U.S. MAB BULLETIN

THE UNITED STATES NATIONAL COMMITTEE FOR THE MAN AND THE BIOSPHERE PROGRAM

November 1991 Volume 15, No. 3A

Human Dominated Systems Directorate Sets Core Research Program

Ecological Sustainability and Human Institutions: Case Studies of Three Biosphere Reserves, the Everglades and Surrounding Areas of South Florida, the New Jersey Pinelands, and the Virginia Coastal Reserve

The U.S. National Committee for MAB approved the funding of the core program proposal for the Human Dominated Systems Directorate. The initial funding of almost $400,000 is for a 2-year period. The Human-Dominated Systems Directorate, which focuses on ecological systems that are significantly affected by human activities, has identified the interdisciplinary issues for exploration that will actively involve all of its members in a coordinated set of activities. These activities will focus on the central theme of ecological sustainability, defining precisely what that means ecologically, and examining a variety of human institutions and policies that impinge upon it. The project will not be an abstract exercise but, rather, will explore issues in the context of some very real environmental problems within three U.S. biosphere reserves that have been selected for use as case studies. They are: the Everglades and surrounding areas of south Florida; the New Jersey Pinelands; and the Virginia Coastal Reserve.

Their goal will be to: a) define ecological sustainability for the ecosystems of the case study biosphere reserves and surrounding areas in terms of particular levels of selected ecological endpoints; b) evaluate patterns of human uses of environmental resources and other anthropogenic stresses imposed upon these systems; c) examine societal and institutional factors influencing ecological sustainability; and d) assess their compatibility with essential characteristics of ecological sustainability.

Methodologies for defining ecological sustainability and understanding its causal relationships with and feedbacks from society will be developed for each case study. Although extrapolation to other biosphere reserves and other stressed ecological systems is an ultimate goal of the Directorate project, more immediate outputs will be directly relevant and contributory to the above-mentioned biosphere reserves. A control-systems model of coupled human/ecological systems will provide the overall framework for the activities, the focal point for specific hypothesis testing and data integration and analyses, and the point of departure for a continual development and refinement of a conceptual model as the project proceeds.

The project will be managed by the University of Miami and work will be carried out under the supervision of directorate members from Lehigh University, University of Michigan, U.S. National Park Service, U.S. Bureau of the Census, Miami University, Florida State University, and the University of Maine.

In This Issue

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Symposium on Society and Resource Management—Issues Call for Papers

Persons interested in presenting a paper or poster at the Fourth North American Symposium on Society and Resource Management to be held on the University of Wisconsin campus in Madison, WI on May 17–20, 1992 should submit an abstract to the Program Chair by December 1, 1991.

The Symposium will focus on the integration of social and biological sciences as they together address natural resource and environmental issues. Submit abstracts no longer than two double-spaced, typewritten pages to: Donald R. Field, Program Chair; School of Natural Resources; University of Wisconsin; 1450 Linden Drive; Madison, WI 53706 (tel. 608–262–6968; FAX 608–262–6055). For further information contact: Mary Miron, Symposium Coordinator, at the above address, tel. 608–262–6969.

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The U.S. MAB Bulletin is published quarterly by the U.S. MAB Secretariat, OES/EGC/MAB, Department of State, Washington, DC 20522–3706. Tel. 703–235–2946, 2947. FAX # 703–235–3002.

"The mission of the United States Man and the Biosphere Program (U.S. MAB) is to foster harmonious relationships between humans and the biosphere through an international program of policy-relevant research which integrates the social, physical and biological sciences to address actual problems. These activities— broadly interpreted—include catalytic conferences and meetings, education and training, and the establishment and use of biosphere reserves as research and monitoring sites." Adopted by the U.S. National Committee for the Man and the Biosphere Program, January 6, 1989.

U.S. MAB is supported by the Department of Agriculture-Forest Service, the Department of Energy, the Department of the Interior-National Park Service, the Department of State, the Agency for International Development, the Environmental Protection Agency, the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration, the National Science Foundation, the Peace Corps, and The Smithsonian Institution.

The program is organized into five directorates: High Latitude Ecosystems; Human Dominated Systems; Marine and Coastal Ecosystems; Temperate Ecosystems; and Tropical Ecosystems.

Notes From the Executive Director

This issue contains descriptions of those proposals —now projects, which were received and funded in response to FY 1990's request for proposals (RFP). You will notice that they cover quite a spectrum of research activities located from the arctic atmosphere to tropical forests, and that they come from a wide variety of schools and sources. All were assessed to be particularly responsive to our RFP and exhibited U.S. MAB's sought-after balance of quality science, policy relevance, and demonstrated competence of the principals. It is also particularly encouraging to note that not all of the proposals came from only top flight "proven" academics: one of the highest rated proposals was received from a graduate student who had obviously done her homework and put together an outstanding proposal. Another came from a federal scientist who also put together a proposal with the proper sought-after mix.

Elsewhere in this issue you will find a description of an embryonic international program developing from the MAB national programs of the geopolitical bloc of nations known as "EuroMAB." Representatives of the MAB Programs of this regional grouping of 22 European and North American nations recently met and made plans to link the scientific research and monitoring programs currently underway on their biosphere reserves. While numerous practical hurdles lie in the path of truly sharing biological monitoring data on a systematic basis, we are hopeful that U.S. MAB can make a significant contribution toward creating a comparable international data base that will enhance our understanding of the effects of global change. While at this stage it is a EuroMAB initiative, it holds great potential to be able to be expanded to functionally and internationally link the biosphere reserve sites. We are hopeful that this initiative, and potential, will soon become an institutional reality.

Roger E. Soles

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Grants Awarded by U.S. MAB for FY 1991

Toxaphene in the Arctic: Atmospheric Delivery and Transformation in the Food Chain

Organochlorine (OC) pesticides and polychlorinated biphenyls (PCBs) are found throughout the Arctic in marine, freshwater, and terrestrial life. A primary concern is human exposure to OC contaminants. The diet of native people in the north is rich in fats, with fish and blubber being staples, resulting in a high intake of lipophilic OCs.

This research will follow changes in toxaphene composition as it is transferred from air to water, then up the food chain from zooplankton through fish and marine mammals to humans. Researchers will attempt to distinguish "eastern" vs. "western" toxaphene signatures by comparative analysis of air and biological samples from the Canadian Arctic, Siberia (Lake Baikal), and the Bering-Chukchi seas and will determine physical properties of the main toxaphene components that are bioaccumulated. This is important in assessing risks of toxaphene in human food sources and in humans themselves.

Terry F. Bidleman—Principal Investigator
Department of Chemistry
University of South Carolina
Columbia, South Carolina

Networking the Networks

The research will support a pilot project being developed by the Committee on Earth and Environmental Sciences Task Group on Ecological Systems and Dynamics to conduct research on the effects of global change on ecological systems using an ecological "network of networks" drawn from:

- biosphere reserves;
- Land Margin Ecosystem Research Sites (NSF);
- Long-term Ecological Research Sites (NSF);
- National Environmental Research Parks (DOE);
- National Marine Sanctuaries (DOC);
- National Park Global Change Research Areas (NPS); and
- Smithsonian Ecological Research Areas.

This will enable them to plan the details of the pilot project, the collection of basic data, facilitation of data exchange, communication among scientists within the network, opportunities to compare and review results, and consider network expansion.

Caroline Bledsoe—Principal Investigator
University of California at Davis
Davis, California

Land-use Practices in Northern Thailand: Impacts on Landscape Dynamics

The harvest of food, fiber, and energy from tropical forests to support village economies perturbs forest communities and ecosystems. Forest fragmentation affects plant and animal population dynamics, biodiversity, the movement of material (such as soil and nutrients) and water in upland catchments, evapotranspiration rates, and primary productivity. These changes in the natural system can limit the ability of the landscape to provide natural resources and a quality environment for villages and the surrounding region. With increasing population growth in tropical forest regions, forest fragmentation and loss is a critical environmental problem for many nations, with possible impacts to the global environment. Because tropical forest impacts originate at the village scale, quantifying the interaction between village resource use and tropical forest landscapes can provide governments and development agencies with information required for regional economic and land-use policy decisions.

This proposed research will use information from forest clearing activities for swidden cropping, rice production, permanent vegetable plots, and tea and fruit production in three villages located in the upland tropical forests near Chiang Mai, Thailand. The villages' database will be used to investigate forest fragmentation patterns and loss in a tropical forest landscape, combined with aerial photographs and satellite remote sensing information to analyze forest fragmentation patterns at the landscape scale.

Jefferson M. Fox—Principal Investigator
Environment and Policy Institute
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Honolulu, Hawaii 96848

The Role of Non-timber Forest Products in Maintaining the Health of the Venezuelan Yanomami

This research will investigate the extent to which non-timber forest products are utilized by the Piaroa Amerindians of the Venezuelan Amazon and the effects which settlement and deforestation may have on the availability, use, and management of these products. The study will concentrate on products such as the fruits, leaves, insects, and fungi that maintain health through their nutritional and medicinal qualities. It will include not only wild products, but also those cultivated in fallow fields or in home gardens.

The study will proceed over an 18-month period to observe seasonal variations in collection and consumption by two Piaroa villages practicing swidden cultivation. One

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village, settled for over 20 years, has had extensive contact with Western society. It is characterized by deforestation and the shortening of fallow periods. The second village, further upriver, maintains a more traditional lifestyle and has better access to forest resources. The results of this study will provide hard data on seasonal variations in the availability of non-timber forest products, amounts consumed within the household and in the field during foraging expeditions, and the methods of product management, as well as an understanding of why certain products are utilized and the extent to which they contribute to the livelihoods of the Piaroa. The results of this research will be directed toward the formation of resource management policies.

Mary Melnyk—Principal Investigator
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Northern Science Network Biosphere Reserve Managers International Workshop

The Alaska Region of the National Park Service and Denali National Park and Preserve and Biosphere Reserve plan to hold an international workshop of high latitude Biosphere Reserve managers in September 1992. It will focus on networking among arctic Biosphere Reserve managers, conceptual agreement on common research initiatives, compatible scientific database formulation, and key scientific protocols relevant to global change research in Biosphere Reserves. Ideas will be shared on an international basis, current research programs will be discussed, and cooperative research and management plans will be initiated.

A second related meeting sponsored by the National Parks and Conservation Association and the Denali Foundation will be a scientific symposium focusing on current and future research projects to be conducted in Denali National Park and Preserve and Biosphere Reserve, and will permit solicitation of international participants for suggestions concerning Denali's developing research program.

Dale L. Taylor—Principal Investigator
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Developing Sustainable Options for the Management of Maraca I, II, and III Extractive Reserves, Amapa, Brazil

Forest products including fruits, medicinals, rubber, timber, and local construction materials are abundant yet underdeveloped resources in the Maraca Extractive Reserves in the northern portion of the Brazilian Amazon region. An integrated research project will be implemented to contribute to the ongoing efforts of the Rural Workers Union of Amapa and the National Council of Rubber Tappers to develop options for the sustainable management of these extractive reserves using a framework of ecological, economic, and social sustainability.

The ecological portion of the study will obtain forest structure and composition data to determine the range of viable development alternatives for the sustainable management of these extractive reserves. Economic data will be collected and interpreted to help understand the production, distribution, and market potential of different forest products in the region. Sociopolitical data will be gathered to understand the structure of ownership and usufruct rights to land and forest resources in the region. The sociopolitical data collection will be integrated with a study of the present patterns of management of the five major resources of the reserves, as well as some minor resources. Management plans will be developed and presented to the Brazilian Government as an alternative means of developing the Amazon region without destroying the forest.

Kristiina Vogt—Principal Investigator
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Management of Mangrove Forests as Sustainable Systems for Tropical Coastal Water Quality and Artisanal Utilization

Mangrove forests provide many benefits to tropical coastal environments. They are biologically very productive, and they filter and buffer the sediments and inorganic nutrients which flow from the land to the sea. In this way, they help maintain the seaward communities of seagrasses and coral reefs, and they also provide protection from storm surges, serve as nursery grounds for a variety of coastal and oceanic fishes, and sustain abundant invertebrates and fishes for use by local populations.

This research will examine the major subunits within four mangrove communities in Jamaica and the U.S. Virgin Islands, including one Biosphere Reserve, from both

the biological and socioeconomic perspectives and establish overall values for each of the subunits and the community as a whole. The program will involve: 1) measurement of primary production within the different zones of mangrove forests; 2) measurement of inorganic nutrient and sediment storage and flux within each zone; 3) survey of local uses within each zone in terms of fishery, wood gathering, land acquisition, recreation, and tourism; and 4) establishment of a combined value rating for each of the zones. The goal of this study is to provide information about the subsystems and, also, to synthesize these findings into a coherent value estimate, with the long-term objective of providing a comprehensive, relatively simple way that managers of coastal resources can rationally allocate uses to these important and threatened ecosystems.

William J. Wiebe—Principal Investigator
University of Georgia Research
Foundation, Inc.
Boyd Graduate Studies Research Center
Athens, GA 30602

Agronomic and Economic Analysis of Progressive Greenhouse Warming: Impacts on Grain Yields, Cropping Patterns and Farm Profitability.

This research will address the problem of jointly assessing economic and agricultural impacts of evolving climate changes caused by gradually increasing greenhouse gas concentrations. A recently developed methodology, which focuses on the response of farm-level decisions to changes in the physical environment, will form the basis of the study. The project will consider the major grain crops of North America, for which reasonably comprehensive agronomic, climatological, and economic data are available.

The evolving agronomic yield potential for corn, soybeans, wheat, and sorghum will be investigated. Growth and development of these grains against the backdrop of changing environmental conditions will be simulated using process-oriented crop-environment models. Adaptation of farming practice to reflect progressive shifts in land-use suitabilities will be explicitly modeled. It is anticipated that the construction and integration of models allowing examination of the consequences of both energy and agricultural policy decisions on landscape patterns, food production, and prices will provide tools that can contribute usefully to informed policy decisions.

Daniel S. Wilks—Principal Investigator
Department of Soil, Crop and Atmospheric Sciences
Cornell University
Ithaca, NY 14853

EuroMAB III Congress Calls for an International Monitoring System

The third EuroMAB Congress, consisting of delegates from 22 European and North American nations, met in Strasbourg, France in September. U.S. MAB sent a four-person delegation: Roger E. Soles of the U.S. MAB Secretariat, Caroline Bledsoe of the University of California at Davis, Robert Lee of the University of Washington, and Michael Ruggiero of the National Park Service.

The Congress called upon the national MAB programs to collaborate in the creation of a system to gather and exchange biological information that would assist in monitoring the effects of global change. The Congress requested that each MAB program survey its existing monitoring and research programs to identify the existing data bases on the more than 140 biosphere reserves in the EuroMAB geopolitical area.

The U.S. offered to host a workshop in early February to review and assess the reports received to identify phenomena and indicators being monitored in common throughout these biosphere reserves. Based on this assessment, this workshop will provide recommendations for the development of institutional arrangements for the systematic exchange and accessibility of such information to the world's scientific community. The EuroMAB III Congress also requested that the international MAB secretariat at UNESCO assist this effort and help to ensure that proper liaison and coordination occurs with other international scientific programs.

The U.S. delegation played an active part in the proceedings. Dr. Caroline Bledsoe made a presentation on "Networking the Networks," the system for compiling information collected by environmental research centers and Long Term Ecological Research measurements; Dr. Michael Ruggiero discussed a number of existing long-term data bases available from the U.S. National Park Service and what will be available in the near future; and Dr. Robert Lee of the U.S. MAB Directorate on Temperate Ecosystems discussed the methodology of integrating the social and biological sciences in research and analysis. Dr. Lee was also designated by the EuroMAB III Congress to develop a program for increasing social science participation in MAB, especially in biosphere reserves' research programs, to increase the focus on the involvement of communities living in or near the reserves.

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Biodiversity, Why Is It Important?

The following is from a report of a IUBS-SCOPE-UNESCO workshop supported by U.S. MAB, *From Genes to Ecosystems: a Research Agenda for Biodiversity,* edited by Otto B. Solbrig, the Bussey Professor of Biology at Harvard University.

Lately there has been a great deal of concern throughout the world regarding the loss of biological diversity. This concern is not felt equally in all nations nor is it shared equally by all members of society. It stems from the realization that humans have been transforming natural landscapes worldwide, both terrestrial and aquatic. People have been cutting down forests, changing natural grasslands and savannas into agricultural fields, using rivers, lakes, and oceans as dumping grounds for their wastes, and modifying the natural composition of the atmosphere by the addition of millions of tons of carbon dioxide, various oxides of sulphur and nitrogen, and other chemical compounds.

The reason for the divergent perceptions about the real impact of the loss of biodiversity, is that ecosystem change, while incurring costs, also produces benefits. Natural landscapes are being transformed because their conversion fills certain human needs and is of advantage to many of those involved in the alteration. For example, the spread and intensification of agriculture is the direct result of the need for food and fiber of a large and growing human population. Likewise the felling of forests answers the needs for timber and fuelwood, the intensification of fishing the need for more protein, etc. Because benefits are typically economic and immediate, while costs are ecological and long term, it is very difficult to objectively balance costs and benefits. Another problem is that while short-term benefits are known, long-term costs are not. Such basic and apparently simple facts such as how many species grow in a tropical forest, how many of them become extinct when the forest is cut down, or how many are needed for the regeneration of the forest, are not known with precision. More general and complex questions, such as the role of diversity in the functioning of communities and ecosystems, and the required minimum biodiversity for the functioning of organisms and ecosystems, are even less well understood. Without them, a proper accounting of the costs of the transformation of the earth will not be possible. However, many cases are known where serious mistakes in calculating benefits from landscape transformation have been made.

....Humanity could stumble into an ecological disaster for lack of proper understanding of the functioning of ecosystems.

.....Resources on this planet are finite, and they must be managed in a sustainable way if they are to continue to serve as our principal source of sustenance. The loss of biodiversity is only one manifestation of the poor management of natural resources.

.....the problem of biodiversity loss and ineffectual management of natural resources has many aspects: social, economic, cultural, managerial, and scientific. But science will be of use only if its practitioners work closely with other actors interested in this drama, such as decision-makers, economists, anthropologists, artists, and peasants.

Why Study Biodiversity?

Clearly the loss of species has many dimensions. There are ethical considerations regarding loss of life and the perogative of the human species to eliminate other species from this planet. There are esthetic concerns regarding the loss of unique landscapes and species and the corresponding impoverishment of the human experience if it is denied the opportunity to encounter the multifaceted products of natural selection. There are economic speculations about the potential use of species. Organisms whose properties have not yet been investigated may be important as sources of drugs, or as food, or as raw materials for the emerging field of biotechnology . . . many not yet described species may possess novel biological properties that may help us understand how nature works. They may also play unique roles in the system.

....In order to ensure the maximum quantity and quality of renewable natural resources for ourselves and our descendants, we must learn to use resources sustainably. This means we must learn to attach proper value to the benefits and costs of using forests, savannas, grasslands, and all other ecosystems that ultimately provide the oxygen, food, fiber, and recreational opportunities for people worldwide.

The International Union of Biological Sciences (IUBS), the Scientific Committee for Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU), and the Man and the Biosphere (MAB) program of UNESCO have jointly agreed to initiate a program of research on biodiversity. The general objectives of the program are to (1) identify scientific issues that require international cooperation on the role of biodiversity in ecosystem function; (2) address general questions about how knowledge of species and ecosystem diversity can contribute to global ecology; and (3) investigate how species diversity contributes to system functioning.

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Announcement

Research Grants Competition— Biodiversity Support Program

The Biodiversity Support Program (BSP)—a joint venture of World Wildlife Fund, The Nature Conservancy and World Resources Institute—funded by the U.S. Agency for International Development (A.I.D.), is soliciting proposals for biodiversity research in A.I.D.-assisted countries. Deadline: November 15, 1991. Research may be ecological, economic, anthropological, or socio-political in focus or may utilize an interdisciplinary methodology.

Proposals must demonstrate substantial involvement of host country researchers and/or institutions, and priority will be given to those proposals in which a principal investigator is from a developing country. Projects should not exceed 2 years; maximum awards will be for $15,000. For further information and a copy of the RFP contact:

Biodiversity Support Program
c/o World Wildlife Fund
1250 24th Street, N.W.
Washington, D.C. 20037
Tel.: 202–778–9795
FAX: 202–293–9211

PUBLICATIONS

REMEMBER, ENCLOSE YOUR SELF-ADDRESSED MAILING LABEL (OR LABELS, IF YOU ARE REQUESTING SEVERAL ITEMS).

New Publications—Available from U.S. MAB

People and the Temperate Region, A Summary of Research from the United States Man and the Biosphere Program. Edited by Peter F. Ffolliott and Wayne T. Swank. Published by the U.S. MAB Program in August 1991.

FROM GENES TO ECOSYSTEMS: A Research Agenda for Biodiversity. Edited by Otto T. Solbrig. Published by the International Union of Biological Sciences with the financial support of the National Science Foundation and the U.S. MAB Program.

Still Available from U.S. MAB:

May 1991 issue of ***BioScience***, the magazine of the American Institute of Biological Sciences, in collaboration with the U.S. Man and the Biosphere Program. **Articles on Coastal Barrier Ecosystems prepared for a U.S. MAB-supported symposium on coastal barriers held at the AIBS meeting at the University of Toronto in August 1989.**

Proceedings of a **Workshop on Forest Hydrological Resources in China, An Analytical Assessment.** The workshop was held in Harbin, China, August 18–23, 1987. The Proceedings were edited by Peter F. Ffolliott and D. Phillip Guertin.

Bibliography on the International Network of Biosphere Reserves. Published by the United States Man and the Biosphere Program in July 1990.

Directory of Biosphere Reserves in the United States. Published by the United States Man and the Biosphere Program in June 1991.

Pamphlet on **The United States Man and the Biosphere Program.** Department of State Publication 9798. Released July 1990.

Available from Others:

NATURE RESERVES, Island Theory and Conservation Practice. Craig Shafer, an ecologist with the National Park Service, reviews the literature on island biogeography and related subjects, synthesizes some guidelines from controversial theories, and assesses the current status of nature reserves, information available from field surveys, and results of conservation trials. Available from the Smithsonian Institution Press, Blue Ridge Summit, PA 17294–0900, tel. 800–782–4612; 717–794–2148.

Ecology Chronicle: Twenty-four Windows on the Man and the Biosphere Programme 1989–1990. Published by the UNESCO-MAB. Available from the UNESCO-MAB Secretariat, 7, place de Fontenoy, 75700 Paris, France.

Geographic Information Systems and their Application in MAB Projects, Ecosystem Research and Environmental Monitoring. Edited by Michael Ashdown and Dr. Jorg Shaller. **Report #34.** Available from: MinR Wilfried Goerke, Dipl.-Biolge. Federal Ministry for Environment,

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Nature Protection and Nuclear Safety, P.O. Box 120629, D-5300 Bonn 2, Germany. Please include your self-addressed mailing label.

Country Environmental Profiles. Six new books providing a national overview of the state of the environment in each of six neighboring island states in the Lesser Antilles—Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines.

Designed primarily for those engaged in setting a national environmental action agenda in motion. Island Resources Foundation and the Caribbean Conservation Foundation have prepared a smaller executive summary of the volumes described above, **Environmental Agenda for the 1990's: A Synthesis of the Eastern Caribbean Country Environmental Profile Series**. Available from the Island Resources Foundation, 1718 P Street, N.W., Suite T 4, Washington, D.C. 20036, tel. 202–265–9712.

Still Available from MAB-UNESCO, 7, place de Fontenoy, 75700 Paris France:

UNESCO Publication, **MAB Digest 1,** on **Eutrophication Management Framework for the Policy-Maker,** by Marjorie Holland, Walter Rast, and Sven-Olof Ryding.

Eutrophication of lakes and reservoirs is one of the most pervasive water quality problems worldwide. This digest aims to provide: quantitative tools for assessing the state of eutrophication of lakes and reservoirs; a framework for developing cost-effective management strategies; specific technical guidance; and case studies for effective management of eutrophication.

UNESCO Publication, **MAB Digest 3,** on **Contributing to Sustained Resource Use in the Humid and Sub-Humid Tropics, Some Research Approaches and Insights,** by Malcolm Hadley and Kathrin Schreckenberg. An overview of recent, ongoing, and planned activities within the MAB framework pertaining to the ecology of humid and sub-humid tropical ecosystems, principally forests and savannas.

UNESCO Publication, **MAB Digest 4, The Role of Land/Inland Water Ecotones in Landscape Management and Restoration, Proposals for Collaborative Research,** edited by Robert J. Naiman, Henry Decamps, and Frederic Fournier. To determine the management options for the conservation and restoration of land/inland water ecotones through increased understanding of ecological processes.

UNESCO Publication, **MAB Digest 6, Debt for Nature Exchanges and Biosphere Reserves, Experiences and Potential,** by Peter Dogse and Bernd von Droste.

DEPARTMENT OF STATE PUBLICATION 9731
Bureau of Oceans and International Environmental and Scientific Affairs

Released November 1991

U.S. Man and the Biosphere Program, OES/EGC/MAB
DEPARTMENT OF STATE, U.S.A.
Washington, D.C. 20522–3706