Kenton Miller
Nels Johnson

Protected Areas and the Bioregional Management Challenge

Introduction

Storm-battered islands of biological diversity in a sea of human settlement: that may well be the fate of the world's parks and natural areas as wildlands give way to farm, pasture, and settlements. Lands set aside for conservation have been at the center of the world's efforts to protect biological diversity, and that strategy is under siege. What can be done to shore up these vital areas, and, just as important, maintain key habitats, species, and genetic materials wherever they are found across human modified landscapes while fostering their careful use?

The answer must address the way people manage and interact with nature outside of protected areas—where they live and work—and with forestry, agriculture, fishing, wildlife management, and other major uses of land and water resources. We believe that conservation and development programs must first expand their geographic scales, shifting their traditional scope to embrace whole ecosystems. We then must change the process of conservation and development programs to involve the broad array of people and institutions who have a stake in the management of that region. Only by adopting this larger "bioregional" approach can we nurture our natural resources while giving local communities the chance to derive sustainable livelihoods from those resources.

The rubric of "bioregional management" draws upon worldwide achievements with protected areas and is enriched by a number of different approaches, including bioregionalism, biosphere reserves, integrated conservation and development projects, and ecosystem management. Each builds upon a strong ethic of "place" and stewardship. Each promotes the use of the best available science and information to help protect, restore, and carefully manage biodiversity and natural resources. The defining characteristics of bioregional management are shown in Table 1.

Table 1. Key Characteristics of Bioregional Management

Characteristics of bioregional management efforts—based on the experience of bioregionalism, biosphere reserves, integrated conservation and development projects, and ecosystem management—include:

1. *Large Regions.* Bioregional management programs embrace regions large enough to include the habitats and ecosystem functions and processes needed to make biotic communities and populations ecologically viable over the long-term. These regions must be able to accommodate migratory patterns, anticipate nature's time cycles, and absorb the impacts of climate change.
2. *Leadership and Management.* The leadership to establish bioregional programs may come from public agencies or from the community of residents and resource users. The tasks of convening stakeholders, negotiating vision statements, planning and implementing agreed-upon activities can be shared cooperatively between public and private entities, or be fully community-based.
3. *Cores, Corridors, and Matrices.* Core wildland sites feature representative samples of the region's characteristic biodiversity. Ideally, such sites, which may already be designated as protected areas, are linked by corridors of natural or restored wild cover to permit migration and adaptation to global change. Both the core sites and corridors are nested within a matrix of mixed land uses and ownership patterns.
4. *Economic Sustainability.* The livelihoods of people living and working within the bioregion, and especially in the matrix, are encouraged. Appropriate incentives to make optimal use of local resources, and apply sustainable technologies, are combined with a system for sharing the costs and benefits fairly.
5. *Full Involvement of Stakeholders.* All parties who can affect or benefit from the resources have the opportunity to be fully involved in planning and managing the bioregional program. Key here is building the local capacity to participate, negotiate, and perform the various tasks involved.
6. *Social Acceptance.* Any proposals for changes in the way of life and livelihoods of the residents and local peoples, including indigenous communities, need to be acceptable to them.
7. *Solid and Comprehensive Information.* All stakeholders have access to critical information prepared to facilitate planning and management. Geographic Information System technology is used to help stakeholders envision their region and its distinctive features clearly. GIS also helps them model options and scenarios for the future. *(...continued)*

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8. *Research and Monitoring.* Research and inquiries focus on people–environment interactions, the development of innovative methods for the managing natural resources, and the long-term monitoring of environmental factors and the impact of management practices.
9. *Use of Knowledge.* Scientific, local, and traditional knowledge are employed in planning and management activities. Biology, anthropology, economics, engineering and other related fields are all tapped.
10. *Adaptive Management.* Bioregional programs are operated on an experimental basis, upon which to draw lessons from real-world experience, and respond appropriately.
11. *Restoration.* Restoration is pursued where the viability of some habitats or ecological functions have been impaired through excessive or inappropriate use.
12. *Cooperative Skills Development.* Communities and public and private organizations together locate and mobilize the skills, knowledge, and information needed to manage the area.
13. *Institutional Integration.* Alliances with other institutions and with local organizations are forged to close gaps, minimize overlap, and make management and investment in the region more efficient.
14. *International Cooperation.* Because some ecosystems cross international boundaries and, in some cases, extend globally along animal-migration routes, international cooperation may be required.

To learn how well bioregional management works in practice, Miller (1995) examined experiences around the world where policy-makers, managers, and communities have attempted to unite conservation and development at broad geographic scales. The areas included: La Amistad Biosphere Reserve in Costa Rica; the Greater Yellowstone Ecosystem in the United States; the Wadden Sea, extending from the Netherlands to Germany and Denmark; the Greater Serengeti Ecosystem on the Kenya-Tanzania border; Australia's Great Barrier Reef Marine Park; the Mediterranean regional sea; Zimbabwe's CAMPFIRE program; the United Kingdom's North York Moors National Park; and the Hill Resource Management Program in India.

These programs were established with a variety of goals, not always giving highest priority to biodiversity conservation. Reviewing their experience provides useful insights on how bioregional approaches—including protected area management — can meet the major challenges of sustainably managing natural resources and biodiversity across large landscapes.

Balancing the Scales

In bioregional management, there is no single, right scale at which to

work. Hundreds of thousands of hectares may be appropriate for some ecosystems that comprise whole watersheds. A few thousand hectares may be enough to manage or restore some habitats or to protect, say, specific strains of wild rice. At each scale, different tools and capabilities will be needed to meet management objectives. Stakeholders and institutional jurisdictions may vary as well.

To be practical, communities, residents, resource managers, and government agencies will want to define the bioregion in terms that most residents think of as home. This space will be subdivided into areas that correspond to specific watersheds, habitat types, the home ranges of certain species, timber-supply areas, development zones, and the like.

Dialogue, scientific trial and error, and adaptation over time are the best way to determine a bioregion's boundaries. Any institution, organization, or individual with a skill or capability needed to help assess, plan, or implement a bioregional program should be made a partner in the effort. So should neighbors in the matrix who have control over or an interest in old-growth or forest regeneration, critical wildlife habitat, dispersal areas for large mammals, cultural or historical sites, or resources and sites key to the regional economy. Anyone in a position to halt or harm the program by, say, misusing resources, diverting water or wildlife movements, over-harvesting timber or wild fauna, etc., should also be invited into the program. By the same token, any abused parcel of land that affects other critical habitats negatively—through erosion, for example—belongs in the program.

There will be one scale that is most ecologically viable, economically practical, and socially convenient for the overall program. Nested within will be other scales suitable for work on specific objectives, such as the restoration of stream flow in a river catchment, retaining old-growth forest habitats, or genetically improving grain varieties to enhance local economic and food security while reducing pressure on wildlands. Similarly, there will be other scales in the program of work suitable for dealing with migratory species, air and water quality, trade in endangered species, and timber certification that require negotiations with other institutions.

Three Major Challenges to Bioregional Management

While the bioregional management efforts reviewed in Miller (1995) varied widely in terms of their goals and achievements, three issues emerged as major challenges in each case.

The first great challenge is building capacity. At larger geographic scales, managers must be able to plan and implement activities that may call for skills and experience not found in their own organizations. The needed tools, methods, and talents may be found in other levels of government, or in the private sector, or indigenous or civil society groups. Bioregional programs should plug the gaps in or-

ganizations' and individuals' capacities—building upon existing capacity wherever possible.

Another challenge for bioregional management is engaging local residents and other stakeholders. Stakeholders who do not become full partners in planning and implementing programs can end up hindering the program's chances of success. So planners and policy-makers should get to know the stakeholders, their concerns, interests and perspectives, and should seek ways to involve them in the planning and implementation process. One key is to help them select issues of common interest for action and investment. These individuals and groups may need help gaining access and skills to participate fully in the decision-making process, and all stakeholders need access to key information as well as a fair distribution of benefits.

The final challenge facing bioregional managers is promoting cooperation between organizations and institutions already working in the area. This means developing management options that balance local interests with society's larger interests. Adjusting the design and delivery of technology may be necessary to give communities and institutions the space and time to adapt. Similarly, drawing on external funding sources may be vital to securing short-term support—so long as that funding gives way eventually to a sustainable flow of resources.

These challenges notwithstanding, bioregional management has the potential to reap huge gains for biodiversity—in part by attracting a larger, more complex pool of skills and tools. We strongly believe that this approach also helps local communities grasp the connections between biodiversity and their own livelihoods and encourages them to begin voluntarily restoring the habitats, sites, and ecological functions that determine the health of larger ecosystems.

Guidelines for Developing Bioregional Management Programs

A set of guidelines, drawing on the experience of bioregional efforts in developed and developing countries alike, can help protected area planners and managers to understand their role in bioregional approaches and integrate or coordinate their efforts with partners outside of protected areas. Twenty guidelines keyed to the challenges of building capacity, engaging stakeholders, and promoting institutional cooperation, are presented below.

Develop the Capacity to Manage More Complex and Integrated Bioregional Programs

Grappling with whole ecosystems, bioregional managers face a daunting challenge. They must develop the capacity to plan and implement the many tasks and functions associated with the protection and use of biodiversity and other natural resources. Typically, this means protecting wildlands; systematically inventorying flora, fauna, and microbial life; establishing *ex-situ* facilities to

maintain key genetic resources; restoring endangered species and degraded habitats; fostering biodiversity education in local schools and universities; promoting research on sustainable natural resource management; and establishing policy incentives and financial mechanisms for optimal land-use practices (WRI, IUCN, and UNEP 1992; UNEP 1995).

In most of the case studies presented by Miller (1995), institutions already in the region had most of these tools and capacities. What they lacked were policies for integrating existing programs and the skills to catalyze a multi-shareholder planning process. In a few cases, however, new institutions had to be established to provide missing skills and knowledge.

Develop leadership for the bioregional program. Who convenes interested parties in a bioregion? Who gets to know the residents and resource managers and users? And who formulates a vision and plan for a bioregional program? Ideally, a well-respected local individual or organization already has leadership capacity and knows the community and its resources. Several policy options for cultivating such local leadership emerge from the profiles contained in Miller (1995).

First, where various jurisdictions and levels of government converge in the bioregion, a new institution can be established to integrate capacities and skills to implement a regional cooperative program for protecting and managing the use of natural resources. A prime example of this option is Australia's Great Barrier Reef Marine Park Authority (GBRMPA). GBRMPA realized that no single new agency could effectively exercise authority over 334,000 square kilometers of open sea, reefs, atolls, islands, and coastlines. Even with aircraft surveillance, local contact would be required to inspect and assess human activity, so the Commonwealth central authority formed a legal partnership between GB RMPA and the Queensland state government to handle day-to-day management of the coastal and marine territory already under state jurisdiction. This avoided duplication in establishing and financing a new Commonwealth protection service for the reef, and expanded the Queensland Park Service's capacity to protect resources. GBRMPA established similar partnerships with local universities and research centers to cover aspects of its research and educational agenda.

Second, as in the multi-country cases of the Wadden Sea and the Mediterranean, new institutional mechanisms were established to convene the constituents, foster dialogue and debate, and help formulate common goal statements and get agreement on implementation programs.

Third, in the CAMPFIRE program in Zimbabwe, and in North York Moors National Park in the United Kingdom, public resource management organizations reached

out to area residents to form new co-management arrangements for wildlife management (in the first case) and habitat restoration (in the second).

Policy-makers should not underestimate the importance of leadership style and legitimacy. For example, where a few powerful governmental agencies dominate the landscape, it might be all too easy to simply enlist them to take over the effort. However, their leadership can overwhelm other stakeholders, blocking cooperation in building a bioregional program. In the Greater Yellowstone Ecosystem (GYE), the bioregion's two dominant stakeholders—the U. S. Forest Service and the U. S. National Park Service—prepared a "vision statement" that prescribed goals and activities for the entire bioregion. Whatever the proposal's merits or deficiencies, employing a top-down, closed-door approach—albeit with public hearings after the fact—alienated other regional stakeholders and national interest groups whose contributions are essential to the bioregion's successful management. The approach effectively short-circuited the debate; failed to integrate capabilities, roles, and functions; and generated more divisive and lingering controversy. Broader-based stakeholder processes—essentially bottom-up and non-governmental—are now under way, including that of the Greater Yellowstone Coalition, though it is too early to assess the relative success of these efforts.

View management as a social and governance issue. All too frequently, planners and managers presume that defining and implementing bioregional programs are technical and professional matters. If, this logic goes, the scientific facts are clear, the best technologies are selected, and control and leadership are given to a professional agency of government, a bioregional management program will take off in the right direction. But the approaches to bioregional management reviewed in Miller (1995) show the importance of both according high priority to science, information, and analysis, and focusing on social and governance issues.

The cultural values and social organizations of the Maasai of Serengeti, fishers of the Great Barrier Reef, farmers in the North York Moors, ranchers in Yellowstone, and rural communities in Zimbabwe and India all had to be taken into account as a management program was defined and implemented. Most significantly, how authority and responsibility are distributed among levels of government and between public and private interests is a central issue in promoting cooperation and mobilizing skills and capacity.

Use authority to foster cooperation. It is idealistic to expect constituents to work together as a tight band of well-meaning stakeholders. Indeed, experience suggests that a measure of authority to provide "backbone" to the effort is both needed and appreciated. Some regulation and regulatory authority is required to ensure that certain minimum goals, standards, and criteria

are met. The exact balance of authority and the relative use of intervention will depend upon local circumstances.

In La Amistad in Costa Rica, regional constituents asked government to establish a commission to ensure follow-up on activities agreed to by all parties. Without this "big stick," hours of dialogue, debate, and negotiation could have become hollow exercises in paper democracy. Similarly, the Great Barrier Reef Authority's power to intervene and protect resources has enabled it to foster cooperative arrangements with resource user communities, even though it has never had to exercise that power.

As needed, redistribute power over land and resources to develop authority and responsibility in the bioregion. The Zimbabwe CAMPFIRE Program illustrates an issue fundamental to all the examples: How can central governments share or redistribute authority and responsibility over biodiversity and biological resources to (a) remove the "open access" problem, (b) establish incentives for local residents to take on responsibility for biodiversity protection and management, (c) foster a fair sharing of benefits from the use of those resources, and (d) place the authority to protect, control, and use closer to the ground?

In many parts of the world, central governments wrestling with budget cuts and personnel quotas appear to be having ever-greater difficulty exercising this power adequately. In Zimbabwe, power over wildlife resources is being shared with local governments and community groups. As a result, evidence suggests, the already-strong public commitment to conservation in that country is now spreading to rural communities.

Identify and assess the capacities of organizations and individuals in the bioregion and fill in the gaps. The Wadden Sea countries (i.e., Denmark, Germany, Netherlands) possess the capabilities needed to manage their own in-country programs. But they couldn't integrate the tri-country bioregion until they formed an international commission and an international conference to convene multi-country dialogues on issues, identify options, and forge consensual work programs with corresponding targets and responsibilities.

In the Serengeti, the Tanzanian Government established the Ngorongoro Conservation Area Authority to forge a bioregional program among the several public agencies, communal groups, and private interests in the region. But though this Authority has identified the elements of a cooperative stakeholders' agreement, it has yet to mobilize the local skills and capabilities needed to provide the veterinarian services, road maintenance, and health facilities it has promised in the region.

In La Amistad, the early analysis of local skills and capabilities identified a lack of capacity to inventory the Talamanca region, which is huge and both biologically and topographically complex. In response, the La Amis-

tad Biosphere Reserve initiative joined forces with other voices calling for the establishment of what is now INBIO, the National Biodiversity Institute of Costa Rica. Now INBIO works with local stakeholders to systematically inventory the Talamanca bioregion.

Use and build upon existing capacity wherever possible. Rather than building a large regional suprastructure of institutions, the Mediterranean program reinforced local and national scientific technical capacity. Some countries helped others in the bioregion train personnel, construct facilities, secure funding, and establish databases, computer services, and other infrastructure. Similarly, the Great Barrier Reef program strengthened universities, state agencies, and research centers in the region.

Build the capacity to handle change. Changing attitudes among constituents, shifts in the greater economy, and environmental change mean that the context of any bioregional program is in flux. The capacity to anticipate such changes and to respond appropriately is thus critical to bioregional management's success.

India's Hill Resource Conservation Program illustrates how economic growth enabled people to find jobs elsewhere and to abandon upstream catchments to vegetative regeneration—a plus for habitat diversity. Still, these shifts took time, and engineers had to re-program their efforts, effectively slowing down the development of water-catchment dams while communities prepared local agreements on livestock management and the use of the new water resource. Costa Rica's La Amistad experience illustrates the need to weave preparedness for natural disasters into the bioregional management program and budget—in this case, hurricanes and earthquakes. However inevitable, such setbacks are unpredictable and can devastate programs otherwise.

Foster Stakeholders as Co-managers to Address Biodiversity Goals in the Core Areas, Corridors, and Landscape Matrix

By reaching out beyond protected areas, proponents of bioregional management are faced with the challenge of involving private land-owners, farmers, foresters, tour operators, indigenous communities, municipalities, state agencies, corporations, and other interests in bioregional management. Already, protected areas such as those in IUCN's categories V and VI, including the Great Barrier Reef Marine Park, have developed considerable expertise in this form of outreach. In general, many more restricted protected areas (i.e., IUCN's Categories I-IV) are working with adjacent communities and regional development programs than was the case a few short years ago.

Also, some stakeholders live at some distance from the site, and future generations—whose welfare, livelihoods, and environment will depend partly on decisions made today—also need representation. In this

context, governments may have a stakeholder role to play representing the public interest in the bioregion, even if little or no public land is involved. Unless stakeholders become full partners in planning and implementing bioregional management programs, one group or another is likely to find its self-interest obstructed and to pursue other, possibly conflicting, goals.

Leaders, planners, and policymakers should get to know the stakeholders, their concerns, interests, and perspectives. The evaluation of the Yellowstone example points to the failure of an early attempt at ecosystem management, mainly because too little effort was made to know and understand the region's peoples. In contrast, the Great Barrier Reef program invested considerable time in meeting with key stakeholder groups, articulating their views, and defining the issues to be examined together. The launch of the Mediterranean program almost failed for want of cooperation until the issues as seen through the eyes of each country were seriously explored.

Initially, focus tasks on a few issues of interest to the widest possible set of stakeholders in the region. Although a principal aim of bioregional programs is to conserve a region's biodiversity, experience suggests the need to begin simply, limiting the program to a few issues of common concern. Gradually, programs can grow to embrace a more comprehensive list of the region's issues and opportunities.

The Great Barrier Reef program began by addressing such specific issues as tourism's impact upon the reefs, sport fishing's effect on fisheries, and mangrove protection. Through a step-wise process of dialogue and collaboration with user groups, the Authority's technical and managerial competence won recognition, and its role as partner was accepted by stakeholders throughout the region.

CAMPFIRE focused on mechanisms to engage communities and individuals directly in decisions on how income from wildlife can be distributed. North York Moors began with the restoration of hedge rows. In contrast, public agencies in the Greater Yellowstone ecosystem jumped prematurely into comprehensive planning and the formulation of an overall vision for the region, raising many issues at once and making it difficult to get a diverse community to agree upon a discrete set of actions.

Link conservation and restoration activities with socioeconomic development goals in the bioregion. Goals to conserve biodiversity can hardly be separated from the needs and perspectives of local constituents. The challenge is thus to integrate development with conservation goals and measures. Kenya's Amboseli National Park (part of the Serengeti regional ecosystem) demonstrates how, through sensitive and open dialogue—in this case, with local Maasai residents and ranchers—it is possible to start a well-focused regional pro-

gram with activities that first address stakeholders' perceived needs. Building fences to help protect gardens and rangelands from migratory wildlife preservation inspired confidence in the program.

In several other cases, a lack of early focus on the needs of stakeholders has hampered progress. For example, the Yellowstone program initially gave short shrift to the problems of local ranchers and loggers—social and economic analysis would have helped. In the Serengeti, more attention should probably have been given to the concerns of pastoralists, including cattle-disease control, transportation, and personal health. In these and other cases, a preoccupation with wildlife appears to have dominated regional programs, prompting concern and opposition from local residents.

Give local residents and communities access to decision-making processes and the skills needed to participate fully in the development and implementation of bioregional programs. In the Serengeti regional ecosystem, a dominant stakeholder group—the Maasai pastoralists—whose practices have been associated with the development and maintenance of the ecosystem for centuries, have been left out of program planning, implementation, and management. Even past agreements to provide human health facilities and road maintenance have not been honored. Government policies that encourage plowed agriculture around the periphery of the Greater Serengeti Ecosystem and provide incentives to convert communal reserve lands and group ranches to private holdings place pastoralism's very future at risk and make it hard to conserve wildlands and biodiversity.

The experience of the indigenous peoples living in the La Amistad Biosphere Reserve demonstrates how barriers to involvement in biodiversity planning and implementation can be overcome. When government agencies failed to provide access to planning activities, the La Amistad indigenous peoples joined forces with church groups to form their own NGO, which now offers them training in the skills needed to participate and negotiate in planning exercises.

While stakeholders along the European coast of the Mediterranean Sea were dealing with a developed-country agenda (environmental degradation, habitat and species loss, etc.), countries along the North African coast were addressing developing-country issues (employment, nutrition, housing, institution building, etc.). The Mediterranean Action Plan provided a means by which the countries could select one topic of common concern—oil pollution, as it turned out—and helped the North African countries, through information exchange and skills development, to participate fully in work on this initial issue.

To keep negotiations fair, give all stakeholders information of equivalent value. In most of the examples, one or more potential partners lacked key information about the resources,

land use, economy, ecology, and other dimensions of their region. Some information was technologically inaccessible, requiring training in advanced computer use, GIS, etc.

Perhaps uniquely, the Great Barrier Reef project worked from a scientifically established information base right from its beginning, regularly issuing maps, data, and carefully prepared information for the public. As a result, the program's constituency is relatively well informed, debate on oil and mineral exploration (which was turned down by the public) has been vigorous, and the reef's many visitors receive an education.

Give stakeholders incentives to get involved in and committed to bioregional programs. Even where interest in conservation is great, few stakeholders can afford to do more than attend a few public meetings or respond to questionnaires. To get them to alter farming, fishing, or logging, or tourism practices, or to restore habitats on private lands, may require compensating them for time, expenses, or alternative uses of resources—at least until markets more accurately reflect true costs and prices.

In the North York Moors, neighboring farmers in the bioregion's matrix were offered contracts to restore and maintain hedge rows on their lands and to restore certain habitats. Remuneration was high enough to sustain cooperation in the program. Presumably, these payments were efficient since they re-established appropriate habitat for less than it would cost to buy new land and hire workers.

In CAMPFIRE, gaining a share of the income and seeing improvements in community services turned the tide of participation. The Great Barrier Reef program eliminated hassles for tour operators by developing strong voluntary codes of conduct to protect and maintain the reefs and coastal areas. In the Mediterranean, shared science, technology, and information helped all parties in the clean-up of everyone's backyard.

To foster involvement and commitment, ensure that individual and group stakeholders receive a fair share of the benefits. In Zimbabwe, the CAMPFIRE program placed potential sources of income on the communal table and those present are allowed to decide what constitutes a "fair" share. Similarly, the North York farmers received a fair price for their labor and expenses, giving the program a sure footing. On the other hand, in both the Tanzanian and Kenyan sectors of the Greater Serengeti Ecosystem program, the Maasai who have basically delivered on their side of the deal are still waiting for the benefits promised.

In areas of multiple jurisdictions, try to develop coordination mechanisms that do not immediately challenge nations' existing mandates or sovereignty. In all the examples, various jurisdictions were already in force. Some twenty-eight distinct public and private entities in Costa Rica had jurisdictional responsibili-

ties in the Talamanca mountains when the country joined Panama in establishing the La Amistad Biosphere Reserve. In the Mediterranean, 21 nations have sovereignty over portions of the terrestrial, coastal, and marine components of that ecosystem.

Mechanisms can be designed to convene a bioregion's constituents and potential answers and promote appropriate action without challenging national sovereignty. The biosphere reserve approach leaves the authority of public agencies and private property rights intact in the Talamanca. The Mediterranean Regional Sea Program encourages activities to address oil pollution within each country and establishes cooperative research and monitoring at new centers around the region.

Honor all commitments that result from negotiations. Evidence from Amboseli, La Amistad, and Yellowstone suggest that various commitments made by government agencies ring hollow several months and years later. Potential partners in the region stood ready to negotiate and implement agreed-upon activities, but government was unable to deliver. Why? In La Amistad, government policies changed, cutting off personnel and budgets. In Amboseli, pumps at the watering facilities were not maintained, forcing pastoralists to return to the national park with their herds. In such cases, cynicism sets in—a further obstacle to future progress.

Promptly implement projects that respond to community needs. Government agencies and regional organizations must quickly implement projects agreed upon by the communities whose livelihoods are affected by a bioregional management program. Non-governmental organizations, which can often move funds and carry out activities faster than public agencies, can often fill a special niche to address this need—at least temporarily. In the Amboseli example, the Wildlife Extension (WEX) project helped procure and install the fencing needed to protect gardens and fields from marauding wildlife in short order after the ranchers had waited two years for government action.

Establish Cooperative Arrangements Among Institutions

Initially, each of the bioregional management programs examined found that the ecosystems of interest were already occupied by an array of public and private organizations and institutions. Along with formal organizations, communal institutions already operating have an important role to play. The indigenous peoples of La Amistad, the Maasai and other peoples of the Serengeti, and the ranchers in the Greater Yellowstone Ecosystem all have strong notions about social behavior, land use, and the role of government that must be reckoned with if regional management initiatives are to succeed.

Don't hesitate to rely on short-term financial support from external

sources initially, so long as it is replaced in a timely manner by a sustainable flow of resources. Non-governmental support, debt-for-nature swaps, and other forms of financial support can be particularly helpful where governments require several years to get a new budget line funded. That said, however, the cases of La Amistad and Amboseli illustrate the pitfalls of relying for too long on short-term external support. In both, programs were halted while alternative sources of funding were sought. Many countries are now setting up "environmental funds" in which grants and contributions from international, national, and private sources are held in trust. Such approaches hold out the possibility of long-term planning and program security.

Establish cooperative management options with and among stakeholders. A cardinal rule of ecosystem management is that people with interests in a bioregion are not simply to be placated with marginal giveaways or menial jobs, but are understood to be partners. Nor are they simply occupants of so-called buffer zones to be accommodated just to minimize negative impacts on core protected areas. Indeed, their patches of forest, farm, and coastal area are vital cogs of the greater ecosystem, and many of the resources they control are as important as protected areas to the ecosystem's overall function and health.

Cooperation between public agencies and private parties hinges on how well government's authority to protect the interests of society at large are balanced with the need to join forces with local interests. The sport fishing boats operating in the Great Barrier Reef now police their own community members to protect nursery grounds of the fishery. CAMPFIRE communities cooperate with the government to prevent poaching of an animal that is worth more to them alive than dead.

Adjust the design and delivery of technology to allow for the space and time necessary for communities and institutions to adapt. The Indian Hill Resource Management program illustrates why technology and innovation have to be introduced carefully and adjusted to local social and institutional circumstance. When engineers building the small reservoirs joined forces with community leaders to pace the program so that the community could more easily adapt to these welcomed facilities, participants began keeping their livestock off the new reservoir walls and agreed on ways to use and share. As a result, both the productivity and the sustainability of the investments increased.

Conclusion

Since most bioregional management efforts have not systematically monitored progress toward conservation and development goals, it's too early to systematically assess their impacts. With more focused attention on the development and use of biophysical, social, economic, and insti-

tutional indicators to measure conservation progress, we hope this will be possible in the not-too-distant future. Still, we believe there is indirect evidence to suggest that bioregional management is making a positive impact on the conservation and sustainable use of biological resources. For example, where bioregional management approaches are being employed, a larger and more varied pool of skills and tools are being used to address conservation problems. In other cases, individuals and groups sometimes seen as adversarial to conservation interests are not only cooperating with bioregional programs, but they are volunteering to accept responsibilities and play active roles in habitat protection, restoration, and sustainable resource management. And, where bioregional management is a reality, greater attention to social, economic, and institutional concerns is easing suspicion of technical issues and experts so that, paradoxically, science and information are assuming new importance as tools of empowerment and choice.

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Kenton Miller
Nels Johnson
Biological Resources and Institutions Program, World Resources Institute, 1709 New York Avenue NW, Washington, D.C. 20006