MAB AND ITS BIOSPHERE RESERVES PROJECT

A New Dimension in Global Conservation

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Introduction

Every now and then, an idea comes along which revolutionizes the way human beings look at the world around them. One such idea had its birth more than a century ago around an evening campfire deep in the Montana Territory. By the light of that campfire, the national park idea came to life, and found its first expression in 1872 when President Grant signed the law creating Yellowstone National Park. It took more than 40 years for the idea to find its most significant expression in the act of Congress which established the National Park Service, and even more time before it found rebirth in the laws of other nations around the world. However, few would contest the fact that the thousands of national parks and similar protected areas existing today attest to the power of this idea, and confirm its validity.

Nevertheless, as populations of people have grown and their demands have increased, the protection of the national parks, which once seemed assured by their very establishment, has become difficult, to the point where many of them are threatened from both without and within. The light of that original concept has been obscured by a veil of conflicting and increasingly strident human demands and influences.

To lift that veil requires us to recognize that we live in a very, very different world from the one that existed a century ago, or even a decade ago, and that there can be no turning back to the good old days. Indeed, it requires us to acknowledge that new infusions of human energy and new dimensions in thought are needed around the world to conserve our natural heritage in the modern age. I believe that the biosphere reserve concept, which was ushered into the global consciousness at the United Nations Conference on the Human Environment in Stockholm exactly 100 years after the world's first national park came into being, will rekindle that Yellowstone campfire in the modern age, giving it new life and new dimensions.

Many people, I among them, believe that by the end of this century the biosphere reserve will become a cornerstone of world conservation.

In today's world, it is increasingly difficult to get people of different points of view and different interests to agree upon common goals and to work together to achieve them. Some would argue that it is human nature to maximize self-interest, and that the growing number of institutions dedicated to narrowly defined goals provides only too obvious evidence of this fact. Government agencies, corporations, and most other human institutions operate under such goals, and receive their support from constituencies which judge their success on the basis of how

well the goals are achieved. Failure of a large energy corporation to award a favorable return to stockholders' investments, or failure of a national government to maintain a strong defense of its territory, quickly results in diminished support of the institution from those who expect these standards to be fulfilled.

As those of us involved in resource conservation know only too well, the conflicting demands of society's institutions are becoming more complex and harder to reconcile, with the result that the quality and diversity of our national and global resource base are declining. We may disagree on the rate and eventual outcome, but the trend is real, and is the by-product of the failure of people and their institutions to collaborate in defining, pursuing, and achieving goals that make possible the sustainable use of the planet's resources for the well-being and enjoyment of its people.

Still, there exists a growing number of people, singularly unmotivated by self-interest, who are committed to doing their part to help solve the world's increasingly serious environmental, land use, and resource management problems. Motivated by the spirit of service to humanity, these people may be found in every country and in every institution concerned with the stewardship of natural resources. Together, they represent an intellectual and moral force which, if effectively enlisted, can give us balanced perspectives and more equitable and successful solutions to these problems. They also provide our best hope for changing existing institutions, and creating new ones...such as The George Wright Society...to obtain and coordinate the resource required to implement these solutions.

Ultimately, the success of the human experiment will depend on how well our institutions represent the broadest interest of humanity, and how well they are able to work together for the progressive advancement of world civilization. This advancement will hinge on how well these institutions are able to conserve the planet's physical and biological resources, while developing them equitably and wisely for the material and intangible benefits they furnish to people. The process of melding conservation and development has been termed "sustainable conservation" and "integrated development," depending on whether the accommodation is considered to be one of conservation to development or the reverse.

Regardless of the terminology, the concept of productive coexistence between conservation and development only recently has begun to achieve serious attention. The IUCN's landmark publication in 1980 outlining a world conservation strategy focused world attention on the concept, giving it both credibility and direction. This publication marks a turning point in global conservation policy away from the traditional focus on protection of significant natural areas toward a broader approach in which the marriage of conservation and development is seen as the essential prerequisite of human progress.

Far from diminishing the importance of protected areas, the

concept gives new dimensions to their missions, as baseline areas for scientific study, genetic reservoirs, and as places for demonstrating new and better methods of stewardship. Yet, it also recognized that, by themselves, these protected areas will be inadequate to the task of conserving the physical and biological diversity of the Earth for human benefit, and that, in fact, this can be done only through coordinated efforts to find ways to integrate conservation and development within each of the diverse ecologi cal regions of the world.

The Man and the Biosphere (MAB) Program represents a significant effort to do just this by providing a catalyst for bringing together institutions and dedicated individuals at the local, regional, national, and international levels.

Purpose and Organization of the Man and the Biosphere Programme

The MAB Program was first conceptualized in 1968 as a major United Nations initiative to establish the scientific basis for the thin veneer of land, sea, and atmosphere we term the biosphere. The Program was influenced by the International Biological Program (IBP), a hitherto unprecedented effort by the international scientific community in the 1960s and early 1970s to develop basic information on the structure and function of the world's major ecosystems which made major contributions to our understanding of many of them. The United States was a leading participant in this program, and many of the same individuals who shaped the IBP also were involved in the early development of MAB. However, unlike the IBP which was basically a scientific program formulated and managed by scientists, MAB's concept was broader. It envisioned not only the carrying out of scientific studies, but also interdisciplinary synthesis and application of their results to provide the basis for sustainable conservation of ecosystems. This would be accomplished through networks of pilot projects, which would often include programs of education, training, and demonstration tailored to the particular capabilities and needs of those involved in land management. The program thus was planned as a focal point for bringing together scientists, decisionmakers, and local people to develop feasible, culturally acceptable methods for managing the planet's ecosystems for a full range of uses, from protected scientific reserves to major cities.

The MAB Program was launched in 1971 by UNESCO. The first several years were spent in establishing the structure and administration of the program, and numerous international task forces were assembled to assist in this task. Early on, it was agreed to compartmentalize the Program's activities into 14 project areas, within which scientific studies, educational programs, and demonstration projects would be encouraged. Seven of these project areas concern improving our knowledge of the world's major ecosystems and how to manage them as natural reserves and for the production of commodities. Of the ecosystem projects, MAB is best known for its extensive work in both dry and humid tropical forests, where its pilots are providing an improved

basis for development and conservation of biological diversity in a score of countries, and in arid and semi-arid areas, where MAB is widely recognized for its contributions in the study and mitigation of desertification in the Old World.

Six additional projects deal with areas of human interactions with the biosphere which may occur anywhere in the world. These projects focus on pest management and the use of fertilizers; engineering works; urban ecosystems; demographic, genetic, and adaptive changes in human populations; human perception of environmental quality; and environmental pollution. Of these, MAB's impact has probably been greatest in the field of urban ecosystems, where MAB systems research has revolutionized land use planning for the city of Rome and provided the scientific basis and practical skills to create an ecologically sustainable urban community in Papua, New Guinea, based on efficient use of indigenous energy sources and materials, and full participation of the local population.

However, MAB's best known effort is its biosphere reserves project, which was established to conserve a representative diversity of the world's ecosystems for scientific and educational purposes in a global network of protected reserves. Through this project the only international system of protected areas is being created, selected under uniform criteria, for the multiple purposes of conserving genetic and ecological diversity, and providing diverse opportunities for monitoring, research, education, training, and demonstration purposes. I will discuss this project in some detail later in this paper.

The structure of MAB is simple, and is intended to facilitate collaboration at all levels among the individuals and institutions that participate voluntarily in the program. At the international level, the administrative structure consists of an International Coordinating Council with representatives from 30 of MAB's participating nations. The Council establishes general policies, priorities, and guidelines for the international program, and helps arrange for international collaboration in planning and carrying out projects. Administrative assistance for the program is provided through a small secretariat at UNESCO headquarters in Paris, which has a small staff and an annual budget of about $1 million to support publications, workshops, pilot projects in the field, and other activities. The principal role of the international organization is to serve as a catalyst for international collaboration among scientists and others interested in land management problems of regional or global importance. MAB lacks the resources to fund major projects itself, nor does it seek large budgets for such purposes. MAB does not aspire to be a purveyor of foreign aid. Instead, it depends on the support of the participating governmental and private institutions, all contributing their share, to carry out the MAB projects. By judicious use of small amounts of seed money...for example, to fund the travel of participants in an international workshop or make an initial contribution toward building a field station in a Third

World nation...MAB has often been able to serve as the catalyst for building institutions, programs, and projects which are subsequently funded by the participating institutions.

The domestic MAB organizations in the developed countries generally have a structure similar to the international organization and operate in a similar manner. A national MAB committee, typically containing representatives from government and the private sector, establishes policies, priorities, and guidelines for the domestic program. A number of directorates for MAB project areas, variously containing members from government and academia, plan and carry out specific projects funded by the participating institutions, either individually or collectively. Administrative assistance usually is provided by a secretariat. In the United States, the Committee contains representatives from each of 10 Federal agencies, from various private organizations, as well as the chairmen of each of the 9 project directorates currently active in this country. A small secretariat at the Department of State assists the project directorates in carrying out projects by managing funds, coordinating workshops and conferences, arranging for and funding travel by MAB scientists, administering the publication program, and directing an interdisciplinary research grant program. At various times during the last six years, the Secretariat has received funding or staff support from five of the participating federal agencies.

In many of the lesser developed countries, the MAB national committee may consist of a small group of academicians and government officials who serve as points of contact for cooperative activities under the aegis of MAB, but who may have few or no active MAB projects. In some cases, a substantial part of the nation's natural science establishment may be represented on just such a committee.

Although the size of the MAB organizations and the scope of their activities vary widely, 101 countries have elected to participate in the program. Together, their MAB organizations enlist the active involvement of more than 1,000 scientists worldwide, and create an international scientific community of impressive capabilities.

In the United States and in most other countries, the strength of the MAB program lies in its capability to forge long-term relationships which enable scientists in widely different fields to work together to develop interdisciplinary perspectives on important problems and to enable government agencies to tap this interdisciplinary capability through active participation in planning and implementing MAB projects.

For an agency like the Department of the Interior, participation on the MAB National Committee and on various MAB Project Directorates provides access to the domestic and international scientific community and a potentially valuable means to supplement the scientific expertise available within the agency itself.

Because of its strict avoidance of advocacy, MAB can be re-

lied upon as an independent source of unbiased scientific perspective on the complex and often controversial environmental and resource management issues of our times. It provides a convenient and very cost-effective vehicle for interagency and international collaboration in carrying out scientific projects aimed at solving problems of common interest, particularly those which require interdisciplinary capabilities in the natural and social sciences. To enable agencies to take advantage of MAB's interdisciplinary capabilities, a MAB research Consortium was established in 1979.

Under its charter and administrative guidelines, the Consortium is dedicated to funding interdisciplinary applied research which furthers the missions of participating MAB project directorates and the agencies which have agreed to sign the charter and provide funding. The research projects focus on the study, of the interrelationships between human activities and the ecosystem in which they occur.

Particular emphasis is placed on problem-oriented research, involving the collaboration of scientists in two or more countries, on subjects of international importance, such as the sustainable conservation of tropical forests, wetlands, and marginal lands. It is worth noting that, although much of the Consortium's research involves two or more nations, the Consortium funds only the U. S. side and does not provide financial assistance to overseas governments or institutions, which are expected to contribute their fair share to these projects. This approach, characteristic of MAB in general, helps ensure success by guaranteeing tha commitment exists on all sides before a project is initiated. During the last four years, the Consortium has provided $1.8 million in funding for 37 projects. Of these, about 57 percent are bilateral projects involving two or more nations, and nearly 50 percent are being carried out in biosphere reserves. Research projects are investigating such diverse problems as the effects of air pollutants on California ecosystems, the effects of native agricultural practices on biological diversity in the Sonoran Desert, the effects of atmospheric deposition on high alpine lakes in Rocky Mountain biosphere reserves, and human impacts on tropical forests under a variety of cultural traditions and environmental conditions. The MAB Consortium is the only institution in the United States specifically chartered to support applied, interdisciplinary, multinational research on the interrelationships between people and ecosystems. If supported and fully utilized, it will provide significant support for carrying out agency missions, as well as an important vehicle for international scientific collaboration within the widely respected and apolitical framework of MAB.

I intend to follow this exposition on the purpose, organization, and activities in the MAB Program, with a discussion of the biosphere reserve project, and the growing impact of this project on conservation of ecosystems and biological diversity.

The Biosphere Reserve Project: Criteria

Put in simplest terms, the ambitious goal of the MAB Program

is to develop the knowledge, technologies, institutions, and practical skills required to enable people in every part of the world to integrate development and conservation successfully and on a continuing basis. The establishment of a global network of protected ecosystems, to be used for developing these capabilities, was considered an essential component of MAB almost from the beginning. The sites, which came to be termed biosphere reserves, would assure long-term continuity in the program and would be a primary focal point for activities under the aegis of MAB.

In 1974, a special international task force was convened to establish the criteria for selection of biosphere reserves (UNESCO 1974). Each biosphere reserve was intended to conserve a reprsentative example of one of the world's major biological regions, and to be used to provide opportunities for a variety of scientific, educational, training, and demonstration activities. The ideal biosphere reserve is an expansive area, containing complete watersheds or comparable conservation units, within which these activities could take place. It is large enough to conserve a complete ecosystem, including the full range of its physical and biological components and processes.

The heart of the reserve is called the core zone. This is a strictly protected ecosystem containing mature or "climax" communities (and in some places certain areas being managed to restore such communities). It is administered as a global benchmark for studying how an ecosystem is structured, how it functions, and how natural and man-caused changes in the biosphere are affecting it. Human uses within the core zone are limited to low intensity recreation, scientific observation, public education, and similar activities that do not disrupt the ecosystem's structure or functions. In the United States, wilderness areas, national parks and monuments, wildlife sanctuaries and nature reserves, and various areas administratively set aside for strict protection and research purposes, usually are suitable as core zones.

Surrounding or adjoining the core is a buffer zone. This zone is envisioned to be large enough to insulate the core zone from the effects of land use changes and human activities in the nearby area. Equally important, however, it is a multiple use area, in which traditional land use practices are studied, experimental research is carried out to develop better methods, and training and demonstration projects are conducted to transfer knowledge and skills to scientists, resource managers, and special interests in the region. Buffer zones should contain watersheds, or comparable large areas, suitable for experimental manipulation, in which experimental results can be compared with baseline data from the core zone. Through such comparisons, new management approaches can be developed to reduce the impacts of utilizing natural resources on the environmental quality and biological diversity of the region. In addition, buffer zones may contain degraded landscapes suitable for research leading to better methods of restoration.

Buffer zones may contain areas subject to grazing, timber

management, agriculture, residential development, and other uses, provided these uses do not compromise the value of the core zone as an ecological benchmark. To the extent possible, uses within buffer zones are managed within the framework of an overall program of experimental research and demonstration leading to improved techniques for sustainable conservation of the physical and biological resources of the region.

Obviously, it is not always possible to find contiguous areas suitable for inclusion as the core and buffer zones of a single biosphere reserve. This has been particularly true in the United States, where some of the most qualified core zones are national parks and monuments and equivalently protected areas, while the most suitable buffer zones in the same ecological region occur some distance away...for example, in an experimental forest, experimental range, or multiple use area. In these cases, a biosphere reserve may be made up of geographically separated sites which function as core and buffer zones, respectively (Fernald et al. 1981). The prototype for this so-called cluster concept involves the Great Smoky Mountains National Park, a biosphere reserve functioning as a core zone, and two experimental research areas comprising a buffer zone...the Coweeta Hydrological Laboratory, an experimental watershed and biosphere reserve about 60km south of the park, and the Oak Ridge National Environmental Research Park, an experimental research site about 60km northwest of the park.

The impetus for the selection of biosphere reserves in the United States traces to the summit conference between Presidents Nixon and Brezhnev in July 1974. The summit communique committed both sides to participate in the MAB Program, and to establish biosphere reserves on their respective territories. Following the summit, an interagency committee identified a score of areas, all under Federal administration, which appeared to satisfy the selection criteria developed by an international task force just three months before. Most of the areas were either large national parks and monuments, administered by the National Park Service, or experimental research areas administered by the Forest Service or the Agricultural Research Service. In September, 1974, the United States and several other countries announced their intention to establish the first areas as biosphere reserves. In 1975, UNESCO developed official nomination forms and procedures; and, in 1976, the biosphere reserves unilaterally established by individual nations were officially designated by UNESCO as part of the international network. The network has expanded steadily since 1976, and now includes 215 sites in 58 countries in all parts of the world.

Four essential criteria must be satisfied if a site is to qualify for designation as a biosphere reserve. The first and most heavily weighted criterion is representativeness. The site must include examples of the ecosystems characteristic of a particular biogeographic province. These provinces, which are distinguished on the basis of both biological and physical features, are described and mapped in a classification of the

world prepared in 1974 to provide a framework for selecting biosphere reserves (Udvardy 1974). To satisfy the representativeness criterion, the ecosystems characteristic of the province must be identified. This is usually accomplished on the basis of natural climax vegetation, except in areas of the world where the long history of human modification has foreclosed this possibility, such as in many subtropical grasslands.

In the United States, the vegetational communities identified by Küchler in his mapping of the nation's potential natural vegetation often are used as a point of reference for these determinations. The scale and distribution of these ecosystems largel determines the location and size of biosphere reserve sites. Experience in the United States has shown that the number of characteristic ecosystems within a given province may vary widely, although in the warmer parts of the temperate zone, an upper limit of around 30 can be expected for the largest, most diverse provinces. Obviously, it will usually be impossible to select a single site containing examples of all of the representative ecosystems of a biogeographic province. For this reason, the international guidelines specifically allow for the selection of multiple sites where this is necessary to satisfy the criterion.

The second essential criterion is diversity. A biosphere reserve must contain as many of the reprsentative ecosystems as possible, and these ecosystems should contain as much variation in the species, environmental gradients, processes, and physical factors that comprise the ecosystems as possible. Emphasis is on diversity at the ecosystem level, rather than on specific communities, populations, organisms, or other features. MAB has emphasized that biosphere reserves are not intended to "meet all local needs for conservation of ecosystems, species, and genetic resources" and that other types of conservation units and special designations will be required to satisfy these needs (I.U.C.N. 1979).

The selection of ecologically and genetically diverse sites as biosphere reserves is important because these are the sites which best enable the reserve to fulfill its multiple missions in conservation, monitoring, research, demonstration, and training. In the United States, many states have developed information systems as part of their natural heritage programs which permit information on species distributions and other elements of diversity to be displayed geographically. Where such systems are available, their displays can be extremely helpful in locating centers of diversity and assessing candidate sites with respect to this criterion.

The third essential criterion is effectiveness as a conservation unit. A biosphere reserve should be a securely protected site, large enough and of an appropriate shape to conserve a self-regulating ecosystem. In terrestrial areas, watersheds are recommended as appropriate boundaries. For a site to qualify as an effective conservation unit, its administrator must have both the capability and intent to protect its natural resources and pro-

cesses, and to make the site available for scientific and educational purposes. This is particularly important for core zones, the integrity of which must be maintained for the reserve to fulfill its mission as a global benchmark for monitoring ecological changes. In the United States and most other countries where biosphere reserves have no independent legal status, the practical consequence of this criterion is to select only those sites where protection has a firm basis in law, such as in a national park, or where the administrator has the legal authority to provide it, such as in the national forests and similar public lands.

The fourth and last essential criterion is naturalness, which is a measure of the extent of human modification. The most suitable biosphere reserve sites generally are the least modified through disturbance of the land surface, pollution, exotic species and other influences brought about by human activities. Undisturbed areas containing mature ecological communities should be included within biosphere reserves, and these areas should be large enough to enable a core zone to be established.

Other factors favor selection of a site, but are not considered to be essential criteria. The presence of significant or unique features, such as critical habitat for endangered species or an outstanding physical feature (like the Grand Canyon), is one such factor. The existence of an exceptional history of scientific study, or an exemplary existing program, is another. Unusual support of the biosphere reserve's purpose by the site administrator is yet another; and particular suitability for international scientific collaboration still another.

All together, these criteria result in the selection of sites that are highly qualified to fulfill the biosphere reserves mission in developing the knowledge, technologies, and skills to provide the basis for sustainable conservation of the world's ecosystems.

The Biosphere Reserve Project in the United States

The Biosphere Reserve Project is the best known and most active MAB project in the United States. The U. S. network presently contains 38 sites, and is the largest in the world. Of the 38, 24 are primarily core zone areas administered by conservation agencies and organizations and 14 qualify primarily as buffer zones, administered for experimental research by agencies of the Department of Agriculture. Those in the core zone group average nearly 400,000 ha in size, versus 18,000 ha for the experimental research areas. Of the 20 biogeographic provinces represented in the 50 states and the Caribbean territories, only one...the Sitkan, which includes parts of southeastern Alaska and British Columbia in Canada...has no biosphere reserve representation.

One need only delve slightly beyond these figures to discover that the U. S. network is by no means complete. Although all but one of the 20 provinces is represented, 8 lack areas

suitable for experimental research and demonstration, and one lacks a suitable core zone area. In addition, because the biogeographic provinces are described on the basis of terrestrial features, they do not work well for selection in coastal areas. For this reason, US-MAB has developed a separate classification which identifies 12 coastal regions (Ray et al. 1982). Only six of these regions are represented within the existing biosphere reserve network. In both terrestrial and coastal areas, the designated biosphere reserves usually contain only some of the representative ecosystems which should be included. Thus, it is clear that the network needs to be supplemented with additional sites in order to expand both ecosystem representation and functional capabilities.

It is for this reason that the MAB Project Directorate on Biosphere Reserves has begun systematically to review individua provinces and coastal regions in order to nominate additional sites, beginning with those having the least representation. Using interdisciplinary teams of scientists to prepare documentation for site nominations, we plan to accelerate the growth and development of the network during the next several years. In most, if not all of the provinces and some coastal regions, we expect to see the designation of multiple sites, under several to many different administrators, linked together under the banner of a single biosphere reserve. The result of this process will be modest growth in the number of reserves, perhaps to a total of not more than 70 at full development, but much greater growth in the number of sites included within individual reserves. Some consolidation of existing designated biosphere reserve sites within particular provinces will also have to occur in order to form the multiple site reserves, which would bear the name of the province or another name reflecting the geographic, physiographic, or ecological identity of the reserve.

As an example of this approach, we have just received a panel nomination for a California Coast Ranges Biosphere Reserve. The proposed biosphere reserve contains four separate sites, each representative of particular ecosystems, and involves lands administered by 8 different entities, including 3 Federal agencies, 2 State agencies, a university, a conservation organization, and a private timber company. Used in this manner, the biosphere reserve symbolizes a unity of purpose, namely to utilize the integrated reserve to support sustainable conservation of a biogeographic region. This symbolic unity can, with time and dedication, be used to advantage to build professional relationships, institutions, and projects which serve the missions of the administrators as well as the goals of the biosphere reserve.

For national parks and other protected areas, the biosphere reserve extends the administrator's horizon of interest into the surrounding region, enabling better communication and better strategies for dealing with a growing number of external influences. For the buffer zone lands, the biosphere reserve extends the administrator's horizon into the natural ecosystem, help make conservation of biological diversity an important element in

regional land use and development. This is not merely an idealistic hope, but a practical reality. The emergence of this reality is being demonstrated in the Southern Appalachian biosphere reserve cluster, where the biosphere reserve concept has been a catalyst for cooperative monitoring and research projects, regular interinstitutional conferences and workshops to share research findings, and for establishment of a unique consortium of government agencies and universities which has increased the problem-solving capability in the region and, because of its success, is being used as a model for building institutions in conjunction with biosphere reserves elsewhere.

By bringing together significant land management units within a single biosphere reserve, cooperation is encouraged among individuals concerned with the interrelated land use problems of a particular region...individuals who have, or should have, good reason to collaborate. Although designation does not ensure that collaboration will occur, or that it will result in a more effective scientific basis for land management, the designation of such a biosphere reserve does provide a catalyst for these activities and does increase their probability of occurring. It also provides, in the long run, a catalyst for broader collaboration within the biosphere reserve network, both domestically and internationally, under the aegis of MAB.

The Manager's Responsibilities

Because biosphere reserves have no independent legal status in the United States, the manager's obligations are moral rather than legal. Lands can be nominated by the U. S. National Committee for MAB to become part of the international network only after the administrator has concurred, in writing, in the nomination and has acknowledged his intention to encourage the use of the area for scientific and educational purposes, avoid taking or authorizing actions which would compromise the value of the area for these purposes, and coordinate systematic planning for the area's management. These general statements of intent are subject to individual interpretation; however, they do represent a moral commitment to utilize the lands in ways that further the purpose of the biosphere reserve.

Although management of biosphere reserves is the exclusive prerogative of their administrators, MAB has an obligation to encourage these administrators to implement policies and standards that further the missions of biosphere reserves. With this obligation in mind, US-MAB has prepared guidelines for long-term monitoring in biosphere reserves (U. S. National Committee for MAB, 1979). These guidelines identify reasonable universal requirements for a basic monitoring program, and provide a framework for developing programs at increasing levels of comprehensiveness and sophistication. Although some biosphere reserves reportedly are using these guidelines, their value is likely to be greatest in planning for integrated development of monitoring programs in multiple site biosphere reserves as these reserves are established in the years ahead.

The National Park Service, in cooperation with MAB, has begun preparing comprehensive histories of scientific studies in its biosphere reserve areas to provide a basic and readily updatable reference, as well as a basis for identifying future monitoring and research needs and priorities. In the prototype, prepared for Great Smoky Mountains National Park, 93 scientists from a score of different disciplines contributed in the preparation of this reference, which should provide an important source of information and a catalyst for scientific study for years to come (Southern Appalachian Research/Resource Management Cooperative and Western Carolina University, 1982).

US-MAB has also prepared guidelines to outline the important role of biosphere reserves in environmental education and communication of information to regional conservation and land management interests, as well as the general public and to personnel working in the reserve itself (Gregg and Zube 1982). A number of administrators have been using the biosphere reserve designation to promote more effective communication with public interest groups in the vicinity. A recent example involved the Glacier National Park and Waterton Lakes National Park biosphere reserves in adjoining areas of the U. S. and Canada. A biosphere reserve conference held earlier this year brought together scientists, administrators, conservationists, and ranchers, and generated unprecedented support in all sectors for exploring ways in which the biosphere reserve could serve as the focal point for regional and international cooperation in this ecologically sensitive region.

Guidance is needed in many areas. Because of their role as internationally recognized centers for research, the development and maintenance of specimen collections, libraries, data management systems, publications programs, and channels of communication at all levels take on particular significance in biosphere reserves. Each of these areas will receive special attention as the biosphere reserve project continues to develop.

Conclusion

The biosphere reserve project is a significant global effort to demonstrate the essential role of conservation in providing the basis for an ever advancing world civilization. It provides long-term continuity in monitoring and research on specific sites around the world. It reinforces conservation in the national parks, wildlife sanctuaries, and other protected areas and increases their scientific value by giving international recognition to their importance as benchmarks for the study of the world's ecosystems. It encourages conservation on a regional basis by providing sites for experimental research leading to improve methods for integrated development, and for demonstration and training projects to transfer knowledge and skills to those who need them.

By linking these two kinds of sites, it provides an umbrella for regional cooperation on a significant scale, and opportunities

for more effective use of funds and manpower. Through the MAB organization, it brings dedicated people together at all levels to solve complex conservation and land management problems. In so doing, it acts to break down barriers of communication among scientists of different disciplines and among institutions with different missions. On the international level, biosphere reserves are increasingly the focal points for collaboration among nations, and major bilateral projects involving biosphere reserves are underway with Mexico, Costa Rica, the Soviet Union, and Canada ...all begun within the last three years...and another is being actively planned with India.

As large sites for ecosystem study become less and less available, the significance of the securely protected biosphere reserves is bound to increase. The wide acceptance of the biosphere reserve concept throughout the world has already made the project an important force in world conservation, and the trend promises to continue. I believe in biosphere reserves because I believe in the ability of people working together to solve problems, and to use the fruits of scientific inquiry to make institutions more responsive to human needs. We can make no better investment in the future than to take advantage of the opportunities the biosphere reserve project provides.

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