

Box 65: Commentary from the GWS Office and Our Members

Protected Areas, Science, and the 21st Century

This essay was presented by John J. Reynolds at the Third International Conference of Science and the Management of Protected Areas (SAMPA III), Calgary, Alberta, Canada, May 1997. It will appear in the SAMPA III proceedings, due to be published in early 1998. For information on the proceedings, contact Neil Munro at neil_munro@pch.gc.ca.

Universally, parks and other protected areas intend to protect a valued condition of natural and societal processes. This challenge “to protect” exists within the continuously evolving context of dynamic societal cultures in which human demands for resources and space become competitive. In our attempts to learn how to protect effectively, we sometimes find that by drawing on common threads, across sites, we can obtain generalized insights on function and management.

Perhaps the most important common insight is the bonding of citizens to their trust—an emotional and personally valued relationship between people and the areas to be protected. The writers of the 1916 U.S. National Park Service Organic Act helped us greatly, especially Frederick Law Olmsted, Jr. Olmsted was a man of community who understood both viscerally and intellectually that in a society those things that last longest are those most valued by the citizens who compose that society.

Another common insight is that protected areas generate ecological and social contrasts that in turn result in more societal and ecological change associated with protection. These changes spread and take any direction. They spread internally and

externally, sometimes across entire regions, following simple paths of least resistance from stressed points to less stressed ones.

Much needs to be learned.

One source to consider is the experience gained from applying the NPS Organic Act in a variety of vastly differing ecological and societal settings. For years, many have discussed the double mandate of the national parks, which is “to conserve the scenery and natural and historic objects and the wild life therein, and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.” The two mandates—“conserve” and “enjoy”—are often interpreted as being in conflict. Consequently, over

time, the NPS has shifted its interpretations in attempts to accomplish its stewardship *properly*. The NPS is re-entering a time when the value of duality is apparent. One mandate cannot be achieved without the other. Responsible stewardship requires paying full and complementary attention to ethical, aesthetic, biological, and societal cultural values in balance at all times, thereby bonding the components inseparably.

The Organic Act of 1916 demands that contemporary citizens provide a similar enjoyment for their descendants, without compromise to deterioration. The NPS is assigned the job of *steward*, specifically charged with setting the limits on what constitutes "enjoyment" and determining what "conserve" entails in the context of enjoyment. As such, the law rejects the option of permanent damage. In fact, the second (and last) amendment to the 1916 act expressly forbids derogation of resources unless specifically approved by the Congress.

The mandate set down in the act fortunately accommodated the future of our parks in additional ways. It anticipated the challenge to *protect* would be responded to by dynamic but stressed social forces that would make increasing demands for resources and space. Combined dual objectives may be a key that saves parks from erosive pressures, such as those resulting from losses of legislative and sustained societal support. That key benefit, when available during times of controversy, mani-

fest itself in systemwide authority, in funding, and in the ability of individual sites to work towards agency goals.

The value and satisfaction gained by a society from its protected areas needs to be felt locally, not just remotely. Otherwise, park qualities inevitably erode or deteriorate because the *costs* of protection become overwhelming. Just as we are able to assert that without societal appreciation of protected areas, there would be no protected areas. It is also important to recognize that the interaction of society and protected areas has a local and very powerful interface.

Building on the field experience of managers worldwide, scientists have proposed that it is the paradigm of a managed "diffusion filter," and not so much an "island," that is the most effective descriptor of park function. Protected areas are not so much independent entities, spatially, ecologically, socially, or temporally, as they are interacting parts of larger ecosystems and societal influences. The boundary filter was proposed to describe the interactive processes associated with protected areas.

The administrative jurisdictional boundary acts as the major filter and passageway *into* and *out of* the park, in all three dimensions plus time. The jurisdictional (or administrative) boundary regulates the capacity of the park to protect and manage its charge, sometimes dramatically. For instance: *what* changes occur, *where* the changes occur, and *how* debilitating, *how* dramatic, and *how* quickly

the system responds to change.

The jurisdictional or administrative boundary of the protected area has always been complex due to internal land holdings, grazing, mines, concessions, road networks, and more. In the last few decades the complexity has increased. Just as before, neighbors can be physically located inside protected areas and protected areas can have numerous neighbors. Worldwide, more and more protected areas have uses inside and adjacent to their boundaries which directly affect resource protection. For example, over 50,000 people live and work inside the crater at Ajo National Park, Japan.

In Poland, many protected areas are surrounded by multiple-use areas managed specifically to reduce adjacency impacts. At Santa Monica Mountains National Recreation Area in the USA, about one-third of the land within the boundary is intended to be left in private ownership. Unless land holdings and authorities are complex, the administrative and jurisdictional boundaries are "one feature."

However, it is imprudent to expect ecological boundaries to be entirely or even barely superimposed directly on their surveyed boundaries. Edges generated by conservation activity and habitat protection extend both to the inside and beyond the protected area's boundary (i.e., inwardly or outwardly).

For example, the spread of elk, bison, and wolf populations surrounding Yellowstone generates a moving

"species edge" that migrates across the park boundary. In cooperative settings where a protected area includes parcels that are not under its jurisdiction, jurisdictional and administrative boundaries may be different. The two worlds have different implications: they coincide in simpler protected area designs (one ownership and one boundary). In more complex settings the jurisdictional boundary is the limit of authority. Its rules set down the limits and preferences for human activity on either side of the boundary. On the other hand, the administrative boundary may be a larger set of properties, jurisdictions, and values.

If a boundary has influence on protection and management, it is likely to generate edges or gradients that are both ecological and societal. However, they are not necessarily going to be noticed other than where the differences between uses (or management) inside and outside are obvious. Such gradients can include a huge variety of changes, and work in both directions. Examples include weed seeds blown in, polluted air, wild animals ranging out, and so on.

Unintended boundaries can occur as well, as demonstrated by the effects of the transportation corridor in Banff and Jasper national parks or the water diversion systems of the Everglades. Whether or not these changes (generated edges) are noticed depends on how finely tuned the protected area's monitoring program is to the boundary processes manifested on both sides of this interface.

Protection mandates establish another societal gradient, *one of values*, in which societal values generate social and physical changes in the region. The boundary effects that we observe are influenced by societal, especially political, commitments to protection. At Grand Canyon National Park the pressures of widespread international affluence, the prevalence of cheap technology (aircraft), and societal assumptions—"Seeing is enjoying and doesn't affect others"—cause intense difficulty in protecting what we see as opposed to what we hear. Changing regulations across a boundary is an expression of *change in values*. These can have secondary influences on how land is managed, simply due to the extent of harmony or disharmony between stakeholders.

Rocky Mountain National Park faces growing private development on park boundaries that affects the park's ability to protect its values. Private development represents different sets of values. The park is affected by the elimination of undeveloped private adjacent land, reducing the functional size of the park regarding the capacity to sustain viable populations of species no longer free to move throughout their natural domains.

These same pressures are evident in Tarangire National Park in Tanzania, where adjacent agricultural development from government settlement policies has been resulting in attempts to control elephant migrations, causing ecosystem degradation

both within and outside of the park, depredation of agricultural crops, and unnatural elephant control measures. Current work with external communities is showing hopeful progress in respecting migration routes in development activity.

In Yellowstone, the brucellosis and New World mine issues are lightning rods of societal conflict between our modern understanding of the meaning of "park," and what it takes to protect parks in the context of contrasting societal differences. In the case of brucellosis, the science is clear, yet the polarity of local, state, and federal stakeholders is extreme. And supposedly protected bison, carriers of brucellosis, are killed when they cross the park boundary. Many more thousands of elk, equally infected, cross back and forth without controversy. The result is a strong social gradient that increases in stress-intensity towards the park, but only regarding bison.

Generated societal and ecological gradients across protected area boundaries can have serious erosive effects on the ecosystem—and unanticipated but damaging ones to societies living in and near the protected area. The displacement of indigenous people to set up protected areas, such as happened with Ngorongoro Conservation Area, can create some of the most extreme contrasts because of hostilities created by displacement. These hostilities feed back on compliance and usually generate needs for intense management, enforcement, and negotiation. The costs can

be prohibitive and outcomes destructive to the entire system (people included). Other solutions, particularly in Canada, seem to offer greater hope and far more respectable outcomes.

The properties of societal and ecological contrast that are generated by *more* or *less* protection on one side of a border than on the other are not static ones. They are not necessarily symmetrical, spatially continuous, nor synchronous with the establishment and management actions taken at the park boundary. Just as with most things in cultural and ecological systems, change is normal, asymmetry is normal, and discontinuity is common.

Certain assumptions about protected areas can be tossed out when we realize there is too little to support them. For example, there is no reason to assume that the functional size of a park is necessarily the surveyed size (as defined by the jurisdictional responsibilities), simply because of the boundary influences discussed above. The cooperative approaches at Rocky Mountain and the "bison war" at Yellowstone are two manifestations—so is the issue of elephants at

can be interpreted as being larger where its boundary joins an adjacent U.S. Forest Service wilderness area, or smaller where bison leave the park onto private land. The functional capacities of protected areas are decreased or increased because of their juxtaposition and similar or dissimilar purposes.

Functional size and shape are closely related: there is no reason to assume that the functioning shape of the protected area is similar to the mapped shape. When off-road vehicles damage desert ecosystems, plants or animals are poached along boundaries, roads affect distribution or movement of wildlife, or in-park development alters migration routes—then the functional shape of the protected area is altered. Thus, intrusive and extrusive influences of boundaries are variable and may be wider, denser, or directionally oriented in some places; their properties change. It becomes obvious that the regions across protected area boundaries are important places on which to focus attention and specifically monitor for indications of change.

There is an overriding theme we consider common to most park and protected areas. It is the essential so-

maybe even five years ago. Rather, it focuses on the interests of people and their values, and the need to bond protected areas to the societies in which they exist. It turns the early-20th-century idea of “boundary” inside out—no longer is a boundary a line of certain demarcation: if it is in, it is protected ... and “we” will do the protecting. No, today a boundary must be seen as something like a “diffusion filter.” But what a change! To a traditionalist, it sounds weak, puny, almost like giving up. Man the battlements! Pour oil on the bastards! We will protect *their* park, for *them!*

No, that’s not the future. In most places, it isn’t even today. Our societies interact with our protected areas in ways Olmsted might not be surprised about, but many protected area managers would be.

What a change!

There is a paper at this conference that’s different than all the rest. There’s a brave soul out there who’s onto something and has guts enough to face his peers with it. It’s titled “A Fuzzy Framework for Managing Landscape Modeling Concepts.” [Authored by H.J.E. Penna, Departamento de Geografia, Universidad de Buenos Aires.] Fuzzy logic in protected area management? Good Mother of Mary—what in hell is next?

Well, *that’s* next. Listen to some of his abstract: “Imprecision, nonspecificity, vagueness and inconsistency are considered undesirable features when trying to define policies or implementations” and “much of the

logic used in human reasoning is a logic with fuzzy truths and fuzzy rules of inference.”

Does that ring true for managing protected areas? Having just finished three years as Deputy Director of the U.S. National Park Service, it sure rings true for me! There wasn’t a park issue that I dealt with that was precise, specific, defined, and consistent, and the superintendents didn’t think so either.

So what about science in this kind of world with fuzzy logic, chaos theory, and diffusion filters? We need an explosion in capability. Our technical knowledge must get better. We’ve got to define our technical research more clearly. We must monitor well and keep records well and analyze the changes well. No difference from a decade ago.

We’ve got to do it better, not only so we know what we are talking about, but also so those through the diffusion barrier receive us with credibility, and we communicate results so that they can understand them.

Who’s out there through the diffusion filter? What are their values? Do we understand them? Do they understand us? After all, what Theodore Roosevelt’s peers thought about parks may not be what the population today feels. We’ve got to know, and we’ve got to relate our values to their perceptions of what they need for the future, and help them have the range of information so they can choose wisely. So, science about people, about vox populi, and the

science of education of those whom we serve are essential.

If we are interested in protecting biological diversity and in ecosystem management, the NPS Organic Act of 1916 provides a good reminder: it reminds us that protection is associated with some sort of social pleasure, and that social pleasure, or satisfaction, is essential to the survival of these areas. Social pleasure or satisfaction includes, but is more than, just direct interaction with park resources. In a larger sense, it directly implies a cohesive acceptance throughout the society that the parks are *of value to the society*; that the society perceives itself as being better off by having parks. Can there be any doubt that the 21st century will bring more controversies and problems?

We will still be asking: How do we interpret the protection process? How does it affect human behavior? And, How does it affect our ecosystems and cultures? Finally, we need protected area managers who are creative, who can take good biological, physical, landscape, ethnographic, historical, paleontological, social, economic, and political sciences and use them in ways that only few have the temerity—or guts—or intellect to even try today.

Creativity based on good information of all kinds will be the basic requirement of the future. The logic will be fuzzy, the issues imprecise and vague, and the boundaries more diffuse than ever.

It's a huge challenge—but an exciting world, don't you think?

John J. Reynolds is the director of the U.S. National Park Service's Pacific West Region in San Francisco, California. **Christine Schonewald** was president of the George Wright Society from 1986-1989. She is a research scientist with the U.S. Geological Survey's Biological Resources Division stationed at the Cooperative Parks Studies Unit, University of California-Davis.

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