

William L. Halvorson
Chris Eastin

**The Partnership Between
Park Wild Life Management Policy and
Landscape Wild Life Management Policy
How Shall We Then Manage?**

Introduction

Resources management practices are changing in North America, not only based on greater understanding of the resources that are being managed, but also on some critical sociological relationship changes between human beings and between humans and nature. The entire way that humans look at the natural world and our own society is changing dramatically as we come to the end of the twentieth century. Managers are changing from making belief-based decisions to making informed knowledge-based decisions through better science programs. Society appears to increasingly be making a shift to a community mind-set, a mind-set of connectedness and interdependence, and away from strict individualism. Managers appear to be ready to embrace the concept of unity and wholeness; to understand that humans and nature are inextricably tied to each other's well-being.

North American land and wildlife ownership has its roots in eighteenth-century western Europe where land, wildlife, and trees were owned by the royalty who would vest some of their land ownership in loyal noblemen. In developing the "new world," framers of the United States of America decided to reject that notion for one that would allow everyone who could afford it to be able to own land—except that they stipulated that the wildlands and wildlife would be owned by all in public trust until it be deemed appropriate to turn them over to private owners.

This idea of lands and wildlife being owned by the public was initially of little concern (at least to those newly coming to the continent). As the continent was populated with Europeans, however, it became abundantly clear that "public responsibility" for the lands meant that little responsibility was being taken; lands that were owned by all were being cared for by none. Prime examples of this are the forestry practices in New England that nearly completely denuded the landscape and forced the population to expand westward to find wood, and the great

The National Park Service's Management Policy in the 21st Century

buffalo slaughter associated with the westward expansion. Further, it became clear that some lands were of such great public value that they should always remain in public ownership and not be allowed to become privately controlled.

Beginning in the late 1800s and into the twentieth century, the federal government began, through a series of laws and the development of agencies like the U.S. Forest Service (USFS), National Park Service (NPS), and Bureau of Land Management (BLM), to take control of the public lands. The initial tendencies were to administer these public lands for some fairly narrowly focused uses: forest tree production, scenic pleasuring grounds, and cattle and sheep production. The management perspective was that Euro-Americans were separate and apart from nature and that natural resources were put on the Earth solely for people's use and benefit. In a sense, Americans went from the king's ownership of public lands and wildlife to government agency ownership, both federal and state—the term “ownership” here meaning that government agencies had authoritarian control. It was NPS land or USFS land and the park superintendent or forest supervisor was, to a very large extent, the authority for control of those “public” parcels.

In the past few years, an increasing variety of public pressures has brought us to an interesting juncture

in history. Today, we find ourselves looking at another new world, one in which the public is no longer content to let the agencies control use of lands. There is a growing outcry to let the public decide what is done with public lands. It is a cry to hold managers of public lands accountable for maintaining healthy systems and for long-term viability of those systems. It is also a cry to take power away from these managers and to let the public have a heavy hand in deciding how the land will be managed.

In many ways, the shifts that are being seen in land management parallel the changes in our social structure, in personal, business, and political lives. People were once content with, and even expected, an authoritarian decision-making process. Authority figures were never questioned, and were always approached with a certain amount of awe and fear. Today, individuals are less willing to remain quiet while being told what to do, how to act, and how to think. Today, the public is much more actively involved and less willing to trust that government land managers know what they are doing or trust that they have all the public's interests at heart.

The result of this is that resource managers can no longer be just biologists, or scientists; they now must be trained in new “people” skills. They must have skills in understanding interpersonal relations and interactions of all sorts; they must

The National Park Service's Management Policy in the 21st Century

have skills in consensus-, team-, and community-building; and they must have skills in methods associated with cooperative, interactive, and participatory decision-making. All this in order to deal with their own staffs, and also to deal with "stakeholders" and "interest groups" as well.

The number of lawsuits relative to land and wildlife management is testament to the fact the transition is not going all that smoothly. Some days it seems as if the courts are making more resource decisions than the agencies. At best, the transition is a slow, painstaking process that causes great frustration and long pauses in action. We are interested in two aspects of this change: 1) research and the need for higher quality and better sharing of information, and 2) the sociopolitical conditions that accompany this change.

The Need for Research and Information Management

In a recent compilation of case studies involving research application to management in NPS (Halvorson and Davis 1996), five lessons emerged which have direct application to the issue of how society can better manage large, landscape-scale areas.

Lesson 1: Resource managers need more information than they have and they need that information in a more useful form. There are a number of issues related to this lesson.

Issue 1A. Absence of information leads to management based on beliefs, which in turn often leads to false conceptual models and costly mistakes. This type of management leads directly to lack of public trust because managers are perceived as not caring or not knowing what they are doing.

The earliest conceptual models of NPS areas considered them to be scenic places to be used by the public as pleasuring grounds. Managers were not too concerned about obtaining knowledge about what they were managing as long as it looked good (Likens 1989; Risser 1991). This conceptual model resulted in practices like predator removals to assure deer in the meadows, and total fire suppression to keep the "politically correct" green forest. These practices, however, led to massive disruptions in naturally functioning ecosystems. Armed with better ecological understanding and information from a long-term view of the consequences of these actions, managers later revised their conceptual models and set a new course—one that included structure and function of biological systems along with scenic beauty. This change to a new, scientifically based course of action has been slow and cumbersome, being pushed from outside the agency and in many ways causing turmoil on the inside (National Research Council 1992; Wright 1992).

The National Park Service's Management Policy in the 21st Century

The shifting paradigm of cut-throat trout management at Yellowstone National Park (Varley and Schullery 1996), for instance, has been based on long-term studies providing information to managers who have been periodically revising their concept of how that complex system works. The goal is to keep adding information until enough is known that management of the lake can be done with complete understanding of the roles of trout, predators, and fishing. Fire in the Sierras (Parsons and van Wagtendonk 1996), as elsewhere, is one of the more publicized changes in management strategies. Early understanding that there were "climax" communities which were stable and that fire was a "disturbance" to that stability led to the unfortunate belief that, to protect our forests, we had to totally suppress fire. It was only after years of gathering information on the dynamics of forest systems that the understanding came that fire is an important environmental parameter in many systems, and that total fire suppression was actually the disturbance that targeted these systems for some rather dramatic changes.

Issue 1B. Long-term monitoring of resources, though costly, is actually cost-effective for protecting resources because it allows for interactive resource management; that is, course corrections can be made during an action program instead of waiting for a crisis to see if the action

worked or not. It is "penny wise and pound foolish" not to monitor, as it keeps agencies consistently in crisis-management mode.

An active program to regularly assess the condition of resources facilitates problem identification and suggests solutions at an early development stage. This is analogous to regular physicals for individuals. In Hawaiian national parks, early detection of some alien species (Stone and Loope 1996) has allowed the parks to remove them with minimum effort and cost. By monitoring back-country use, the Sierra Nevada parks (van Wagtendonk and Parsons 1996) are able to adjust use in such a way as to minimize damage and, therefore, ameliorate the need for large-scale restoration projects. The use of monitoring protocols at Ozark National Scenic Riverways has allowed the park to effectively set carrying capacities on river use. This is as important as the business concept that it is more cost-effective to do the job right the first time, or to do preventative maintenance, in order to avoid the cost of doing something over, correcting a mistake, or suffering through unscheduled down time.

Issue 1C. Long-term data sets not only provide good information, they are politically and legally powerful and assist greatly in the decision-making process, whether it is a management, political, or legal decision.

Managers of natural areas and natural resources regularly need to

The National Park Service's Management Policy in the 21st Century

do battle in legal and political arenas. This need is actually increasing as parks become more and more affected by surrounding human developments. In order to effectively uphold the rights of natural resources, managers need to have data and information that are sound (in both the public and legal sense) and can refute the desires of those who want to use natural features for human activities which will adversely affect resources.

By monitoring air quality (Shaver and Malm 1996), Grand Canyon National Park was able to prove the impact of a nearby power-generating plant on visibility in the canyon. The Devil's Hole pupfish (Williams et al. 1996) was saved only because of research that showed the relationship between regional groundwater use and the habitat of this endangered species. Saguaro National Park (Shaw 1996) actively pursued the issue of the impact of urbanization on species within its boundaries. Understanding all the species interchanges between the park and the surrounding housing developments helped the superintendent in sensitizing the public to the effects of developments near the natural area. This led to changes in zoning close to the park boundaries—changes that assist in protecting the park's biological resources, not just its scenic values.

Lesson 2: Natural areas are not the static entities that they were once believed to be (one of the more seri-

ous false conceptual models under which NPS was managed for many years). Managers now have a clearer understanding that changes occur no matter what actions are implemented, including no action.

Through studies like those highlighted by Halvorson and Davis (1996), as well as a number of other problems that park managers have had to deal with in the last three decades, NPS management has recognized the need for a change in attitude. A change has pretty much taken place from "All we have to do is put a line around it and protect it" to "We better find out what's inside the park's border and check periodically on how conditions are changing."

Lesson 3: Studies to understand the characteristics and dynamics of natural systems need to be undertaken, and need to be long-term, consistent, and multifaceted to address a broad range of temporal and spatial scales.

Issue 3A. NPS areas need active programs to provide managers with information on the long-term dynamics of ecosystems. There is no area in the National Park System that can do without information on its resources. Every area should have a monitoring and research program in place, with scientists regularly available to the staff. This information should be available to all divisions of the park, including interpretation, protection, and maintenance.

The National Park Service's Management Policy in the 21st Century

One of the most troubling problems in managing long-term research is the fact that research sites are continually being lost to development as society marches across the landscape. NPS areas can provide stable sites for long-term studies, where threats to the research site are minimized.

There have been instances in the past in which agencies such as the National Science Foundation have been reluctant to fund long-term research in any NPS areas because of a lack of sensitivity for such research on the part of NPS managers. While this has been a problem, a new relationship is possible, as managers change the way they view monitoring and long-term resource management (see also Risser 1996). With continuing agency support through an operations-based program in resource monitoring, there can be a better cooperative relationship between NPS and research in the national parks. This will not only benefit park resources through increased information about those resources, it will also benefit the understanding of landscape and ecosystem ecology in general.

Issue 3B. Consistency is absolutely necessary in long-term studies. There are many reasons why there are so few long-term ecological studies. In order to develop information useful to managers, all the impediments must be overcome. Reasons for the paucity of long-term data

sets in NPS areas include inconsistent support from park management and funding sources, lack of a dedicated leader with a personal stake in the project, lack of support from the research community for promoting and rewarding such studies, and the lack of support to maintain a database management system in an environment of regularly changing personnel.

The dynamics of population interactions are extremely complicated and our understanding of such interactions is still very shallow at best. The long-term studies of moose and wolf populations on Isle Royale (Wright 1996) is a good case in point. Through them we have come to understand that defining interspecific population interactions is arrived at only with great diligence. Even after 15 or 20 years, the changes from year to year can be puzzling.

Having gaps in data collection is often a cause of databases losing their functionality. It is important that any resource data-collection program be set up to be in operation for a reasonably long term, but with built-in reviews at given intervals. Such programs should not go on unquestioned for years, but neither should it be possible for a new staff member to come and shut down a project because of personal preference. Likewise, a program should not be lost because a particular scientist happens to move on to another area (Al-

The National Park Service's Management Policy in the 21st Century

exander 1996). The means must be found to institutionalize an active program of data collection, storage, summary, and analysis, and reporting of results, and to maintain it with changing personnel.

Issue 3C. Research in NPS areas should address management issues of varying temporal and spatial scales. Early research efforts in NPS were on single species, and studies with short temporal scales. These types of studies are still needed as each NPS manager is daily faced with problems that require quick, short-term solutions. Research must respond to such problems as efficiently as possible. Managers should also support long-term monitoring and research on their park resources to have a more complete set of data and understanding of their systems so that day-to-day decisions are made in the context of this more complete understanding.

In most cases, the best attitude to take when managing resources or carrying out a resource management project is that there is an experiment taking place. The need is to have every action followed by the collection of data that will help evaluate that action.

Lesson 4: No longer can we afford to treat any land management unit as an island unto itself. All areas, natural or otherwise, are connected in a myriad of ways to surrounding lands. Managing any piece of landscape in the future will involve coop-

eration and coordination with neighbors.

As more information is accumulated about ecosystems, it becomes clearer that all areas are very much connected to and influenced by the lands that surround them. This inevitably leads to placing emphasis on landscape-level research and monitoring. This is demonstrated well at Mammoth Cave National Park (Alexander 1996) and Ozark National Scenic Riverways (Chilman, Foster, and Aley 1996), where karst topography results in waterway connections far beyond the boundaries of the NPS units. Initially, NPS managers were slower than researchers to understand this. Tensions were high as new data were developed which led everyone to understand that problems were more complex, and involved people and situations outside the park boundaries. It is easy to see why some managers would come to the point of saying, in frustration, "Don't give me any more information, I have more problems than I can deal with now." Not having the resources to deal with it, many managers did see new information as another problem, and did work toward slowing down the numbers of "problems" that were coming at them by not supporting research or, in some cases, being more aggressive in restricting research.

Most managers today understand that they need to be involved in the management of areas that surround

The National Park Service's Management Policy in the 21st Century

them. They welcome the gathering of information that will help them deal with their neighbors. This understanding will be increasingly important in the future and will be necessary for NPS and other land management agencies to see their areas as part of interconnected resources and not as isolated "islands." Though usually not as dramatic as buffalo at Yellowstone National Park walking outside the fence and being shot, every NPS natural area today deals with wild life issues at its boundary.

Lesson 5: A good relationship between scientists and park staff is crucial.

Issue 5A. There is a need for recognition, support, and leadership in understanding the value of long-term ecological research in national parks from both scientists and NPS managers. The official statement of the Cary Conference on Long-term Ecological Research of May 1987 (Likens 1987) concluded that there needed to be, because of common long-term goals, a new partnership between scientists and resource managers. This partnership needs to include 1) an agreement by scientists to answer the questions put to them by managers, making clear the level of uncertainty that exists and what additional research needs to be done; and 2) an agreement by managers to give serious consideration to scientists' answers and to support continuing research toward better answers.

Data are important, but they must be in a form that is understandable by the managers who need information in making day-to-day decisions. It is necessary that scientists and managers work cooperatively in the development of this information. A scientist-manager partnership requires a change in attitude in both the manager and the scientist; to understand and respect the value and needs of the other. Without such respect, there will be constant struggle in any research program. Narrowly focused and obstinate scientists are often as troublesome to the search for truthful information as are superintendents who feel the need to impose their authority on and begin to direct research.

Issue 5B. Research in national parks should be jointly supervised by local superintendents, regional scientists, and the scientist's research supervisor. There has been a long history of individuals, committees, commissions, and task forces that have advised the NPS to increase its science capability, up to and including the establishment of an independent research branch of the organization (Leopold et al. 1963; Robbins et al. 1963; Orians et al. 1986; National Research Council 1992). All of that advice has had little effect on Congress, on the Department of the Interior, on NPS, or on the research program. This is still a major need and one that will be even more complicated to solve because of the

The National Park Service's Management Policy in the 21st Century

reorganization of research in the Department of the Interior.

However research is to be organized, it is clear from the case studies in *Science and Ecosystem Management in the National Parks* (Halvorson and Davis 1996) that supervision of research must be done cooperatively. Scientists require input from superintendents so that the individual park needs get met, and from scientist supervisors who can assure that NPS research needs are being met, which the scientists' standing in the scientific community is protected and enhanced.

Issue 5C. Each NPS-area research program should be related to a university peer group or the larger research community. This can be done either through a Cooperative Park Studies Unit or an advisory group, and is for the purpose of assisting a park's research program from becoming so in-house that it does not relate to regional knowledge bases or becomes insensitive to theories and concepts being developed by other researchers. In the case of studies of the saguaro cactus (McAuliffe 1996), for example, interested superintendents got bad information and advice from researchers who failed to use available information, to involve a review process, and to use a holistic approach in planning their specific research projects.

Of primary concern should be that the resources of NPS areas are managed in such a way that sustains

ecological processes and provides for the enjoyment of future generations. All involved must work more cooperatively to get this job done. They must get beyond the personalities and the personal agendas of researchers and managers and become more in tune with working with committees and looking at resources on a regional or landscape level.

Sociological Changes in Resource Management

The change taking place in the way federal agencies do research and obtain information, and share that information, is related to and brings us to our second major point: that of the sociopolitical changes in the field of resource management.

The following are lessons, not that have been learned, but that we believe are being learned, both from the perspective of the agencies and society as a whole.

Lesson 1. A shift in social consciousness of humans relating to nature is taking place. This shift is from a consciousness which says that nature is totally separate from people and is there for us to use and abuse with impunity, to one which says that humans and nature are integral to each other and that we need to be protective of natural processes and find the way to live in a sustained manner as part of the landscape.

Lesson 2. In order to more successfully manage "public" lands, there will need to be better coordination among neighbors, partners,

The National Park Service's Management Policy in the 21st Century

and stakeholders (Howe et al. 1997; Sonoran Institute 1997). Resource management will come to be seen as a landscape-scale issue into which many "publics" will have input. The days are over in which a few individuals in one agency decide what is best for a particular property. Land management agencies will need to develop training programs in participatory decision-making and community-building to have managers more fully capable of interaction with their neighbors.

Outside the boundaries of any land management area, there continue to be increasing activities in the development of citizen groups or collaboratives: watershed associations, watershed councils, "friends" groups, and other assorted, variously named comings-together of people on a particular piece of landscape. These groups will more and more be demanding a say in how that landscape will be managed. The leaders of these groups will also benefit from taking the time and expending the effort to obtain training in community-building and decision-making.

It is not only that NPS managers are being asked for participation by the local populace interested in the park, the NPS manager is finding it necessary to participate with local and county groups to raise consciousness about wild life and to influence development near the parks. A couple of important programs in this regard are the United Nations

Man and the Biosphere Program's biosphere reserve initiative and the Gateway Communities Program of the Conservation Fund and the Sonoran Institute (Howe et al. 1997).

Lesson 3. The various publics need to have additional and more usable information than they presently have. A library full of books and journals doesn't cut it in the fast-paced world of the 1990s. The doubling time for gathering information is decreasing exponentially and is causing us to become dependent upon computerized geographic information systems (so that everyone is using the same maps and data), quality control and quality assurance of data, and computer networks.

If managers are going to have effective partnerships, society will need to find ways that all groups—federal, state, and local agencies; nongovernmental organizations; and interested citizens—have access to the same information. This was one of the major reasons given by Secretary of the Interior Bruce Babbitt in his creating of the National Biological Survey. As yet, little has been done to solve this problem, as we are moving in that direction slower than a desert tortoise.

Lesson 4. In order to more successfully coordinate with all stakeholders in any landscape-scale area, new governance structures and new institutions will need to be developed. It is problematic that this can be accomplished without going

The National Park Service's Management Policy in the 21st Century

through chaos. Along with the new governance structures comes the need for new decision-making processes—processes that are cooperative and participatory.

Lesson 5. Social structures in how we view private versus public lands are shifting to a community mind-set: one of interconnectedness and interdependence, and moving away from strict individualism.

We believe that the days of “It’s mine and I’ll do whatever I want to with this land” are going away for all ownership categories, including federal agencies, state agencies, and private land-owners as well. As society begins to manage landscapes, all owners will be brought—some kicking and screaming—under an umbrella plan that gives everyone a set of rules to live by, much like the home-owner association rules of some of today’s more progressive home developments. This new structure will lead to a new level of “local” governance. Land managers will be actively working with planning programs of neighboring agencies and with the counties and municipalities that are adjacent to and near to their borders.

Lesson 6. A shift from commodity-based management to ecosystem-based management strategies is taking place. It is becoming necessary to manage all aspects of ecological systems, whether they be natural areas, timberlands, or grazing lands. The whole system must be considered

from a long-term sustainability perspective, not simply any one parameter, whether that be biodiversity, water, productive soil, cattle, timber, or one of the many charismatic or endangered species.

Discussion

Early NPS wildlife management took the flavor of managing a game preserve: intensively managed areas that focused on the preservation, and enhancement, of a few selected species. The management methods used in these areas, such as artificial feeding, control of predators, fire control, and habitat enhancement, were designed to protect species considered to be desirable. Having enhanced the good species, NPS then faced problems associated with overpopulation, and management was forced to start culling herds to prevent habitat destruction and large-scale die-offs. NPS then actively entered a time when management meant deciding how many of the good species were appropriate and variously feeding and killing to maintain that number. This made it difficult for some outsiders to understand how this “park” was somehow so different that hunting would not be allowed. It began to look like hunting was allowed, but only for a privileged few.

Later approaches to wildlife management were in the realm of “hands off,” where “natural” processes were left to function as they would. This approach is also not without its

The National Park Service's Management Policy in the 21st Century

problems, and required a shift away from the belief that there are good and bad resources and good and bad processes. NPS actually began to really get to know its neighbors at this time as it was often difficult to make park neighbors understand this "let nature take its course" management style when that management causes an impact on their property, in the form of fire, or deer browsing, or disease, or some other form of destruction. A major difficulty with this approach is that the world is drastically different today, with no freedom to roam for the herds, no Native Americans hunting, changed fire regimes, and fewer numbers of predators. So what "natural" processes are operating? Further, it is very difficult for the American public, and for many managers, to watch wild fluctuations that natural processes can cause to occur.

For most of us, it is more comfortable to see consistency in numbers and in habitat condition year after year, but is this natural? Our collective world view (belief) won't let us get comfortable with massive die-offs and wild fluctuations. Collectively, we still believe in the concept of carrying capacity and believe that the way it is supposed to be is a gentle variation around that carrying capacity. Even though there is a lot of information to support the contrarian view that nature is full of drastic, powerful, stochastic fluctuations, many continue to cling to a belief in

succession, climax and long-term stability. Thus it is that there is still too much management based on belief, even while not understanding why our natural systems don't behave the way they are supposed to and not mentally coping with wild swings in population numbers or health conditions of our natural systems. Since there is not yet a sufficient monitoring program to aid us in understanding the dynamics of natural systems, management continues to fall back to beliefs on which to make decisions. In the coming world of partnerships, wild life management will need sound information in order to overcome struggles over differences in beliefs of the various groups at the decision table. Management will be forced to make knowledge-based decisions.

No matter what we call it—"ecosystem management," "landscape management," or something else—society is now moving into an era of cooperation; a time when many in our society will no longer look at interactions from a win-lose, competitive perspective, but one in which there is a realization that health, peace, and sustainability demand a win-win, cooperative attitude. This will drive our future resource management programs. It seems to us that: 1) government and private institutions will have to be reorganized and in many ways reconstituted by new laws and regulations in order to accomplish this coopera-

The National Park Service's Management Policy in the 21st Century

tion efficiently; 2) we will need close partnerships in the gathering, use, and sharing of information; and 3) we will need close partnerships with neighbors and "stakeholders" in the decisions of what we do with our management units and programs.

For many, this entering into partnerships is a painful and difficult time. Some want to continue to say, "It's my land and I'll do what I want with it," some want to say, "We're the professionals, *they* are not going to tell us how to do our business," and some want simply to say, "It's too hard, I can't (or I'm not going to) do it."

We must, however, do it. We must move away from an NPS wild life management strategy and get to a

landscape wild life management strategy. To do this will require better science and better sharing of information, as well as policies and goals that reflect the needs and desires of an entire protected landscape (Jackson 1984), and it may even require NPS to revisit issues of culling (hunting), fire management, timber harvest, joint or cooperative management, and others. We must now work toward managing resources inside the park's boundary in the context of landscape, toward supporting (and sometimes changing) the desires and beliefs of the parks' neighbors, and toward developing full partnership involvement of those who live and manage at the parks' borders.

References

- Alexander, E. C. 1996. Karst hydrogeological research at Mammoth Cave National Park. Pp. 201-228 in Halvorson and Davis 1996.
- Chilman, K., D. Foster, and T. Aley. 1996. River management at Ozark National Scenic Riverways. Pp. 295-317 in Halvorson and Davis 1996.
- Halvorson, W. L., and G. E. Davis, eds. 1996. *Science and Ecosystem Management in the National Parks*. Tucson: University of Arizona Press.
- Howe, J., E. McMahon, and L. Propst. 1997. *Balancing Nature and Commerce in Gateway Communities*. Covelo, Calif.: Island Press.
- Jackson, J. B. 1984. *Discovering the Vernacular Landscape*. New Haven, Conn.: Yale University Press.
- Likens, G. E., ed. 1989. *Long-Term Studies in Ecology: Approaches and Alternatives*. New York: Springer-Verlag.
- McAuliffe, J. R. 1996. Saguaro cactus dynamics. Pp. 96-131 in Halvorson and Davis 1996.
- National Research Council. 1992. *Science and the National Parks*. Washington, D.C.: National Academy Press.
- Parsons, D. J., and J. van Wagtenonk. 1996. Fire research in the Sierra Nevada national parks. Pp. 25-48 in Halvorson and Davis 1996.
- Risser, P. G., ed. 1991. *Long-Term Ecological Research: An International Perspective*. New York: John Wiley & Sons.
- Shaver, C. L., and W. C. Malm. 1996. Air quality in Grand Canyon. Pp. 227-250 in Halvorson and Davis 1996.

The National Park Service's Management Policy in the 21st Century

- Shaw, W. W. 1996. Urban encroachment at Saguaro National Monument. Pp. 184-200 in Halvorson and Davis 1996.
- Sonoran Institute. 1997. *National Parks and Their Neighbors*. A report by the Sonoran Institute for the National Park Service Division of Park Planning and Special Studies. Tucson: The Sonoran Institute.
- Stone, C. P. and L. L. Loope. 1996. Alien species in Hawaiian national parks. Pp.132-158 in Halvorson and Davis 1996.
- van Wagtenonk, J. W., and D. J. Parsons. 1996. Wilderness research and management in the Sierra Nevada national parks. Pp. 281-294 in Halvorson and Davis 1996.
- Varley, J. D., and P. Schullery. 1996. Yellowstone Lake and its cutthroat trout. Pp. 49-73 in Halvorson and Davis 1996.
- Williams, O. R., J. S. Albright, P. K. Christensen, W. R. Hansen, J. C. Hughes, A. E. Johns, D. J. McGlothlin, C. W. Pettee, and S. L. Ponce. 1996. Water rights and Devil's Hole pupfish at Death Valley National Monument. Pp. 161-183 in Halvorson and Davis 1996.
- Wright, R. G. 1992. *Wildlife Research and Management in the National Parks*. Urbana: University of Illinois Press.
- Wright, R. G. 1996. Wolf and moose populations in Isle Royale National Park. Pp. 74-95 in Halvorson and Davis 1996.

William L. Halvorson, U.S. Geological Survey Biological Resources Division, Cooperative Park Studies Unit, 125 Biological Sciences East, University of Arizona, Tucson, Arizona 85721; halvor@srnr.arizona.edu
Chris Eastin, 2010 East Connor Stravenue, Tucson, Arizona 85719

