Review: *Science and Ecosystem Management in the National Parks*

W.L. Halvorson and G.E. Davis, editors. Foreword by P.G. Risser. University of Arizona Press, Tucson, 1996. 364 pp., clothbound.

Reviewed by Ronald L. Hiebert

This book addresses the role and value of long-term research and monitoring towards informed management of natural resources and ecological processes in national parks. The stated purpose is to demonstrate to policy-makers and managers the value and cost-effectiveness of basing decisions on ecological information, to provide scientists with models for long-term research, to alert the scientific community that parks as natural areas are in serious jeopardy, and to enforce the paradigm of ecosystem research and adaptive management as long-term experiments.

This work has its origins in the persistent efforts of the editors and others to establish a viable inventory and monitoring program for the U.S. National Park System. This effort is based upon the belief that one can't manage what one doesn't know. In 1988, the U.S. National Park Service (NPS) adopted a three-pronged approach to developing a long-term natural resource monitoring program: 1) review sustained research efforts in parks, 2) complete resource inventories in all park units with significant natural resources, and 3) develop and evaluate 10 park-based prototype monitoring programs. This book represents part of the review of sustained research.

In 1990, park scientists and managers were asked to nominate examples of long-term research or monitoring programs that could serve as models for other parks and protected areas. Over 100 nominations were submitted. A panel of senior scientists and park managers met to select the 10 or so best examples of where long-term research has been applied to park management issues. In reviewing nominations, the panel was amazed at how difficult it was to find 10-12 cases that could serve as models for managers and scientists. Flaws in programs could usually be traced to insufficient and/or inconsistent funding, rapid turnover in park managers and scientists and the related shifts in philosophy and priorities of park management, and poor planning. However, 12 interesting case studies were selected and are presented in the book.

The case studies follow two introductory chapters, one on the purpose and origin of the book, and one reviewing the history of the national park system and the role of science in management. The case studies are in turn followed by two concluding chapters summarizing the issues addressed and the lessons learned from applying research results to park management. The case studies are arranged into three parts: Long-term versus Short-term Views, No Park is an Island, and Protection versus Use.

Long-term versus Short-term Views

Fire Research and Management in the Sierra Nevada National Parks. When Yosemite and Sequoia-Kings Canyon became national parks, protection from all hazards, including fire, was the philosophy. Observations of encroachment of pines into giant sequoia stands and the build-up of hazard fuels stimulated research. Research and its subsequent application to management has changed our view of fire from one of hazard to an important ecological process. The research, experimental management, and monitoring not only influenced forest management in Sierra parks but throughout the park system and other land management agencies.

Yellowstone Lake and Its Cutthroat Trout. Here is a very interesting tale where research and monitoring were stimulated by decreases in fishing success. Monitoring of cutthroat trout dates back to early in this century. This is an excellent example of how management for a single species can cause major errors. A more holistic look at the Yellowstone Lake system and the surrounding terrestrial zones has led to a understanding of the value of interdisciplinary studies and is a great illustration of the connectiveness of ecosystems.

Wolf and Moose Populations in Isle Royale National Park. This paper chronicles the long-term predator–prey (wolf–moose) studies at Isle Royale. The 35-year-plus data set has not only provided important basic information on predator–prey relationships but clearly illustrates how long-term data sets enhance ecological understanding.

Saguaro Cactus Dynamics. In the 1940s, saguaros were removed from 130 ha of land because scientists believed a bacterial decease threatened their continued existence. Deductive research approaches were used for years to prove this preconceived idea. Later, a similar line of research tried to prove that air pollution was the cause for decline. Although there still is no consensus on the ecology of saguaro, inductive research is now exploring a broad range of causes of saguaro decline.

Alien Species in Hawaiian National Parks. This paper demonstrates the profound effects that introduced species can have on native biota and ecological processes. It also clearly demonstrates the need for good planning and a close working relationship between science and management.

No Park is an Island

Water Rights and Devil's Hole Pupfish at Death Valley National Monument. Securing and protecting water rights is one of the most significant issues for NPS in western parks. This case illustrates how data collected through a monitoring program were used to protect water rights and how the desert pupfish was used as an indicator species.

Urban Encroachment at Saguaro National Monument. In 1933 when

Saguaro National Monument was designated, the population of Tucson was 35,000. The population is now about 700,000, with residential construction taking place on the park's boundaries. Because of park managers' concern about the impacts of urban encroachment, management has become a community effort based upon ecological understanding.

Karst Hydrogeological Research at Mammoth Cave National Park. The park lies in a classic karst terrain where surface water runoff quickly enters an underwater conduit system. In the 1970s, NPS initiated a program to delineate movement of water in the region through dye-trace technology. This information made it clear that Mammoth Cave was not an island and was very much affected by activities outside its boundaries. Research and monitoring information has affected water treatment and development outside park boundaries.

Air Quality in Grand Canyon. Many within NPS have given air quality monitoring and research low priority because it is something we can do little to remedy. Here is a case where top-notch, cutting-edge research conducted by NPS did make a difference. It was demonstrated that the Navajo Power Generating Station was a major contributor to visibility impairment at Grand Canyon. EPA used the WHITEX report as the basis to require substantial emission reductions by the power plant.

Protection versus Use

Rare Plant Monitoring at Indiana Dunes National Lakeshore. Indiana Dunes contains a exceptionally diverse flora despite many impacts before designation and heavy visitor use since. Twenty-six percent of Indiana's rare flora is found within the lakeshore. To make ecologically based management decisions, management needed to know the distribution of rare plants. The geographically based monitoring program is described.

Wilderness Research and Management in the Sierra Nevada National Parks. Providing access to wilderness while maintaining wilderness values is a major issue in many parks. This case study illustrates how awareness by managers of backcountry impacts and subsequent impact inventories, studies, and accurate records of visitation levels and patterns led to controlled-use policies that sustain the wilderness environment and experience in an effective way.

River Management at Ozark National Scenic Riverways. Management of national riverways, in my opinion, is a most difficult task. In most cases, boundaries include the river and a narrow strip of adjoining land, the drain at the bottom of the bath tub. Maintaining high water quality depends upon cooperation of all parties in the watershed. Through recruitment of scientists from numerous agencies and institutions, Ozark has developed a broad aquatic and visitor-use baseline as the foundation for an overall river management program.

According to the editors, the lessons to be learned from these case studies

are 1) ecosystems are dynamic, 2) no park is an island, 3) knowledge is better than ignorance, 4) sustained research reveals secrets that short-term studies never do, and 5) research must be a cooperative effort. I found the last point to be strongly illustrated. All cases presented were successful because of the dedication and persistence of both park managers and scientists (either within or outside the Park Service) and because of close and frequent interaction. Advancement of this synergy must be a major goal of park managers and of the U.S. Geological Survey's Biological Resources Division, which is now the research arm of the U.S. National Park Service, if parks are going to be managed upon ecological principles.

Who should read this book? Park managers and policy-makers to learn the value of scientific information and enforcement of the adaptive management paradigm. Scientists to realize the value of long-term research, the rewards of effective interaction with management, and the national parks' desperate need for scientific information. Science students to prepare them for effective research or resource management careers. It should also provide enlightenment to the interested layperson as to the complexity of park management.

Science and Ecosystem Management in the National Parks excellently packages interesting, well-written, and skillfully edited case studies by presenting the historical perspectives and then guiding the reader to the lessons to be learned. I highly recommend it.

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