INTEGRATING SCIENCE AND MANAGEMENT

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Integrating Science and Management: The Road to Rico-Chico

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Introduction

THE VISION AND DIRECTION FOR SCIENCE-BASED MANAGEMENT OF NATURAL RESOURCES in the U.S. national parks was initiated with the National Park Service's Organic Act (1916), articulated by the National Parks Omnibus Management Act (1998), and formalized by the Natural Resource Challenge (1999). The progress and dedication to that vision we see in the NPS today would not be possible without the agency's critics, nor without the foresight and support of its leaders. Through new funding and staffing, the agency's Natural Resource Challenge formalized the Park Service's commitment to science-based stewardship of natural resources in the national parks.

To fully meet that commitment, we must take actions that facilitate and improve the integration of science, natural resource monitoring, and management decision-making. These actions should expand communication and collaboration by creating new partnerships between park managers and scientists. They should explicitly link NPS science programs and management in their objectives and processes.

If we are successful, what will emerge will be a new, innovative environment for learning, sharing, and applying new information and knowledge to management of the natural treasures protected by the National Park Service. Managers and scientists will integrate that information and knowledge—gained from research, monitoring, and management experimentation—to support relevant planning and informed decision-making about the resources entrusted to our care. Similarly, the experience and needs of managers will help guide research and monitoring efforts in parks. Together, scientists and managers will use adaptive concepts, strategies, and techniques to implement new knowledge in managing resources in accordance with the mission of the National Park Service.

The opportunity to strengthen the relationships between natural resource managers and scientists broadened with the

funding of several initiatives included in the Natural Resource Challenge. One of these initiatives was the Inventory and Monitoring (I&M) program. The program is charged with developing and implementing long-term, park-based, natural resource monitoring of key indicators, or "vital signs," of ecosystem health. Vital signs monitoring is a crucial component in the NPS's strategy to provide scientific data and information needed for planning, management decision-making, and education. The program organized some 270 park units into 32 I&M networks. Each network links parks that share similar natural resource values. The networks promote a collaborative approach among parks to sharing resources and integrating science (e.g., resource inventories, monitoring, and research) and park management. This year, the Vital Signs Monitoring program received funding for all 32 networks, and the expectations for successfully integrating science and park management are greater than ever.

The Rico-Chico task team

The successful integration of natural resource monitoring and research information into park planning and management is critical to the continued relevance of the I&M program. With all 32 networks expected to be conducting vital signs monitoring by 2009, establishing a strategy and framework that explicitly links science and management—and strengthens collaboration for adaptively learning, sharing, and applying new information to park management—is becoming increasingly imperative.

In 2005, the Intermountain Region I&M networks initiated an effort to directly engage park managers, planners, and I&M staff and scientists to improve communication and strengthen the integration of science and management. We organized and hosted two workshops focused on improving the integration of research and monitoring information with natural resource management in parks. The first workshop, held in Rio Rico, Arizona, in December 2005, brought together park superintendents, resource program managers, and I&M staff and scientists to address the needs and expectations of managers for science-based decision-making. "Rio Rico," as the workshop came to be known, resulted in the formation of the Rico task team, an interdisciplinary group of managers and scientists assigned to begin work on a draft strategy and framework for improving the integration of science and park management within the Intermountain Region.

A second I&M workshop was held at Chico Hot Springs, Montana, in September 2006. The Chico workshop broadened the existing audience to include additional stakeholders important to the successful development and implementation of a framework integrating science and management. Participants included park superintendents, resource managers, regional planning staff, and staff from research learning centers, cooperative ecosystem studies units, regional offices, the Washington office, and other partners.

At Chico, the Rico task team presented a draft outline of a strategy and framework focused on several themes important to successfully integrating science and management. The Chico workshop included exercises that actively engaged managers and scientists in an adaptive process of integrating science and management. Using real management issues and monitoring data,

management needs were discussed and incorporated into vital signs monitoring, and monitoring and research information was brought into management decision-making processes. In short, managers and scientists discussed resource management issues and objectives as well as research and monitoring results, and adaptively applied their newly gained knowledge to solving problems. The Chico workshop produced a broadened group of committed managers and scientists, called the Rico-Chico task team, who were assigned to expand and refine the strategy and framework for improving the integration of science and park management.

The framework

The Rico-Chico task team has introduced a strategy and framework that incorporates three themes for integrating science and management: (1) improving communication, (2) incorporating management needs into ecological monitoring, and (3) incorporating monitoring results into management and planning. The strategy promotes communication and information exchange between scientists and managers through workshops, thematic meetings, and consultation. Products include web-based resources, professional and technical reports, concept papers, and publications such as those presented in this issue of *The George Wright Forum*.

Improving communication

Communication is at the center of the framework. The other two themes are inherently dependent on developing and maintaining open communication based on mutual trust and benefit. While NPS scientists and managers may differ in their motives, the passion they share for the resources they study and manage binds them to the same mission and goals. Nevertheless, scientists and managers often find that they use the same terms differently—and different terms similarly—when conveying concepts that are basic to their respective positions. As will be evident from some of the papers in this issue of the *Forum*, communication barriers between scientists and managers have hindered, and continue to hinder, our ability to integrate science and management. With that in mind, the task team identified the following statement as its integration goal for this theme: *"to improve communication and the sharing of knowledge between science and management."* The paper by Carter et al. in this issue addresses some of the emerging tools and ideas that will better facilitate communication between scientists and managers.

Incorporating management needs into ecological monitoring

Too often, managers and scientists find themselves competing for the same limited resources. When the I&M networks were created and funded through new appropriations, we moved from an environment of competition to one of sharing resources for mutual benefit. In the National Park Service, the opportunities for scientists and managers to work together have never been greater. The integration goal for this theme identified by the task team—"*to incorporate the knowledge gained from resource management experiences, and information needs of management and planning into the design and implementation of our ecological monitoring*"—is more feasible now than ever before. The paper by Carter and Bennetts

begins to explore how a hierarchy of goals and objectives can be used to reinforce the assimilation of monitoring and park planning. The paper by Hubbard et al. addresses the need to integrate goals and objectives for natural and cultural resource planning when prioritizing management and monitoring needs. The essay by Lewis highlights the real challenges faced by managers when trying to balance political and socioeconomic interests and concerns with what the science is telling them.

Incorporating monitoring results into management and planning

Prior to the Natural Resource Challenge, most park managers who wanted to acquire science-based information for decision-making purposes had no other avenue but to try and entice researchers from universities and other agencies to conduct studies in their parks. However, once the research was completed and the results in hand, ideas about how to apply the new information were too often an afterthought. Because the I&M program designs its research and monitoring efforts with direct input from park managers, the results are more readily of use to managers, facilitating this theme's integration goal of *incorporating the knowledge gained through science, including research and monitoring, into park resource planning, management, and decision processes*. The I&M monitoring program is new, and figuring out how best to apply our monitoring methods and incorporate the results into management decisions will take some time, creativity, and even experimentation. The paper by Bennetts et al. explores the merits of using assessment points as a means of allowing monitoring data to inform management and planning. The essay by Marcot discusses assessment tools and methods for aiding scientists and managers in analyzing uncertainty and risk in decision-making.

Vital signs monitoring is also expected to provide park managers with measures of performance in regard to long-term management goals. Working with planners and managers, we will more closely link vital signs to management goals, such that monitoring data will inform managers about the condition and trend of key resources in the context of long-term desired outcomes. The effectiveness of near-term strategies and actions at producing desired outcomes likely will require additional information, possibly from new research and other types of monitoring. The essay by Bingham highlights potential information-management barriers and solutions to integrating existing and new research, monitoring, and management information across agencies and programs. The paper by Bennetts and Bingham expresses some concerns that have emerged about the efficacy—and even fairness—of using monitoring results related to resource condition to provide accountability for management performance.

The challenge continues

The essays and papers presented in this issue of the *Forum* represent some of the results of the Rio Rico and Chico Hot Springs workshops, and the efforts of the Rico-Chico task team. We are grateful to the George Wright Society for the opportunity to present these results and ideas. However, we fully recognize that significant effort and accomplishments are occurring throughout the NPS, at all levels in the organization, and in other agencies and organizations as well. The Rico-Chico effort is just one small part of a much larger movement within the

National Park Service and other agencies and organizations to bring science and management into closer partnership.

In his essay on integrating science and management, Soukup captures what the National Park Service must become to achieve the vision initiated nearly a century ago with the Organic Act. The NPS is fortunate to have visionaries and doers at all levels, from our leadership to our professionals completing projects in the field. The Natural Resource Challenge generated momentum, but it is our people that keep us moving forward. They all contribute to emerging, evolving ideas about improving the integration of natural resources science and management. Although the authors listed here have tried to capture some of these emerging ideas, the ideas themselves have emerged in no small way from the Rico-Chico workshops and many discussions with others far too numerous to name. We appreciated the enthusiasm expressed by participants in these workshops and discussions, and we recognize that transforming these concepts into workable solutions will require continued effort by all of us. We also recognize that the goals we have outlined and are striving to achieve will not be reached overnight. The "challenge" continues, and working toward better integration of science and management is going to be a long-term commitment. We are confident that the dedicated individuals working to protect our natural and heritage resources are up to the challenge.

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