The Greater Yellowstone Ecosystem: Challenges for Regional Ecosystem Management

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Abstract – An adaptive management approach is necessary but not sufficient to address the long-term challenges of the Greater Yellowstone Ecosystem. Adaptive management, in turn, has its own particular challenges, of which we focus on two: science input, and stakeholder engagement. In order to frame our discussion and subsequent recommendations, we place the current management difficulties into their historical context, with special emphasis on the 1990 Vision document, which attempted a broad synthesis of management goals for the ecosystem. After examining these two key challenges in the context of the GYE, we make several recommendations that would allow for more effective ecosystem management in the long term. First, we recommend adoption of the GYE as a site for long-term science research and monitoring with an emphasis on integrative research, long-term federal funding, and public dissemination of data. Second, we conclude that a clearer prioritization of legislative mandates would allow for more flexible ecosystem management in the GYE, a region where conflicting mandates have historically led to litigation antithetical to effective ecosystem management. Finally, we recommend a renewed attempt at an updated Vision for the Future that engages stakeholders (including local landholders) substantively from the outset.

Keywords: Greater Yellowstone Ecosystem, ecosystem management, adaptive learning, stakeholder engagement, Greater Yellowstone Coordinating Committee
Ecosystem Management in the GYE

Although only recently defined as such, the Greater Yellowstone Ecosystem (GYE) has arguably been the crown jewel of the modern-era American landscape since the very first explorers stumbled onto its game-rich valleys. At approximately 19 million acres, it contains the headwaters of three major continental river systems (the Missouri-Mississippi, the Snake-Columbia, and the Green-Colorado), is home to 60% of the world’s geothermal regions, and remains the largest functionally-intact temperate ecosystem in the world (Greater Yellowstone Coordinating Committee 1990, Marston and Anderson 1991, Patten 1991). Although its exact boundaries may be in dispute, management of the GYE, which spreads over parts of Idaho, Wyoming and Montana, includes a number of federal lands including two national parks (Yellowstone National Park and Grand-Teton National Park) and all or portions of seven national forests (Beaverhead NF, Custer NF, Gallatin NF, Shoshone NF, Bridger-Teton NF, Targhee NF, Caribou NF). It also includes almost 5 million acres of private land, and over 1.5 million acres of state lands and Native American Reservations.

Biogeographically, the landscape of the GYE is a patchy mosaic representing the accumulated history of biological and geological processes, principally volcanic activity and widespread forest fires. This heterogeneity has provided for the incredible biological richness of the GYE, which is only hinted at by its most visible residents, which include grizzly bears, wolves, elk, mountain lion, lynx and bison. Its biological and geological uniqueness, the very reason the area was first set aside, was highlighted in 1978 when Yellowstone National Park, the keystone of the GYE, was designated a World Heritage Site by the United Nations.
Although it would be difficult to overstate the importance of the GYE to the rest of the world, it would be impossible to overstate its importance to the United States. Since its creation over 130 years ago, Yellowstone has become a powerful symbol of the American West where, for almost two centuries, conflicts over conservation versus preservation, environmentalism versus ‘wise-use’, and federal power versus private ownership have played out. Its historic status and symbolic power make Yellowstone National Park a lightening rod for controversy and a battleground for outside interest groups; this creates a perfect storm in which environmental conflicts quickly turn ‘wicked’ (Nie 2003). The development of a regional ecosystem management scheme for the GYE is further hindered by the complex political overlay of private land and public land managed by a suite of federal agencies. In this way, the Greater Yellowstone Ecosystem is similar to many other ecosystems in the world that face management challenges by virtue of the multiplicity of agencies or countries involved (e.g. the Black Sea Basin, the Jordan river). In this analysis, we review the evolution of the current GYE management framework, explore the benefits of an adaptive management approach for the GYE, and review two components of environmental management crucial to successful adaptive management.

**Governance and Social Structure of the GYE**

The management and political context of the GYE is complex (see Figure 1). The three principal agencies involved in the management of the GYE are the U.S. Forest Service (USFS), the National Park Service (NPS), and the U.S. Fish and Wildlife Service (USFWS). Whereas the latter two agencies are within the Department of Interior, the
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U.S. Forest Service is under the U.S. Department of Agriculture, an important distinction that highlights the commodity-based underpinnings of the agency. Although the Forest Service and the Park Service together manage the majority of the land in the GYE, the Fish and Wildlife Service is responsible for implementation of the Endangered Species Act and, as such, also plays an important role in the region. To coordinate their activities, the top officials of these three agencies, along with several other important land managers in the region, meet bi-annually as the Greater Yellowstone Coordinating Committee (GYCC). The GYCC, which will be discussed in more detail in the next section, is the primary forum for negotiating regional ecosystem management. All three agencies and the GYCC interact with stakeholders by a variety of means that will be discussed in more detail in the following sections. The agencies involved and many of the stakeholder groups collaborate with academia on scientific issues pertinent to management decisions. This includes not only direct collaboration on projects of shared interest, but indirect interaction via the peer reviewed literature and scientific conferences. Finally, the GYCC and the different stakeholder groups interact with the media in order to educate, persuade, or engage with the public at large (which are themselves stakeholders).

Establishment of the Greater Yellowstone Coordinating Committee (1960s)

As the science of ecology matured throughout the first half of the 20th century, the concept of an ecosystem as an entity to be managed gained widespread acceptance and led to the realization that Yellowstone National Park, as legislatively defined, was not and could not be a self-contained natural community, particularly with respect to populations of large mammals that often roamed well beyond the Park’s boundaries. Even before landmark legislation such as the Endangered Species Act, the National
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Environmental Policy Act, and the Federal Land Policy and Management Act, the USFWS, USFS, and the NPS realized the importance of coordination in their activities.

In the early 1960s, the Greater Yellowstone Coordinating Committee (GYCC) was created, providing a vehicle for easier communication between the parks and forests of the GYA. In those early days of the coordinating process, natural resource issues were not a major focus of attention of the GYCC. Starting in the late 1960s, the grizzly bear became a topic of national interest, leading managers and conservationists to a heightened recognition of the ecological interrelatedness of GYA lands. [W]ith the creation of the Interagency Grizzly Bear Study Team, there was growing agency recognition that some resources in the GYA would require cross-boundary management...(Greater Yellowstone Coordinating Committee 1990)

The GYCC quietly continued its work of interagency coordination, including policies regarding outfitters, with little public attention; so little attention, in fact, that Congressional oversight hearings in 1985 criticized the lack of coordination between the land management agencies in the Greater Yellowstone Area (GYA), and discussed the lack of data on resources and activities, the effects of road building, the possibility of adjusting administrative boundaries, and noted difficulties in grizzly bear management. (Pritchard 1999)

The Vision For the Future Document (1990)

Seeking to address congressional concerns and consolidate the admittedly piecemeal coordination in the GYE, the GYCC set to work. Its first step was to decide, through negotiation between the USFS and NPS, on overarching policy goals for the GYE. The results of these discussions were presented to the public in August 1990, in the draft form of a document entitled Vision for the Future (Greater Yellowstone Coordinating Committee 1990). This 74-page document laid the groundwork for future coordination on the theory that the two agencies had to agree on a general goal before progress toward it could begin.
Given the sometimes conflicting agency mandates, the goal statement was necessarily vague. The *Vision* document stated, “(t)he overarching goal is to conserve the sense of naturalness and maintain ecosystem integrity in the GYA through respect for ecological and geological processes and features that cross administrative boundaries” (Greater Yellowstone Coordinating Committee 1990). Aside from its goal, the *Vision* document is significant for what it did not state. “The *Vision* set no firm administrative guidelines for management, and hence committed itself to neither extreme of absolute preservation nor uncontrolled resource extraction. The *Vision* did not define resource protection and resource use as being mutually exclusive” and, additionally, “[e]nvironmental groups noted that no changes in managerial discretion were planned” (Pritchard 1999). The *Vision* document itself stressed its own limitations:

The *Vision* is not a regional plan. It is a statement of principles. It does not make specific land allocation decisions, and does not seek to change the separate missions of the national forests or the national parks. Management principles suggested in the *Vision* can be accomplished within the existing legal framework, and without either agency [the USFS and NPS] going outside of its historical and legal mandates (Greater Yellowstone Coordinating Committee 1990).

For all that it was not, the document elicited a “vociferous” response (Pritchard 1999) described as “swift”, “emotional”, and “intense” (Barbee and others 2006). Public hearings were attended by busloads of opponents and “user groups who suddenly saw coordination as a conspiracy” (Pritchard 1999). Others noted the lack of national attention from those “sympathetic to the ecosystem management concept” (Pritchard 1999) and the resulting control of the debate by local user groups and those affiliated with the broader ‘wise-use’ movement (Stapleton 1993). The following year, a ten-page final version of the *Vision* document was published.
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Following this rocky beginning, the GYCC has nonetheless become the primary vehicle to coordinate agency policy in the GYE. The results of its deliberations, though not binding on agency participants, have provided valuable guidance for GYE managers. Since the *Vision* document debacle, the group has accomplished relatively uncontroversial joint research and public education projects. More importantly, it has evolved into a forum where National Park, National Forest, and Wildlife Refuge supervisors develop relationships, discuss joint problems, and determine GYE-level goals. Because its membership is composed of decision-makers collectively responsible for the majority of the ecosystem area, agreements reached, while not always implemented by the GYCC in its own name, are quickly effected through the established machinery of the federal agencies involved. In addition, there are over a dozen interagency subcommittees coordinated by the GYCC tackling issues that range from invasive species to sustainable operations (Barbee and others 2006).

**Adaptive Management: New Challenges for a New Approach**

In this section, we introduce the principles of adaptive management, and argue that the particular management challenges of the GYE require the flexibility and experimentation of adaptive management. As will be made clear, adaptive management requires particular attention to several components of resource management, of which we focus on two: an unusually extensive program of scientific research and the structures for involving stakeholders at every stage of the process.

**Why Adaptive Management Is Necessary**
Adaptive management is the ability to formulate management policies as refutable hypotheses in order to understand how the ecosystem has responded to human intervention (Clark 2002b). To be clear, adaptive management is not just management that adapts; it requires a deliberate desire to manage by experiment. This “rolling rule” approach is suited to decision making in a regime of chronic information shortage (Karkkainen 2002). Unlike management by decree, adaptive management necessitates a framework for ecosystem monitoring and depends upon a governance structure that is prepared to utilize this constant inflow of data to adapt policy. There are several reasons to use an adaptive management approach, but first we address several reasons that may be used to argue against an adaptive approach to management. First, adaptive management is inappropriate in the protection of species on the brink of extinction, in which potential failure is not an option. Even where appropriate, ecosystem management, and by extension adaptive ecosystem management, lacks a clear legislative mandate (Haeuber 1998, Keiter 1998). Finally, adaptive management is inherently time consuming and costly, particularly with regards to long-term monitoring programs necessary for evaluating management policies (McLain and Lee 1996, Haney and Power 1996).

Nevertheless, the inherent dynamics of an ecosystem dictate that its management as such be fluid, adaptive, and closely monitored (Folke and others 2005). An understanding of ecosystem functions and processes is required to enable managers to identify and respond to environmental changes. To this end, adaptive management requires the integration of different knowledge systems and the institutional capacity to monitor and track changes in ecosystem dynamics. Although the GYE benefits from
active scientific research programs both internal and external to the Park Service, the scientific information available is often deemed credible by only a subset of all stakeholders. As a result, the goals of adaptive management remain disputed since only limited consensus exists as to the potential effects of the experiment. Even when the goals are clear, limited understanding of the system may generate disagreement over the appropriate experimental design. For this reason, adaptive management depends on long-term, independent science research that encompasses the ecosystem components being adaptively managed. In the next section, we discuss the issues involved in harnessing science input so as to maximize its effectiveness for ecosystem management.

Adaptive management requires more intense engagement with stakeholders than is required with a more traditional, top-down, style of management. For one, adaptive management is inherently experimental, and some experiments are bound to fail. It is important that stakeholders are engaged throughout the process so that these failures are understood as a natural part of the overall management strategy and do not, in themselves, reflect negatively on the process. Most importantly, litigation is antithetical to adaptive management. Land managers, fearful of a lawsuit, will not feel free to think creatively. Management strategies will be prematurely halted, and the data collected will be insufficient to judge the strengths or weaknesses of the current policy. Effective adaptive management is flexible, and responds to current conditions, but this is not possible when management decisions are suspended by lengthy lawsuits that, when resolved, are already outdated relative to constantly changing conditions on the ground.

Folke and others (2005) argue that adaptive governance can be implemented by initiating adaptive co-management that combines dynamic learning with participatory
multilevel governance approaches. Cross-level interactions between a variety of stakeholders from communities to government agencies could facilitate the generation and transfer of knowledge and develop support for such adaptive management approaches. Johnson (1999) further highlights the need to develop a broad consensus among stakeholders before embarking on an adaptive learning endeavor. The management institution must be open to change induced by recommendations from outside and within the organization. Therefore, the institution must be flexible enough to question itself. If an institution were to fulfill this premise, it could formulate hypotheses of how the ecosystem might function, decide what management steps should be tried and include the results in the formulation of further management strategies. This step is critical, especially in cases involving the questioning of basic assumptions and customary practices.

Why Adaptive Management Is Not Sufficient

As Folke and others (2005) argue, managing an ecosystem only according to its observed dynamics is not sufficient. Not only is it necessary to prepare for abrupt changes and uncertainty within the ecosystem (like forest fires or insect outbreaks) but also for slowly evolving external, socio-economic factors (e.g., legislative decisions or changes of global trade conditions). Ecosystem experiments are typically designed only within the bounds of the current paradigm and do not usually provide an opportunity for more comprehensive adaptive learning. For example, adaptive management is applied to improve fire fighting techniques, but it is not used to answer the question about the reason for fighting fires in the first place. In other words, adaptive management is a
Science advice

Science advice is a major component of adaptive ecosystem management. In addition to advancing the state of knowledge, itself an important goal, scientists often provide contributions to the understanding of the ecosystem problem, describe alternative management strategies, and give advice on the most effective choice. On the other hand, science can be a major hindrance to sound ecosystem management if it creates unnecessary controversy, lacks the capacity to handle the scientific questions at hand, or if it is used as a stalling tactic when concrete action is required (Nie 2003). Finally, unless science specifically addresses questions of interest to policy-makers, it can become irrelevant to the process. The challenge, therefore, is to design a system whereby science has the scope, capacity and independence necessary to effectively and efficiently aid in making better on-the-ground decisions.

Recent work on the effectiveness of science advice on environmental issues suggests three criteria that influence the way science comes to bear on decisions; all else being equal, science advice will be more effective to the extent that the scientific results and the process of producing them are perceived as simultaneously scientifically credible, politically legitimate and practically salient to the stakeholders involved (Cash and others 2002 and 2003, Clark and others 2006). In this context, credibility describes the degree to which the advice is seen as scientifically adequate and saliency deals with the pertinence of the advice to the questions asked by the users. Legitimacy involves the notion that the production of science advice must respect divergent beliefs, perspectives and interests of
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the various stakeholders and treat them fairly in the process of gathering and interpreting
data. Although it is analytically useful to differentiate the three criteria, it is
acknowledged that they are closely interconnected in reality and that enhancing one of
the attributes almost always occurs at the cost of another (Clark and Majone 1985, Clark
and others 2002, Eckley and others 2002). As a promising approach to enhancing the
three criteria, Cash and others (2002) propose open and iterative communication,
translation and mediation between scientists on one side and the users of the knowledge
on the other. These functions of effective science advice can best be facilitated by so
called “boundary management” (Guston 1999, Cash and others 2003) as an intermediary
between the political and the scientific realm.

Credibility of the science

Discussing the credibility of science in the management of ecosystems in which
humans are a necessary component raises the question of the role of scientific “fact”.
Frequently implicit in a management policy debate is the belief that science and scientists
have a monopoly on the truth, and the only barrier to effective ecosystem management is
the need for more or better science. However, this is not always true, as scientists from
different groups (or even the same agency) often reach different conclusions following
their own review of the data. Former Director of the U.S. Fish and Wildlife Services John
S. Gottschalk noted that “management recommendations and the decisions that follow
can seldom if ever be backed up completely by data: at some point, judgment and
educated guesses have to take over” (Pritchard 1999). Moreover, much knowledge
resides outside of the scientific umbrella, in the accumulated experience of the ranchers,
hunters and Native peoples who live, and have lived, in the GYE. This information can
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also provide a basis for formulating management strategies intended to elicit an

environmental response (Reading and others 1994, Berkes and others 2000, Robbins

2006). A common currency for evaluating the various types of information serving as the

basis of the management alternatives is nonetheless critical for wide acceptance of the

policies deployed in the GYE.

The science produced in the GYE has in the past been interpreted by various users

as only partially credible. Many scientists doing research in the GYE are affiliated with

an academic entity and have only an indirect stake in park management, but scientists

employed by different federal and state agencies, conservation groups or other

stakeholders are in many cases perceived as not really independent. Grizzly bear biologist

John Craighead states that “[a]gency control of the production and release of scientific

knowledge has created a credibility gap and, frequently, an adversarial relationship with

concerned scientists. Bureaucratic staffs have aggregated this further with an “in-house”

paranoia that has discouraged and effectively prevented “outside” criticism and

assistance...” (Craighead 1991). Although Yellowstone National Park maintains a large

and very active staff of park scientists, “the Park Service’s science program has been

repeatedly criticized because it lacks independent stature and funding within the agency,

has not taken full advantage of independent scientists, and does not consistently subject

park research to outside peer review” (Keiter 1996/97). Despite these concerns, a survey

of gateway community citizens showed that scientists/veterinarians were rated as being

the most trusted group of all participants involved in the controversy over bison

management to control the spread of brucellosis (Morris and McBeth 2002). There is,
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therefore, a tremendous potential for science to provide credible information pertinent to management.

One could make the argument that the GYE would be well served in this regard by being designated a Long-term Ecosystem Research (LTER) site (Pringle and Collins 2004). These sites (currently there are 26) are coordinated by the National Science Foundation with the mission to promote “synthesis and comparative research across sites and ecosystems and among other related national and international research programs” (Long-Term Ecological Research Network 2006). A LTER site in the GYE would provide federal and academic scientists an infrastructure for collaboration, long-term funding of ecological monitoring, and the opportunity for cross comparison with other sites. We return to this point in our recommendations.

Saliency

The science done in the GYE lacks comprehensive saliency as it is predominately focused on the natural sciences and leaves social science questions unresolved. Many problems facing the GYE are often interwoven with broader social and economic concerns. There is an important unmet need for the kind of interdisciplinary social science that can consider the ecosystem as a whole and also its economic and social implications. “Without ready and open access to these social areas of expertise and practice, ecologists may not exploit the most cogent or important connections to their research” (Boynton and others 2005).

Ongoing research is also geared towards tackling ‘ordinary’ challenges at the expense of even more difficult ‘constitutive’ challenges. Whereas ‘ordinary’ challenges involve specific policy issues discussed within the existing decision-making framework,
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‘constitutive’ challenges involve the decision making process itself, its underlying goals, and the parties involved in the process (Clark 2002a). Whereas wildlife biologists, studying ‘ordinary’ problems, might be asking “What is the reproductive success of grizzly bears in the GYE”, the ‘constitutive’ challenge is to understand “How do grizzly bears fit into our society, how do we value them, how do we understand our relationship to them”? These underlying governance and ‘constitutive’ challenges could be adequately addressed if more comprehensive, discipline-crossing research were undertaken, particularly in those areas that combine an understanding of the ecological system with an understanding of the social system in which it resides. The reintroduction of wolves involved numerous biological studies, but very few studies on the impact of wolf reintroduction to the culture and economics of the surrounding communities (the pre-introduction study of public attitudes by Bath (1989) is one exception). Ten years later, it is clear that the wolves are doing just fine, and it may be a lack of community support, encouraged by powerful commodity interests, that will make management of wolves difficult in the long-term.

**Legitimacy**

Some stakeholders question the legitimacy of the science in the GYE, stating that only those scientific findings that support a pre-ordained policy are used in the decision-making process. In the mid-1940s, “to solidify his position against the formidable opposition of [former Yellowstone National Park Superintendent Horace] Albright, [Direct of the National Park Service Newton] Drury solicited comments from scientists and conservationists who almost unanimously supported his decision to abolish the bear show in Yellowstone” (Pritchard 1999). More recently, there have been charges that the
Bush administration ignored extensive scientific evidence concerning the deleterious effect of snowmobiles in the Park when it reversed an earlier ban proposed by the Clinton administration. Michael Finley, who oversaw the earlier ban on snowmobiles as Yellowstone’s previous superintendent, has been quoted as saying that “[the Bush administration appointees] decided they were going to have snowmobiles in Yellowstone no matter what the facts demonstrated. They never asked to review the facts. They had their minds made up” (Dustin and Schneider 2005). More recently, Finley told the New York Times that “[t]he facts and science gave them a direction to take, then they softened, twisted and contorted the science” (Robbins 2007). Exacerbating concerns (legitimate or otherwise) of outright cherry-picking of the data, science is often used as a weapon that is used by policy marketers on each side against the other (Nie 2003, McBeth and Shanahan 2004). In cases where all parties to an argument have their own ‘science’, the legitimacy of science in general can be called into question. Boundary organizations, or other independent mediating bodies, can help alleviate some of these legitimacy concerns.

*Boundary organization*

Science advice has to be undertaken in a delicate balance. Scientists risk their independent status if they become too directly involved in political decision-making. On the other hand, science undertaken by scientists disconnected from the policy arena may not address questions of interest to the policy process. It is also unrealistic to expect that those scientists will have no political opinions or have no role in the community as anything other than as a scientist. In this, the scientist always risks a conflict of interest.
Boundary management at the interface between scientists and experts on the one side and decision makers and interest groups on the other can facilitate the communication, translation and mediation necessary to successfully resolve the issue. Often, such boundary management is performed in boundary organizations – institutions that facilitate knowledge exchange between different parties by acting as an intermediary between them. The different groups interact via the boundary organization, which serves as a neutral ground for the various groups to debate.

In the GYE, the Interagency Grizzly Bear Study Team (IGBST) can be seen as a first and promising approach to initiate a boundary organization. It was particularly important in, and was in fact created to mediate, the dispute over the closing of the Yellowstone National Park garbage dumps. For decades, there had been serious disagreements between scientists over what would happen to the grizzly population once the garbage dumps were closed to them. “Because the biologists disagreed, in 1974 the secretary of the interior sought an adjudicator, requesting that the National Academy of Sciences appoint a Committee on Yellowstone Grizzlies” (Pritchard 1999). The opinions offered by the independent National Academy of Science’s report helped quell controversy over the garbage dumps temporarily and, in 1973, a new interagency study team was created. “[T]he Interagency Grizzly Bear Study Team (IGBST) represented biologists from the NPS, the USFWS, as well as the state fish and game departments. The IGBST goal was to study population trends, determine the use of habitats, and examine land management policies in relation to preserving the bear” (Pritchard 1999). The IGBST’s work solidified the idea that the bears belonged to the entire GYE (not just Yellowstone National Park), and the whole GYE would need to be managed.
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comprehensively in order for the grizzly bear to survive in the region. With the recent
Endangered Species Act delisting of the grizzly bear, the IGBST continues to play an
important role in the management of bears in the GYE, and serves as an example of a
boundary organization that can bridge science and policy and ensure that science input is
credible, salient, and broadly viewed as legitimate.

Stakeholders

With regards to stakeholder engagement in the management of any ecosystem,
there are really only two questions to be addressed: “Why?” and “How?” To address
either of these questions, it is important to define ‘stakeholders’ and to reflect on what is
meant by the oft used but rarely defined term ‘engagement’. Although the term
stakeholder may be used to mean any person or organization with a stake or interest in
the ecosystem, here we restrict our definition of stakeholder to three categories: non-
governmental organizations (environmental groups, hunting organizations, etc.), industry,
and individual citizens. We exclude from our definition of stakeholder government
officials, scientists (in their role as scientist), and federal agencies. Stakeholders, from
this perspective, seek to use science and the media to influence those in government with
the authority to make decisions with regard to ecosystem management. Defining
‘engagement’ is a more difficult challenge. In practice, engagement often refers entirely
to a series of one-way interactions. Governing bodies often engage with the public with
programs that are inherently one-way: the governing body informs the public through
education programs, newsletters, press releases and open houses, or solicits opinion
during comment periods in town meetings and public opinion polls. In fact, this
proceduralism is rooted in the very conception of individualism in American democracy,
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whereby government provides a neutral process for the deliberation of individual rights at the expense of deliberative assemblies aimed at the common good (Morris and McBeth 2002). Despite their long-standing role in the public-policy making process, we argue that these programs do not constitute engagement. Whereas the former is easily dismissed as a public relations campaign used to sell a pre-packaged plan, the latter also falls short of true engagement. Effective stakeholder engagement in this context requires an iterated series of two-way interactions in which land managers and government officials negotiate a strategy for ecosystem management. In other words, public participation must be authentic, defined as “deep and continuous involvement in administrative processes with the potential for all involved to have an effect on the situation” (King and others 2001). This process, which might take months or even years, “helps to build a sense of shared ownership and responsibility for natural resources by moderating a top-down style of government agencies that has tended to disempower landowners and local interest groups. But it also recognizes that government as a partner can provide unique resources, incentives, and opportunities important to collective efforts” (Wondolleck and Yaffee 2000). Land managers must afford stakeholders more than a passing role in the management process. Why is this necessary? Why would government officials and professionally trained land managers consider this complex, uncertain, and time-consuming strategy?

There are many reasons stakeholder engagement is critical to the success of managing large ecosystems such as the GYE. Superficially, the law often requires it. The National Environmental Policy Act of 1969 (42 U.S.C. §§ 4321-4347), for example, requires the publication of environmental review documents and a period for public
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comment for land use decisions and many government-led or funded activities. Likewise, the United Nations Conference on Environment and Development (UNCED) in Rio explicitly emphasized public involvement, stating in its key principles that “[e]nvironmental issues are at best handled with the participation of all concerned citizens” and that “each individual shall have appropriate access to information...and the opportunity to participate in decision-making processes” (UNCED 1992, see also Eden 1996). Even in the case where management choices are limited, there are still several incentives for the GYCC to invest in the process of negotiation and collaboration with stakeholders (Walters and others 2000). For example, stakeholders negotiating on a regular basis with one another often prefer to negotiate a settlement rather than risk the “crap-shoot” of litigation (Craig Gehrke, Wilderness Society, pers. comm., December 8, 2005). Secondly, stakeholder constraints are often more limiting than logistical or ecological constraints, and delaying stakeholder involvement only postpones (and often exacerbates) conflict (Nie 2003). Finally, these negotiations, either between conflicting stakeholder groups or between stakeholders and the GYCC, allow for more flexible decision making over the long-term and more rapid decision making when crises arise. Whereas a legal decision defines a winning party and a losing party, a negotiated settlement might ‘expand the pie’ – allowing for a better solution overall (at least, as defined by the parties at the table).

Intense and protracted stakeholder engagement throughout the process can also lead to more effective implementation by creating a sense of shared ownership among those impacted by the final policy. Although it can be argued that a thorough vetting of stakeholder interests during the development stage of a management policy may lead to
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stalemate and stagnation (a ‘morass’ of consultation), this perspective implies that current
strategies for incorporating stakeholder ideas and values (newsletters, press releases,
town meetings etc.) do not result in stalemate and stagnation. Unfortunately, flexible and
adaptive ecosystem management in the GYE is consistently thwarted by lawsuits that
take years to be resolved by the legal system. Procedural impediments to protracted
citizen deliberation and the subsequent ‘winner-takes-all’ paradigm encourages losing
parties to go outside the policy process and engage in litigation that not only impairs
policy implementation but escalates the cycle of confrontation and polarization (Morris
and McBeth 2002). In this situation, a compromise solution based on shared values (of
which there are often many) becomes increasingly unlikely.

Two case studies will serve to illustrate what has worked and what has not
worked with regards to effective stakeholder engagement in the GYE. The spectacular
failure of the 1990 draft Vision document can be pinpointed in large part to a failure to
address the concerns of local residents. Most recently, the 1995 reintroduction and
imminent delisting of the wolf has remained a hotbed of contention among stakeholders,
pitting environmentalists and the Endangered Species Act against ranchers and local
residents, many of whom were more than happy with the wolf-free status the region has
‘enjoyed’ for almost a century.

Perhaps the textbook example of a failure to effectively engage stakeholders is the
failed 1990 draft Vision document. Following Congressional concern that GYE
management was not being effectively coordinated by the agencies involved, the GYCC
set about to draft a document that would lay the foundation for the future of the GYE as
an ecosystem to be comprehensively managed (Freemuth and Cawley 1998, Pritchard
In order to garner public opinion, a set of principles were laid out and distributed for comment. The GYCC wrote press releases, held open houses, and distributed newsletters all designed to “engage” the stakeholders in the region. On the surface, their efforts at informing the public and getting feedback on the plan seem ambitious, but ultimately, all of these techniques are essentially a series of one-way interactions. By their own admission, the public input received largely served to consolidate and reorganize the statements of principle already existing in the plan from its inception within the confines of the GYCC (Greater Yellowstone Coordinating Committee 1990). The basic principles of this long-ranging vision for the region were largely already decided by the time stakeholder input was solicited. This dissonance (between the generation of policy and the solicitation of input) is not unique to the GYE; in fact, stakeholder engagement is typically focused very early in the scoping process or very late during review of the completed management plans. Public meetings, which are a popular method of marshalling public support, are particularly problematic if the goal is to adequately represent public sentiment (King and others 2001). “To truly involve the public, resource managers must move beyond the traditional realm of public meetings toward a more comprehensive understanding of the public. Public meetings can be used to identify extreme viewpoints, because those who attend are usually strongly supportive or strongly opposed to the plan or action proposed by the agency. The vast majority of the public, who are ultimately affected by the decision, is not a part of the decision making process when public meetings alone are used” (Bath 1991).

In the case of the Vision document, it is particularly remarkable that stakeholders were not more substantively engaged during the process since the management principles
being crafted in this case concerned not only federal and state land but also all of the privately-held land in the GYE. Wide acceptance of the *Vision* document would require that affected stakeholders feel a sense of personal ownership over the plan. But when the document was released as a draft in 1990, the endemic lack of public involvement allowed well-organized interest groups, such as the Wise Use Movement, to stoke public fear and resentment over a plan they were encouraged to see as a federal lock-up of public and private land (Wilson 1997, Barbee and others 2006). Poor long-term planning and public engagement allowed the Vision document to become a “biopolitical pawn” in a broader cultural argument that was ultimately unhelpful for resolving the more specific issues addressed in the actual draft plan (Mitchell 1994). It is clear that such a broad guiding vision for the region needed a more substantive attempt at involving stakeholders given the broader context in which these policies resided.

Given the real need for a long-term guiding vision for the region, it is unfortunate that the *Vision* document, which was ultimately reduced from 74 pages to a mere 10 (and rechristened the Framework document), was so unpopular. Although there are many facets to the successful integration of stakeholders, here we focus on the time scale, regularity, and intensity with which stakeholders are engaged with the process and with each other.

Stakeholder engagement in the process of regional ecosystem management is most effective when the form of stakeholder engagement is commensurate with the *time* necessary to address the problems (from years to decades) and, as noted above, with the *timing* of successive stages of the process. As noted by Robert Axelrod, who has studied cooperative behavior in computer simulations and in case studies, “Critical to the success
of these cooperative arrangements was a time frame that was long enough to allow for iterative decision-making” (Wondolleck and Yaffee 2000). For the 1990 draft Vision document, it would have been more effective if stakeholders had been engaged from the very beginning of the process. By their own admission, the authors should have done more to understand what the public wanted from the GYE (Barbee and others 2006), and what principles for management might they have envisioned. A forum for regular and sustained negotiation among stakeholders and between stakeholders and the GYCC would have created a set of principles more in line with public sentiment for the region. In addition, this process might have clarified some of the language that ultimately became problematic in the aftermath of its release.

Secondly, stakeholder engagement in the process of regional ecosystem management is most effective when stakeholder-stakeholder and stakeholder-agency negotiators have frequent, compulsory meetings occurring over long periods of time independent of the immediate need for negotiation. Even if a representative panel had been assembled for the creation of the Vision document, this would have already been too late. There are already working groups that meet regularly about a number of ‘ordinary’ problems in the GYE (the Interagency Grizzly Bear Study Team and the Greater Yellowstone Interagency Brucellosis Committee both meet regularly) but there is no regular forum for engaging stakeholders on the broad questions addressed by the Vision document: What do we envision for the GYE? How does regional ecosystem management fit into the larger socioeconomic picture? How do we sustainably manage our resources? Long before these principles were put into writing, there should have been
a forum in which to build a shared vision among stakeholders, agency officials and land managers.

Finally, stakeholder engagement in the process of regional ecosystem management is most effective when there is a coincidence in values among stakeholders, which can arise from a long history of working together, shared experiences, fieldtrips, or joint research. The Greater Yellowstone Ecosystem is more than just a place on a map, and its many faceted nature permits many “ways of knowing” (Cheng 2003). To some, the GYE is an economic engine which provides both raw materials and jobs for economic growth in the region. To others, the GYE is a playground to be enjoyed. Still others see the GYE as a spiritual place of great significance, hollowed ground to be revered.

Scientists see the GYE as a natural laboratory, and bioprospectors see untapped potential in the hot springs and geysers. There are as many ways of appreciating the GYE as there are visitors to the region, and all are equally valid. Although you could not, and would not want to, homogenize the different ways in which people interact with the region, stakeholder-stakeholder negotiations require that the different parties be able to see through the other’s lens. One way to do this is to engage in regular fieldtrips in which a variety of different stakeholders experience the land together. Even entirely unrelated activities done together, such as working together on a third, undisputed project, can build bridges of understanding that promote collaboration or negotiation. Another suggestion has been to create advisory panels of randomly selected citizens to serve as deliberative bodies that advise the decision-making process (DeLeon 1997); most effective would be panels that, unlike a Citizen Jury (Crosby 1986), involve long-term appointments and encourage the development of ‘horizontal’ community-based networks.
unmediated by interest groups and other ‘vertical’ party affiliations. The social networks
developed in the process of regular meetings and shared experiences are particularly
important in situations of rapid, unexpected change (for example, the 1988 Yellowstone
fires) for which more typical bureaucratic processes for decision making would be too
slow (Folke and others 2005).

Finally, we consider the reintroduction of wolves into Yellowstone National Park
discussed above. With local opposition so deeply entrenched, how was it that wolf
reintroduction became a reality? Bruce Babbitt, who literally had a hand in the
reintroduction of wolves into Yellowstone, felt that national support for wolf
reintroduction (aided in no small measure by the wolf’s charisma), decades of
preliminary analysis by the Fish and Wildlife Service, and the tool of the Endangered
Species Act, all coalesced to make reintroduction possible (Bruce Babbitt, former
Secretary of the Interior, *pers. comm.*, December 1, 2005). This sentiment is largely
repeated by James Pritchard: “Several factors operating together made wolf
reintroduction possible, including legislation on endangered species, the persistent efforts
of environmental organizations, solid information on wolf ecology, and a changing
national constituency for the parks that increasingly understood Yellowstone in terms of
its ecosystem functions.” (Pritchard 1999) It is interesting to note that all of these factors
are external to the local dynamics of GYE residents. There is no evidence to suggest that
at any point in the process local residents were suddenly convinced of the wolf’s value or
became less concerned about the economic impact to ranching. The process largely
moved forward on a wave of external forces, a national constituency that saw benefit to
the wolf’s return to Yellowstone, a federal law mandating its reintroduction, and a federal
agency that had finally pushed the idea to the front burner of political debate. From the perspective of those in favor of wolf reintroduction, this was a victory, although without buy-in from local residents, including ranchers, the long-term future for wolves in the Rockies remains uncertain.

The USFWS Northern Rocky Mountain Wolf Recovery Plan lays out the importance of public support to the reintroduction process, citing that

Public understanding and support is critical to the wolf recovery program. Implementation of recovery actions, especially a translocation program, cannot succeed without public acceptance. Until now, lack of knowledge and misinformation have been very real factors in inhibiting the wolf recovery effort. Thus, it is essential that the public is kept informed and involved in such programs. This can be accomplished through issuing news releases and articles, holding community or public meetings, and otherwise informing people of the facts about the wolf, its ecology and needs, and the transplant program. (USFWS 1987)

Again, the official position on stakeholder engagement is to inform the public, with the implicit belief that if the public were only better informed as to the habits and ecology of the wolf, they would support wolf reintroduction. The very real possibility that a fully informed public would still reject wolf reintroduction is never even considered.

Although stakeholders were nominally engaged at length during the policy development process, attending 34 open houses and submitting over 160,000 comments in the five month comment period on the recovery plan’s Environmental Impact Statement, many local residents never bought into the reintroduction process.

This lack of local support may ultimately prove fatal to the grand vision of wolves roaming freely in the Rocky Mountains. As wolves have moved toward ESA delisting, state agencies in Idaho, Montana, and Wyoming have had to develop their own plans to manage wolves. Wyoming, in particular, was slow to meet the minimum requirements for
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wolf management, a delay which reflects the fact that much of Wyoming never bought into wolf reintroduction. Park County, WY Game and Fish commissioners have been quoted as saying the “fewer wolves the better” (Cloudwalker December 4, 2002), and state that “[a]lthough the board realizes the gray wolf may be here to stay, (neither) we nor a majority of our constituents supported the forced reintroduction ... in our county” (Cloudwalker December 16, 2002). Rep. Barbara Cubin, R-Wyo has complained that "[t]hese wolves were re-introduced against the wishes of local and state authorities and have cost Wyoming's livestock industry hundreds of thousands of dollars due to heavy predation, in addition to significant losses to our big game herds" (Straub February 9, 2007). The long-term future of wolves outside of Yellowstone National Park remain in doubt.

Recommendations

Designation of the GYE for Long Term Ecosystem Research and Monitoring

As introduced in our discussion of science input, effective management of the GYE would be greatly facilitated by its designation as a site for long-term ecosystem study. Although the Northern Range has been proposed as a site for the National Ecological Observation Network (NEON), information salient to environmental management is more likely to be achieved through the Long-term Ecological Research (LTER) program, which includes population study and disturbance patterns as two of its core areas of focus (Long-Term Ecological Research Network 2006). There is currently no LTER site in the GYE, or in the surrounding environs. In addition, although social science research is not currently institutionalized in the LTER program, there is a wide acknowledgement that human activity is essential to ecosystem functioning and
subsequently there is a recognized need in the LTER program for more social science research. To meet this need, the creation of an Integrated Science for Society and the Environment program has been proposed to help further formalize the integration of social science into the LTER program (Collins 2007). A LTER site in the GYE would signal a commitment to long-term monitoring, sustained funding, and publicly available data on the region which would be credible to stakeholders and salient to the decision making process. An integrated program of social science research would help contextualize the current controversies, would develop strategies for long-term stakeholder engagement, and would provide economic analyses relevant to the impact of management policy on local economies.

Statutory Priorities for the Region

An obvious prerequisite for effective regional ecosystem management in the GYE will be the clear designation of legislative priority for the region. Management of the region as an ecosystem is not necessarily incompatible with a division of land holdings between different federal agencies with different mandates. However, unless statutory priorities are made clear, it will be impossible to manage the region effectively (Nie 2003). This conflict might easily arrive in a case in which management (for example, logging) by the National Forest Service per its legislative mandate for ‘multiple-use’ impairs the ability of the U.S. Fish and Wildlife Service to protect an endangered species per its legislative mandate. In his discussion of exactly this concern, William Lockhart quotes the Bureau of Land Management as saying
The NPS Organic Act, as amended, states that NPS is to leave 'parks' unimpaired for the enjoyment of future generations’. This law does not address the administration of [BLM] public lands whether in proximity to an NPS unit or not; it does not require the Secretary to leave [BLM] lands unimpaired to preserve park values. To the contrary, Congress provided that [BLM] lands are to be managed for multiple use and sustained yield, whether in proximity to an NPS unit or not. (Lockhart 1991)

Lawyers, bureaucrats, and academics have long debated the status of “enjoyment” as an objective of the Organic Act versus a stipulation subordinate to “conservation” (Freemuth 1989, Keiter 1996, Nie 2003). In cases of legislative conflict, the more specific Endangered Species Act has often taken precedence over the more generic Organic Act, and has driven many recent decisions involving park management (Keiter 1996/97). Although Keiter (1996/97) states that “the Endangered Species Act can be viewed as supplementing and strengthening national park preservation efforts”, it is not clear that the ESA, being narrowly focused on individual species already threatened or endangered, is the right legislative tool for ecosystem management. Additionally, the ambiguity surrounding the Organic Act leads inevitably to litigation, as various stakeholders go to court in order to force a particular agency to enforce its mandate. Although highly fragmented, current statutes do provide legal support for ecosystem-based management on federal or state land, although the legal basis for incorporating private land remains a significant challenge (Keiter 1998). This is particularly difficult when, as in the GYE, private areas provide critical winter habitat or act as wildlife corridors (Fritts and others 1994). A clear establishment of priorities, and legal mechanisms for integrating public and private land for ecosystem protection, will promote the kind of fluid, dynamic, and adaptive management style that will be necessary to manage this ecosystem over the long term. The problem remains, however, that unless we know what we want the GYE to be,
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we cannot lay out clearly a set of priorities on which to manage the ecosystem. This leads us to our final recommendation for a renewed *Vision* enterprise.

**A New Vision for the 21st Century:**

The principle roadblock to effective ecosystem management in the GYE is that we, as a society, remain conflicted as to what it is we want from this vast natural area and indeed, from nature itself (Clark and others 1991). The themes considered thus far are, in many ways, merely a means to an end: effective governance structures allow for the development of policy to achieve a particular goal; the evolution of policy by adaptive learning can best capture the dynamic nature of the ecosystems to be managed; science is a tool to be used by governing bodies to understand the cause and effect of a considered policy; these policies must then be effectively implemented; and implementation of effective adaptive management requires a tremendous degree of stakeholder ‘buy-in’ created by a protracted and intense process of stakeholder engagement. None of these issues address the real question which lurks in the subtext of all of these debates: What is it that we want from the Greater Yellowstone Ecosystem? To what end do we manage this vast area?

The laws and statutes creating the managed areas of the GYE are, at best, a static declaration of Congressional (and, in theory, public) will with regards to the purpose of Yellowstone National Park and the surrounding ecosystem. Like many statutes, they are either internally inconsistent or vaguely written and open to interpretation. Even if the dual mandates (to “conserve” and “provide for the enjoyment of”) of the 1916 National Park Services Organic Act were not incompatible, the language used raises several
difficult questions: What exactly do we wish to conserve? Is it enough to simply avoid species extinction? Do we want to conserve the park as it was before Europeans arrived, or do we want to preserve the natural processes (hydrological flows, natural fire regimes, etc.) themselves and allow the ecological system to change as it might? Whereas the former option may in fact be impossible (the very process of evolution by natural selection requires that some species go extinct), the latter ‘laissez-faire’ approach presumes that natural processes can act unfettered in the isolation of a protected ecosystem, even one as large as the GYE. There simply is no objectively “right answer”. Moreover, although an expanded and more transparent scientific program will be necessary for adaptive management to be used effectively, “[s]cience itself cannot define a new ethic...in an area like Greater Yellowstone. Science attaches no significance or value to the many human interests that figure prominently in policy judgments about the public lands” (Keiter 1989).

The 1990 Vision document failed, not because managing the GYE as an ecosystem was such a radical concept, but largely because many stakeholders were alienated in the process. In the wake of its failure, there has been little to replace it as far as a guiding vision for the region. As the suburban and exurban growth continues unabated in the surrounding counties, conflict between man and nature will only grow more pressing (Barbee and others 2006). Yet, without a grand vision for the region, the GYCC can only plug its fingers in the proverbial dike. This new guiding vision should result from a long and committed process of negotiation with stakeholders. In order to engage stakeholders in a more meaningful way, a permanent council of local residents and other stakeholders should be organized with regular and mandatory meetings. This
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council would decide not on particular issues as they arise but would be engaged in a permanent, on-going conversation about the long-term future of the region. What do we envision the economy will look like in 50 years? 100 years? What is our relationship to nature? What do we want to manage the region for? The resulting *Vision* document might take five or even ten years to write, but unless the conversation is started, we can not even in theory reach a consensus on what we want for the region, and how we intend to reach our goals.

The process of developing a new *Vision* for the GYE is not going to happen overnight and without an initial investment in additional personnel. This effort cannot simply be tacked on to the responsibilities of already overworked administrators, as the additional commitment of time and energy is more likely to foster resentment than inspire creative new solutions. On the other hand, all of the groups involved in the GYE currently spend a significant amount of time and energy working on these issues, and a successful outcome would see much of the effort now invested in conflict redirected towards this process. Finally, it is critical that the established framework be robust to the inevitable turnover associated with our political process. The machinery of discussion and collaboration, and the advisory boards created for the process, should be established on a time scale that extends beyond any single political appointment.

The Greater Yellowstone Ecosystem has always meant more to us, as a nation, than the sum of its parts would suggest, and its ecological, aesthetic and cultural importance cannot be overstated. Against this background, the enormous efforts currently needed for innovative management policy are only outweighed by the importance of preserving this unique feature of the national landscape for the centuries to come.
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Figure 1: Simplified schematic of the important organizations and their interactions in the GYE. Forums for interaction are in bold, and critical legislation is in italics. NPS = National Park Service, USFWS = United States Fish and Wildlife Service, USFS = United States Forest Service, GYCC = Greater Yellowstone Coordinating Committee.