Protected areas management and research: complement or conflict?

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Abstract

Land areas designated as research sites and those designated as protected areas can share similar potential problems and basic needs. Both types of land uses require varying levels of management. In neither case can management be viewed as a passive activity. Though protected areas may not require large spatial scale manipulations or intensive inputs characteristic of research sites, these areas can not be managed simply as "islands" within surrounding landscapes of differing land uses. For example, protected areas can be impacted by numerous disturbances that originate off-site. In this sense, management of protected areas requires knowledge and technologies applicable to its local environment. In addition, management of protected areas requires technically skilled science-based personnel. A research program embedded within a protected area can synergistically service the knowledge and personnel needs required for land management. More importantly, an active research program can provide relevant information to users of land surrounding protected areas. Technology transfer activities resulting from on-site research can improve community-based support for protected areas and improve adoption of conservation practices.

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preserves

Introduction

Protection requires a basic understanding of the entity being protected. Any component being protected, such as an endangered species, is part of a larger ecosystem. The basis of our understanding of ecosystems is the concept that the structure and function of any system is dynamic. Ecosystems are characterized as synergistic and a product of interactions among organisms and their environments. Within this setting, any attempt to protect a component of an ecosystem requires knowledge of that component's interactions, its spatial and temporal variabilities, its sensitivities to stresses, and its capacities to recover from disturbances. A focus of most ecosystem research is to understand structure and function in a fashion to predict future conditions. Long-term protection of ecosystem components is thus reliant on the results of focused ecosystem research. Effective protection of natural resources is strongly linked to a scientific knowledge base concerning those resources.

In the United States we have witnessed an increasing sophistication in the management of protected areas. For example, Yellowstone National Park, the first of our protected areas and one of the most popular parks within the National Park Service system, is an intensively managed and researched area. Many of the components of this ecosystem, including wildlife, watershed units, fire, noxious weeds, and humans require elaborate and integrated management plans. These plans utilize an active in-house and extramural scientific program. For example, restoration of burned areas and management of brucellosis infected bison are two recent activities in Yellowstone National Park that rely on knowledge derived from active research programs. For other public lands, especially those managed by stewardship agencies of the U.S. government such as the Department of Agriculture's Forest Service, a research component is an active aspect of their management activities. For non-government organizations which are playing an increasing role in development of protected areas within the United States, research can be a central element of their activities. For example, The Nature Conservancy (TNC) has scientific staff in their state offices, and convenes their staff for research symposia. Some private individuals also are now either engaged in research activities of their private holdings or directly interact with scientists in state or federal research organizations. As a result, field research is increasing on public and private lands throughout the Unites States.

Basic Needs

The incorporation of a research component into the management of protected areas reflects several complimentary functions between land management and research. Basic infrastructure needs for a professional and competent field research program are similar to the infrastructure needs for areas established for long-term ecosystem protection. Fifteen basic needs for a field research facility are listed in Table 1. These needs are physical, biological and philosophical. Basic elements are land access and control, high level of control over site integrity, security, a skilled scientific staff, available field support, background data and data management, communications infrastructure, long-term commitments and outreach/educational programs. Many of these elements would be important, if not crucial, to successful long-term management of protected areas.

An Example

One example of the parallel application of these needs in the United States is at the Jornada Experimental Range (JER) in New Mexico within the northern region of the Chihuahuan Desert. Established in 1912, this 72,000 ha field research facility is one of the most studied arid regions in North America. The JER has served as a research site that has resulted in hundreds of research articles that have contributed significantly to the scientific basis for sustained management of desert rangelands. At the core of this utility is a highly trained technical staff that can accommodate and implement most field scientific needs. The history of research provides crucial background data, and the 88 year land use tenure by the U.S. federal government provides both security and the ability to plan for long-term objectives. The mission of the JER is research, but as a UN Biosphere Reserve, it has also functioned as a protected area since 1976.

During the past 25 years as a protected area, the management of the JER has benefitted significantly from research in this region. For example, during the 1990s the JER has supported an increasing number of African oryx, *Oryx gazella*. This large ungulate was introduced to an adjacent region in the 1950s, but has gradually expanded its distribution on to the JER. As a large introduced herbivore in this arid region, the oryx can have a pronounced negative impact on localized areas, especially during drought periods. However, because of various laws pertaining to big game animals, the authority for management of oryx resides with the Department of Game and Fish of the State of New Mexico. The only option for the JER to manage oryx populations is through depredation hunts regulated by this New Mexico governing agency. Fortunately, this agency has recognized the negative impacts of this introduced species and the need for an aggressive plan of managed depredation hunts controlled by the land management entities in the area including the JER. Their recognition of this problem was strongly influenced by regional studies on population demographics and dynamics of the oryx. Modeled projections of population increases based on scientific estimates of fecundity, longevity and mortality provided a basis for management action. In addition, these data also provided a basis for depredation goals at the JER for effectively reducing resident populations. Without these data and resulting model predictions, our management of oryx within the JER protected area would be seriously constrained.

Another example of the utility of the research program to the management of the JER as a protected area comes from the history of ecological experiment beginning in 1915. From this body of research, we have identified a few key postulates that characterize the inherent ecological nature of arid regions. These postulates are that 1) ecosystem structure is often characterized by long-lived dominance, 2) few species may be dominant within these systems, 3) acute, episodic disturbances are to be expected, and 4) there are thresholds in the transition of one long-lived state (or vegetation structure) to another. From these postulates it can be concluded that arid landscapes are dynamic, that inevitable change can result in long-term vegetation states, and that change can be rapid. Thus, protection of arid ecosystems cannot be a simple, passive process. More importantly, we have a strong scientific basis for our ecological expectations of the JER as a protected area. There exists a quantified history of measurements which serve as our foundation for hypothesizing about the nature and complexity of this ecosystem. We have a conceptual framework for communicating the ecological nature of the land we are charged with protecting. From this framework we can also structure a basis for monitoring ecological change, developing management practices for remediating degraded sites, and planning land use within the context of a carrying capacity. All of these management activities are highly functional to protected areas and all of them are heavily reliant on an active scientific program on site at the JER.

Complementation

Recently, Adrian Phillips, Chair of the World Commission of Protected Areas, has identified six problems common to protected areas around the world. These problems are: lack of trained personnel, poor support from the local community, poor planning practices, inadequate financial support, on-site problems, and impacts from off-site surrounding areas. Phillips has recommended a new paradigm to secure the future of protected areas. This paradigm consists of developing and implementing a management plan involving stakeholders in the activities of the protected area, cultivating partners that can assist with biological, social and economic factors, work from a broader view of the landscape beyond the borders of the protected area, and develop a networked system where common vision can be supported. Often ecological research areas face these same problems. Adopting a new paradigm like that proposed by Phillips for protected areas would effectively service these problems. Ecological research and, in particular, long-term field sites used for ecological (and agricultural) research need managed, networked facilities that partner with diverse scientific institutions, that involve local communities, educate stakeholders, and interact with clients in developing research goals and in securing funding for research. For example, it is an increasingly common occurrence for field research sites in the United States to have either commodity-based or client-based focus groups for goal development and funding support.

Recognizing these common problems and adopting this new paradigm should lead to a union among scientists and conservationists. A distinct advantage of this union is that each entity would bring different strengths to the pursuit of this paradigm. Conservationists generally have developed outreach programs, or at least access to materials effective in engaging and educating the public. Scientific information is attractive to an educated public, and can be used by scientists to engage and cultivate clients. Conservationists generally have a sustained, long-term view for managing and conserving natural resources that can be brought to bear in developing and implementing realistic plans. Scientists are often involved as educators, and can be directly involved in preparing the next generation of resource managers and advocates from the general public.

In developing compatible research programs within protected areas there are two major potential problems that need to be addressed. First, both research and the management of landscapes are expensive activities. Development and maintenance of the different basic needs for research and protection requires substantial funds on a reoccurring basis. These operations are similar to the maintenance of research laboratories, with the added costs of maintaining large outdoor laboratories. Second, scientists and conservationists are not always working from a common vision, or with a similar mission. For scientists, a focus on creating new knowledge through rigorous experimentation may not be compatible with a conservationist's mission to protect a landscape or a specific set of components. However, if scientists and conservationists exploit each other's strengths, then these problems can be addressed. Working with partners, clients, and stakeholders can be highly useful in securing funding for management and research. Working together to develop a management plan for an area used for protection and research should result in a common vision and a communicated set of management objectives for accomplishing that vision.

Conclusions

The goals of protected areas can be complementary with the goals of ecological research. More importantly, research can be a synergistic activity within protected areas. Protection of landscapes is not a passive activity, and conservation of natural resources requires technologies. Technologies are based on knowledge which is defined as both tools and information. Both of these components of technology are products of relevant and creative research programs. In general, management needs of protected areas can be supported by research activities if managers acknowledge that scientific activities and research information can service their land management mission.

It is also a reality that management of protected areas and management of research programs is a business. Management is defined as the skilled handling of something, such as a set of resources. As scientists and biologists, we should recognize that there are a well-established set of proven business principles applicable to guiding skilled management. These principles include planning, cultivating clients, producing relevant information, marketing our information and adapting our business plans to new markets and new technologies. First, though, we must acknowledge that viable long-term programs in natural resource conservation and ecological research will be serviced by conducting these activities as businesses. Second, applying these business principles to protected areas and research programs will be complimentary. Third, successful land management and research programs will engage our public in our activities as a normal part of our businesses. Results of this engagement will be increased support for conservation and research, and increased public application of ecologically-based technologies.

Table 1. *Fifteen basic needs for an effective field research facility*

- Collaborative agreements among scientific organizations.
- Full access for scientists to facility land base.
- Background data on attributes of the site.
- Control over access to the site.
- Organized outreach activities for the surrounding communities.
- Qualified and capable field support staff.
- Financial and organization commitment to maintenance of the facility.
- Qualified and capable laboratory support staff.
- Capabilities to conduct long-term experiments.
- Effective security measures.
- Protocols and implemented practices for management of all data.
- Operational, modern communications infrastructure.
- Capability to protect all aspects of site integrity.
- Capabilities to apply and maintain a variety of experimental treatments.
- Well-trained skilled and motivated scientific staff.