks as laboratories, and facilitating education to engage the public as partners in resource preservation. Don Neubacher, superintendent

## Administrative and Intellectual Tools for Park Management

of Point Reyes National Seashore and co-chair of the NRC council, suggested that a successful science-based management program answers the following questions:

- What are we protecting and preserving?
- What is the condition of our resources?
- How does the condition of our resources change over time?
- What is the condition of resources outside park boundaries?
- What are the implications of these findings for parks and the larger systems in which they reside?
- What actions need to be taken for preserving species?
- How can this information be best communicated to the broader society?

Neubacher described several examples where systematically collected data and an understanding of science have supported management decisions at Point Reyes National Seashore in California. For instance, multi-year data showed a strong correlation between numbers of harbor seal (*Phoca vitulina*) pups and kayak use. Pup numbers were lower after kayak use increased and higher following kayak use restrictions. This relationship was evident at one of three locations, allowing managers to determine where kayak use had the greatest effect on seal pupping. In a second example, observers documented that fewer snowy plover (*Charadrius alexandrinus*) chicks died the year the park began educating weekend and holiday visitors. While further study was needed to be conclusive, it initially appeared that education efforts reduced disturbance by humans and dogs. Without these types of data, managers would have less information on which to base decisions and no documentation on the effectiveness of these decisions.

Neubacher cited a “lack of long-term credible data” and public opposition to proposed management actions as common barriers to science-based management. He suggested that managers need long-term research on which they can base good decisions. However, this needs to be coupled with extensive public discussion, outreach, and education. Neubacher concluded with two local

examples that coupled scientific data collection with raising public consciousness: the Tomales Bay Biodiversity Inventory (TBBI) and the Pacific Coast Learning Center at Point Reyes. Learning centers, which are park-based field stations, are being developed throughout NPS to facilitate both research and education about natural and cultural resources within national parks. The TBBI, supported by private foundation and individual funding, couples a comprehensive marine biodiversity survey with educational opportunities for the public to experience the scientific process first-hand while learning about the stewardship and conservation of marine systems.

### Bureau of Land Management

In June 2000, BLM created the National Landscape Conservation System. The NLCS includes national conservation areas, national monuments, wilderness and wilderness study areas, and wild and scenic rivers; these areas were designated to protect important scientific and ecological characteristics. Lee Barkow, director of BLM’s National Science and Technology Center (NSTC) and advisor to the agency’s Science Coordination Committee, discussed efforts within BLM to improve the use of science in management.

Barkow began with a brief overview of the history and mission of BLM. The fact that BLM has never employed scientists poses significant challenges to creating a link between science and management. Although the agency does not have a science mandate like the Omnibus Management Act, many of the laws it operates under require scientific information (e.g., Federal Land Policy and Management Act, National Environmental Policy Act, Endangered Species Act, Clean Water Act, and Clean Air Act). BLM has recently developed a science strategy, signed in 2000, which addresses the role of science in decision-making, provides a process to identify and prioritize science needs, and addresses the need to communicate those needs to science providers.

BLM has two formal groups that address science issues. The Director’s Science Advisory Board, an external committee com-

posed of academic and non-academic members, and the Science Coordination Committee, an internal committee composed of resource specialists representing various administrative levels. These committees provide the strategic and tactical views of science within the agency, respectively. In addition, the NSTC provides free science- and technology-related services to BLM employees. The NSTC provides free library services, synthesizes scientific information, identifies current technologies, and develops partnerships with science providers.

Barkow described several barriers to science-based management in BLM. Science does not have an identity in the budget process; therefore, efforts to improve science depend entirely on broad program support. Additionally, members of the internal Science Coordination Committee address science only as a collateral duty. Barkow noted that science is used by those within the agency who seek it, but its use is not always explicit or well documented. Finally, he cited technology transfer as often being the first target for reduction or elimination during tight budget years. Barkow suggested that science should be a part of the organizational culture, and that it should be valued and desired during the decision-making process. The agency needs full-time staff dedicated to science coordination and to technology transfer. To ensure that sound science is considered in the decision-making process, funding technology transfer should be a priority, and scientific information sources should be readily accessible to managers and resource specialists.

### Scientists' Perspectives

Two scientists, Jan van Wagtenonk, U.S. Geological Survey (USGS), and David Parsons, U.S. Forest Service (USFS), provided their perspectives on barriers as well as potential solutions. Van Wagtenonk began by reminding the audience that management is not "science-based," but rather it is "science-informed." Van Wagtenonk and Parsons commented that the scientific community does not offer much support for scientists conducting research application activities. Individual scientists are rewarded more for

developing knowledge and distributing it within the scientific arena than for extending the information to land managers. This is particularly true in the Department of the Interior, where experience on research-grade evaluation panels that evaluate the productivity levels of individual scientists shows that USGS offers less credit for research application efforts than does USFS. For research application to be effective, scientists in both agencies must take it upon themselves to extend information about the results and implications of their research. The outcome is that some scientists devote more time to research application, at the expense of developing and publishing new knowledge, than others.

Parsons noted that scientists are also challenged by the legal system (e.g., the 2000 Data Quality Act, P.L. 106-554, Section 515, and subsequent appeals), making literature syntheses and extrapolation of scientific findings to management issues risky. Van Wagtenonk concluded by saying that research application is a two-way street. He emphasized the point that if researchers take the time to summarize results for management audiences, then managers must take responsibility for reading those summaries. There's only so much distilling that a scientist can do without losing the meaning and appropriate application of research. Both scientists acknowledged that it is easier for researchers and managers to develop relationships and communicate about relevant research when the two groups are co-located, as is the case for some previous NPS scientists who now work in park-based USGS field stations.

### Workshop Discussion

The spirited discussion that followed the presentations focused largely on the need to extend scientific information, not only to the management community, but also to agency partners and the public. Ironically, a strong advocate of Point Reyes National Seashore complained about restrictions that keep her from traveling where snowy plovers, a species near extinction, nest. Concern was also expressed about the "myth" that managers can "let nature take its course" in parks, while

humans continue to develop and pave the landscapes outside parks and protected areas. The sentiment was that if the public better understood the science behind management decisions, they might be more supportive of those decisions.

Discussion also addressed the need to better fund research and research application efforts. Government agencies often are not eligible to compete for external grants. However, government employees interested in research application might investigate sources such as the new educational grants offered by the National Science Foundation. A member of the audience from the Northeast expressed concern that he often sees the same names on proposals submitted for special natural resource project funding under the NPS and USGS Natural Resource Preservation Program (NRPP). Unfortunately, while the NPS's NRC has increased the amount of NRPP funding, many managers and researchers still cannot, or do not, take advantage of it.

In addition to the aforementioned discussions, the audience offered a variety of other ideas to reduce barriers to science-based, or science-informed, management. Whereas Parsons and van Wagtenonk had mentioned the need to improve the reward system for scientists who emphasize research application, others suggested managers could be better rewarded for explicitly including science in management decisions. However, some audience members expressed skepticism that the latter could be effectively accomplished. On a different topic, the discussion ended with the comment that it would be easier for both managers and the public to use science if they had clarification on how specific research results fit within the context of entire ecosystems.

### Conclusion

In keeping with the GWS mission and conference objectives, the GWS/CR2003 conference included numerous presentations on the role and contribution of science to nat-

ural and cultural resource stewardship. In addition to the workshop described here, there was similar interest in a panel on "Science in the NPS: Where have we been? Where are we going?" With an emphasis on improving the use of science within NPS, that panel focused on cooperative ecosystem studies units, inventory and monitoring networks, and the role of the USGS in NPS science delivery.

Other science emphases at the conference addressed the role of parks as places to develop scientific knowledge, the evaluation of proposals for conducting scientific activities in wilderness, and efforts to integrate scientific knowledge and research with public education. It is my hope that, in addition to providing a forum for sharing information about the contribution of specific research efforts to resource stewardship, future GWS conference committees will continue to pursue—and recognize member interest in—dialogue on how to reduce barriers to science-based management.

### References

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