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THE UNIVERSITY OF MICHIGAN
School of Natural Resources

In this Issue:

A Global Strategy for Conserving Biodiversity

by
Kenton Miller, Walter Reid, and Jeffrey McNeely

In the past decades, local, national, and international organizations and initiatives have contributed significantly to the effort to slow the loss of the world's biodiversity. But, despite these efforts, biodiversity is still being eroded at alarming rates. The continuing impoverishment of the biota is degrading essential ecosystem services and represents the loss of the very elements of life that are needed to place humanity's use of the environment on a sustainable footing.

A reduction in the rate of loss of biodiversity is an insufficient response to the problem: the endpoint remains unchanged. Instead, the tide of loss must be turned. To ensure that a productive biota remains for all that directly or indirectly depend upon it now and in the future, we must build on the defensive posture and mount a strong offensive to change humanity's relationship with the world's biological resources from one of exploitation to one of sustainable use.

The tide can be turned and it must be turned immediately, while the opportunity remains. Once funding becomes available, the World Resources Institute (WRI) and the International Union for the Conservation of Nature and Natural Resources (IUCN), in close cooperation with a growing list of organizations, including World Wild Fund for Nature, The Nature Conservancy, Conservation International, World Bank, UN Environmental Programme (UNEP), and related UN organizations, and bilateral development agencies, expect to initiate a major international program to: i) add essential new elements to the existing backbone of conservation activities, ii) build political commitment, and iii) foster effective action for biodiversity conservation at the appropriate level of planning. In this article we describe the program as it has taken shape under the guidance of leading figures from the scientific, resource management, development assistance, and international non-governmental organization (NGO) communities.

The conservation of biodiversity is the explicit or implicit objective of numerous local, national, and international activities underway throughout the world. A brief sketch of just a few of these activities reveals both the breadth of coverage of conservation and the commitment of individuals, institutions, and nations to the prevention of the biotic impoverishment of the earth.

In the past decades, national and international seed banks, under the leadership of the International Board for Plant Genetic Resources (IBPGR), have made tremendous advances in ensuring the security of the genetic resources of major crops. National governments and NGOs have established an impressive network of protected areas in some 120 countries and complemented these areas with national and private zoos, botanic gardens, and projects to rescue and propagate endangered species. International initiatives, under the direction of the World Heritage Convention, the Ramsar Convention, the Convention on International Trade in Endangered Species (CITES), and the Man and the Biosphere program of UNESCO have responded to the global nature of the problem of biotic impoverishment and facilitated international responses.

The scientific and technical commissions of IUCN on species, protected areas and ecology, and the specialized programs on tropical forests, wetlands and marine environments have prepared strategies for conservation by regions, biomes and species. The botanic gardens of the world are preparing a strategy for contributing to global conservation and development. The field projects of the World Wide Fund for Nature family reach through more than 78 countries and include work on species conservation, protected areas, and the sustainable development of lands surrounding important reserves. The International Union of Biological Sciences, in cooperation with the Scientific Committee on Problems of the Environment (SCOPE) is establishing a task force on biodiversity to study the function and structure of ecosystems. New and continuing bilateral programs, such as the US-USSR Scientific Exchange, offer vehicles for directing considerable scientific capability toward the biodiversity agenda.

The United Nations system has provided leadership, technical assistance and funding in all these activities. Special mention can be made of the work of UNEP on species and ecosystems, environmental law, pollution, regional seas and rivers; the work of the Food and Agriculture Organization (FAO) on the Tropical Forest Action Plan and work at the national level on protected areas; and the activities of the UN Development Programme in support of the Tropical Forest Action Plan and conservation-oriented development projects. IUCN and UNEP are developing an international convention on biodiversity that will fill the gaps in existing international agreements and will establish a funding component to support conservation programs.

Bilateral development assistance agencies are increasingly considering the impact of grants and loans on biodiversity. In 1987, the U.S. Agency for International Development (U.S. AID) spent $4.9 million on biodiversity conservation projects. The World Bank has contributed to the development of national environmental action plans, as exemplified by its work in Madagascar with IUCN, U.S. AID, WWF, and others, and has organized a Biological Diversity Task Force to help guide its

environmental planning effort.

But despite these activities the rate of biotic impoverishment is still increasing dramatically. Today, the loss of biodiversity is having a clear impact on the well-being of people both in developed and developing nations. The exponential growth in human population and the even faster growth in consumption of the globe's natural resources, have led to high rates of loss of species and habitats. Declining ecosystem productivity is thwarting people's efforts to meet immediate needs for food and shelter. The world is losing species that are of immediate and future value to humanity, and essential for the maintenance of productive ecosystems. If current trends continue, by the middle of the next century we may see the loss of up to 25 percent of the world's species. Moreover, even the common species that support our agricultural, livestock, forestry, fisheries and pharmaceutical industries are facing the serious impoverishment of their genetic basis.

The proximate causes of the loss of biodiversity are clear. Biological resources are degraded, and species and habitats are lost, through such activities as the large-scale clearing and burning of forests, overharvesting of plants and animals, indiscriminate use of pesticides, draining and filling of wetlands, destructive fishing practices and sedimentation of coral reefs, air pollution, exotic species introductions, and the conversion of wildlands to agricultural and urban development.

In contrast, the root causes of the loss of biodiversity are less obvious, yet it is the root causes that must ultimately be addressed. Behind the proximate causes of biotic impoverishment lie demands for commodities such as tropical hardwoods, wildlife, fiber, and agricultural products. People's decisions regarding what or where to plant, and what conservation measures should be taken, are stimulated by national and international economic policies. Similarly, environmental, agricultural, and trade policies affect land management options. The growing human population, without accompanying economic growth and development, places increasing demands on natural resources and ecosystem processes that, like the Sahel, are already impoverished and stressed. Settlement policies promote the movement of the growing unemployed labor forces to frontier zones. The debt burden forces governments to encourage the production of commodities that can earn foreign exchange. Energy policies encourage inefficiency in many nations, and in so doing add to the burden of air pollutants and the risk of substantial global climate change. Inappropriate land tenure arrangements prevent rural people from making the investments that would enable sustainable use.

When the problem of biodiversity loss is defined in terms of immediate causes, the response is to take defensive and often confrontational actions. When the problem is defined in terms of its root causes, a more constructive response can be stimulated that seeks to take the offensive through cooperative efforts to address those causes.

Current conservation efforts are insufficient to reverse the trend toward biotic impoverishment. Traditional means, such as national parks, endangered species programs, zoos, botanic gardens and seed collections, will remain key elements of conservation and development programs in the future as they have been in the past. Indeed, they are necessary ingredients and must be greatly strengthened to better fulfill their roles in overall conservation. However, they are not sufficient; they do not necessarily address root causes of the problem.

The conservation of biodiversity is on the threshold of a new era. It has been carried to this threshold by a recognition of the linkages between various conservation activities, a recognition of the linkage between conservation and development, and by the development of new approaches to conservation.

In the past decade, the breadth of concern of institutions concerned with the conservation of biodiversity has expanded to address the entire array of social and biological factors that influence the success of their activities. Institutions with a mandate to conserve bio-

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UPDATE

A forum for information exchange on endangered species issues
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Instructions for Authors:

The Endangered Species UPDATE welcomes articles related to species protection in a wide range of areas including but not limited to: research and management activities for endangered species, theoretical approaches to species conservation, and habitat protection and preserve design. Book reviews, editorial comments, and announcements of current events and publications are also welcome.

Readers include a broad range of professionals in both scientific and policy fields. Articles should be written in an easily understandable style for a knowledgeable audience.
Manuscripts should be 10-12 double spaced typed pages. For further information please contact Rob Blair at the number listed below.

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diversity are increasingly focusing on multiple goals and methods. For example, having secured the domestic genetic resources of the world's most important crops, IBPGR is now identifying priorities for *in-situ* and *ex-situ* conservation of wild genetic resources. The Consultative Group on International Agriculture (CGIAR) has recommended a doubling of the research effort that the International Agricultural Research Centers devote to the management and conservation of natural resources. Similarly, many organizations that previously have focused their activities on the establishment of strictly protected areas are now devoting considerable effort to projects that attempt to provide sustainable alternatives for the use of resources outside of protected areas for the benefit of neighboring people.

New opportunities are available to address both the immediate symptoms and the root causes associated with the loss of biodiversity. Experience with the management of protected areas suggests ways to maintain samples of wild habitats while addressing additional objectives including the supply of water, erosion protection, protection of genetic materials, research, monitoring and tourism (McNeely and Miller 1984). Extractive reserves offer options for retaining forest cover while providing an employment base and certain commodities and services (Reid *et al.* 1988). Work in rural lands adjacent to important protected areas shows options for employment and sustainable use of natural resources (World Wildlife Fund 1987).

The conservation of biodiversity must add these new dimensions to the traditional set of approaches. Economic activity derived from biodiversity resources must be linked with the welfare of rural people in surrounding regions. The capacity of local communities to help protect, inventory and utilize biodiversity resources must be fostered. In addition to local self-help efforts to mobilize the benefits of biodiversity, new approaches to international financial investment, cooperation and support can assist governments and NGOs to establish methods of conservation and production—such as extractive reserves and multiple-use areas—that can make sustainable contributions to people's needs. In addition, inappropriate economic subsidies and policies, and legal barriers must be removed in order to eliminate many of the root causes of biodiversity loss and unsustainable resource use.

An increasing body of theory and information resulting from field studies has established a sound scientific basis for planning and management. Significant new guidelines from the fields of conservation biology and ecosystem science point to the need for more technical and scientific rigor in the identification, selection and management of protected areas to ensure that viable samples of wild ecosystems remain for long periods into the future. The size, shape and internal management of parks and reserves must be adjusted to meet biological objectives in addition to tourism, recreation, water conservation and other worthy aims.

Recent economic studies at WRI and elsewhere suggest innovative ways to finance conservation activities including protected areas and approaches to biodiversity utilization (ICFP 1989). Efforts at community action in Costa Rica, Colombia, Mexico and elsewhere demonstrate how biodiversity can be put to use for the benefit of local communities (Altieri and Merrick 1988, Janzen 1988). Policy studies are beginning to illustrate the economic losses engendered by policies that promote certain commodities at the expense of biodiversity (Repetto 1988). The Tropical Forest Action Plan and ensuing country studies demonstrate a viable mechanism for cooperation between donor institutions and local forestry programs WRI/ World Bank/ UNDP 1985). The international Tropical Timber Organization is forging a basis of negotiation between producer and consumer countries of tropical timber, a major factor related to the loss of tropical forests and biodiversity. Finally, the regional planning experience of the Organization of American States and other organizations points to approaches that can orient development and conservation investments and activities in ways that provide for human needs while retaining a diverse landscape (U.S. Congress Office of Technology Assessment 1987).

The conservation of biodiversity is not simply a traditional protection agenda, but a scientific, economic, social, political and developmental one. New modes of finance, cooperation, and the integration of conservation into the development process are required. Furthermore, it is not simply a problem of the tropical poor countries. While more than half of the Earth's biological wealth lies in the tropics, and at least 40 percent in the 20 countries containing significant amounts of the remaining tropical moist forests, all nations carry responsibilities to conserve the diversity within their own borders. Any scheme to prioritize the needs for biodiversity conservation must recognize that, from a national perspective, the maintenance of local biological resources is essential to support sustainable development even if the nation's biological diversity is not particularly high from a global perspective. All nations share in the global imperative to create and capture new opportunities to maintain maximum possible diversity and to use it wisely for benefit of this generation while keeping options open for the future. A world that has abused its biological resources will have far less diversity available to the development challenges that are certain to come in the future. Thoughtless exploitation today will lead to needless suffering tomorrow.

The combination of high rates of loss of genetic resources, species and ecosystems, and the anticipated changes in global climate compel us to act quickly to capture these and additional opportunities while time remains. The values involved for current and future generations are too high to allow inaction to compromise current biotic productivity and future options for sustainable development.

The elements now exist that will allow a reversal in the trend toward the biotic impoverishment of the world. What is needed is a period of synthesis of many activities that pertain to the conservation of biodiversity in this new political, social, and technical environment and the incorporation of novel approaches into a reality of improved

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human well-being and a secure biotic heritage.

The Global Strategy for the Conservation of Biodiversity seeks to achieve these objectives, involving an intensive 10-year effort to be known as the "International Biodiversity Decade." The aim of the Strategy is to provide a comprehensive framework to stimulate urgent, positive, innovative, and coordinated action to stem the loss of biodiversity and capture the opportunities for practical contributions of biodiversity to human well-being.

The strategy will be developed by and for governmental officials and leaders, non-governmental conservationists, scientists, academics, resource management professionals, officers of foundations, multilateral banks and bilateral aid agencies. It will provide a framework for concerted attention and action on both immediate needs and root causes of the problem of biotic impoverishment. The Strategy will identify the complementarities of current activities, priorities for the conservation of biodiversity, where and how these priorities will be addressed, new funding mechanisms, and it will promote direct action while time and opportunities remain. The project will provide leadership in ensuring that the benefits of biodiversity conservation reach local people, especially the rural poor; that diversity is passed on to future generations; that the best science is fostered and employed; and that political grassroots support for the initiative is developed.

The organizers of this effort—WRI and IUCN—are currently seeking funding, collaborators, and other forms of support for the project. The development of the strategy will be centered around a series of regional workshops in Asia, Africa, Europe, Latin America and North America. Prior to the workshops, issue papers will be developed by individuals or small teams of researchers on six key topics that successful biodiversity conservation must incorporate in order to change the tide of biotic impoverishment (see box). Some of these topics, such as *#5 Protected Areas*, will be examined regionally by local and international experts capable of identifying critical needs and who can represent the political and social realities of the region. Other topics, such as *#6 Action Plans*—the examination of lessons learned from existing action plans—will provide a more global perspective on the issue. The workshops will serve as fora for a reciprocal exchange of information. First, the work on the new elements of conservation will be disseminated to regional and national decision makers and interested parties. Second, the workshops will contribute regional and cultural perspectives, facts, and case studies into a global synthesis, and allow the development of sections oriented toward the unique needs of specific regions.

Subsequently, the materials will be synthesized by the researchers and project team to form the first draft of the strategy. The strategy will be published, launched at an appropriate international event, and promoted by the cooperating organizations.

The Global Strategy will propose and set the stage for an international Biodiversity Decade to provide an operational and programmatic menu for international cooperation on specific opportunities and to foster national action that addresses root causes of problems. The project will not feature a "global action plan," as such, since action planning on natural resources can only be done properly by, and in cooperation with, national institutions where sovereignty resides. On the contrary, the project seeks to stimulate action planning at the local level by governmental and NGO institutions in an effort to meet the biodiversity challenge through local approaches supported by international assistance where necessary.

The 1990s will be the last decade during which decisions, activities and investments can be made to ensure that many of the world's species and ecosystems are maintained, are examined for their material and ecological value, and promoted for use to support new and innovative approaches to sustainable development. The project will formulate and promote a decade-long period of intensive world-wide effort by all interested institutions and individuals to put into practice the types of work called for in the strategy. It will sponsor international dialogue to establish the most appropriate organizational center for continuing to lead and guide biodiversity action through the 1990s and beyond.

We are at a crossroads in the history of human civilization. Our actions in the next few years will determine whether we take a road toward a chaotic future characterized by overexploita-

(Continued on UPDATE page 5)

Pivotal Issues in Halting the Loss of Biodiversity

1. Root Causes. Analysis of policies and institutions including agriculture, forestry, fishing, trade, and wildlife policy; land tenure; foreign assistance; international cooperation; international finance; the human capacity to manage biotic resources including training and education; and public awareness, in order to orient efforts to remove obstacles and promote change in structures and approaches to those that favor biodiversity conservation and use.

2. Science. Analysis of support for, and use of, modern science for guiding the protection, inventory, study, monitoring, and use of biodiversity and biotic resources to identify the means by which science can make greater contributions to the process of planning and decision making.

3. Sustainable Development. Examination of examples and options for management and use of lands adjacent to protected areas in fragile ecosystems and sites requiring rehabilitation, in order to bring the benefits of biotic resources and biodiversity to rural local people living in these areas and to the global community at large.

4. Integration. Consideration of opportunities for collaboration among various approaches to biodiversity conservation, including parks and protected areas, multipurpose reserves, botanic gardens, zoos, game ranches, seed collections and other germplasm and ecosystem maintenance techniques, to enhance the potential for conservation and efficiency.

5. Protected Areas. Synthesis of geographic location and requirements for parks and protected areas, sites important for agricultural and forestry genetic materials, critical sites for flora, fauna, wetlands and selected taxa, and key sites of importance to surrounding people in order to determine priority areas warranting cooperation, establishment, particular types of management, and possible emergency attention due to considerations of threat and value.

6. Action Plans. Critical review of existing action plans on forestry, desertification, protected areas, and species; national conservation strategies; environmental profiles; and similar instruments and approaches in order to orient future action planning for biodiversity conservation and development in ways that benefit from lessons of previous experiences.

tion and abuse of our biological resources, or take the opposite road toward maintaining great biological diversity and using biological resources on a sustainable basis. The future well-being of human civilization hangs in the balance.

Editor's note: Since the writing of this article, the Global Strategy for the Conservation of Biodiversity has received funding for an initial two-year period and will commence in September 1989.

Kenton Miller directs, and Walter Reid is an associate in, the Program in Forests, Biodiversity and Sustainable Agriculture at World Resources Institute. Jeffrey McNeely is Chief Conservation Officer at International Union for the Conservation of Nature and Natural Resources (IUCN).

This article first appeared in *Diversity* 1989 5(1):4-7, which is a quarterly journal for the plant genetics resources community published by Genetic Resources Communications Systems, Inc. 727 8th Street SE, Washington DC 20003, (202) 543-6843.

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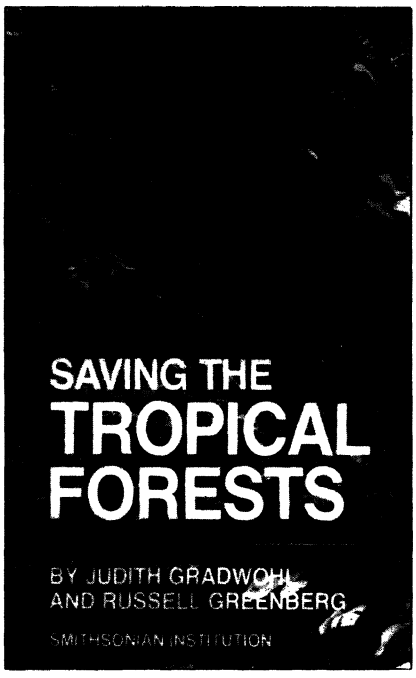
Book Review

Saving The Tropical Forests

By Judith Gradwohl and Russell Greenberg



This book was released in conjunction with the Smithsonian Institution's traveling exhibit "Tropical Rainforests: A Disappearing Treasure". It provides both a general introduction to the issue of tropical deforestation and examples of efforts being made to combat it.

Part I of the book describes some of the ecological processes which make rain forests particularly susceptible to deforestation. It goes on to list both some causes and implications of this deforestation. The book identifies economic and political factors, such as the demands of developed countries for tropical timber, the power of agribusiness and local elites, and international debt, along with social problems such as growing human populations, as major causes of deforestation. However, both of the authors are biologists and the details of these mechanisms and processes are not explored.

Part II of the book presents a series of 38 very brief "case studies" of projects which are attempting to address the problem of tropical deforestation by combining an understanding "...of the ecological value of the tropical forest with an acknowledgement that forests should be used for peoples' benefit". The case studies are divided into four groups: Forest Reserves; Sustainable Agriculture; Natural Forest Management; and Tropical Forest Restoration. Each group is preceded by a general introduction which describes some of their common characteristics. Twenty-nine case studies are drawn from the Neotropical realm, eight from the Indo-Malayan realm and only three from the Afrotropical realm. Whether this reflects the distribution of tropical forests, tropical forest problems or innovative projects is unclear. However, one result of this emphasis is some overgeneralization, particularly with respect to land ownership patterns.

Where the book is valuable is in: its unequivocal statement that the causes of, and therefore also the solutions to, tropical deforestation are social, economic and political rather than biological; its presentation of a range of approaches to the problems of tropical deforestation; its description of real ongoing projects; and its provision of the names and addresses of contact people for each project. The authors also help to dispel some of the popular myths about tropical forests. In particular, for example, they point out that what is often taken to be "virgin" forest is actually secondary forest which has regrown following "abandonment" by the shifting cultivators who last cleared it perhaps hundreds of years ago.

Saving the Tropical Rainforests is available from Island Press, Box 7, Covelo, CA 95428 for $24.95 plus $2.00 postage and handling.

Book review by John Hough, Ph.D.

Opinion

Financing Local Protection of Biological Diversity

by Robert Culbert

Editor's Note: In last month's issue Robert Culbert called for increased local planning for the preservation of biological diversity. In this column, he explores two possible methods for funding local protection efforts.

Funding wildlife preservation at the local level can be accomplished in two principle ways: through the use of mitigation fees on new development and through fees on most real estate transfers. Both have generated large sums of money.

Because of the Endangered Species Act's provisions against the incidental taking of an endangered species, some local communities are preparing Habitat Conservation Plans (HCP) to allow continued development, even in the habitat of an endangered species. The U.S. Fish and Wildlife Service requires each HCP to describe how the species will be protected and to guarantee sufficient funding to protect the species. Mitigation fees on new development have been used, from Texas to California, to provide this money.

I initially felt that mitigation fees and species preservation could not coexist; that additional habitat loss (development) and protection of an endangered species were irreconcilable. But now I'm not so sure. Mitigation fees can turn the inevitable development (even the Tellico Dam boondoggle could not be stopped) and habitat loss into large sums of money used solely for the benefit of wildlife.

Consider the plight of the Stephens' kangaroo rat, an endangered desert-living rodent with a range that has always been restricted to western Riverside County, one of the fastest growing regions in California. The County has established a $1950 per acre mitigation fee on new development that must be paid before permits are issued. The County estimates this fee will generate $50 million over the next 20 to 30 years. This money, which must be used solely for the kangaroo rat, should be sufficient to save the species from extinction unless the HCP is biologically flawed.

However, Riverside County must overcome many pitfalls to successfully preserve the kangaroo rat. Perhaps the most severe problem is that it will take years before enough money is raised (even at $1 to 2 million per year) to purchase the quantities of land necessary for this species' protection. This problem will be heightened if land prices increase more rapidly than expected (they always seem to in rapidly developing areas); any increase in land prices decreases the purchasing power of this money.

A second method of generating money for wildlife conservation on a local level comes from two resort islands, Nantucket and Martha's Vineyard, off the coast of Massachusetts. They are two of the fastest growing counties in Massachusetts, and, as a result of their rapidly increasing summer populations, "No Trespassing" signs were appearing everywhere. The numbers of places where the public could go were disappearing.

The solution, which was first implemented on Nantucket and then on Martha's Vineyard, was to add a two percent fee onto most real estate transfers. An agency, independent of county government, was established with the sole purpose of spending this money to purchase land for public access, aquifer protection, and wildlife preservation. The result has been that on Nantucket $19.3 million was collected from 1984 to 1988, and 992 acres of land was purchased with this money. On Martha's Vineyard, the $11.8 million raised since 1986 has helped preserve 567 acres.

This fee on real estate transfers has a broader financial base than mitigation fees, since almost every land transfer contributes to this fund, making it less contingent on new development. And because it is a percentage rather than a flat fee, its revenues will increase as property values increase, so there will be no reduction of buying power. Perhaps the most important disadvantage is that as a "tax" (user fee?) it had to be approved by the state legislature. Its passage in the legislature was made possible by nearly unanimous local support on both islands. Another potential disadvantage is that it is not as specific as the mitigation fees; each land purchase does not necessarily benefit wildlife conservation (this could be an advantage since widespread support for wildlife conservation is often lacking).

My point in discussing both the mitigation fees and the real estate transfer tax here is to show that there are at least these two different techniques for generating large sums of money on the local or regional level for wildlife conservation. Every community, especially those undergoing rapid development, should implement some variation of these fund-raising techniques. The money should then be used to purchase wildlife habitats, thus protecting the wildlife that depends on those habitats. The biodiversity crisis will be resolved only after such local or regional efforts are made across the country. Depending solely on the federal government is not sufficient.

Robert Culbert hails from Martha's Vineyard where they have imposed a successful two percent transaction fee on most real estate transfers in an effort to protect habitat at the local level.

Bulletin Board

Wildlife Rehabilitation Today

Wildlife Rehabilitation Today, published by Coconut Creek Publishing Company, is a new magazine devoted to wildlife rehabilitation, preservation, conservation, and education.

This quarterly publication is intended for licensed rehabilitators, veterinarians, wildlife professionals, environmental educators, humane officers, and interested laypeople. News and feature articles cover the rescue, treatment, breeding, and reintroduction of injured and orphaned wild animals. Two-year (eight issue) subscriptions are available for $20. More information may be obtained from *Wildlife Rehabilitation Today*, 2201 NW 40th Terrace, Coconut Creek, Florida 33066.

Biological Diversity of Mexico

Conservation International has announced the first authoritative review of available knowledge on Mexico's rich biological diversity, *Conservation in Mexico: Overview on Terrestrial Vertebrates, Vegetation, and Land Use.* The report, compiled by the Natural Research Institute for Biotic Resources (INIREB) and Conservation International, identifies critical gaps in ecological knowledge concerning Mexico's biological richness, land use, and protected areas, and recommends the urgent need to develop a comprehensive natural resource data base to effectively protect and manage this rich heritage for present and future generations.

Although Mexico is one-fifth the size of the United States, its biological diversity is equal if not greater. It is estimated that Mexico harbors at least 24,000 higher plant and animal species, with more than 4,000 of these endemic to the country. This is one of the highest rates of endemism in Latin America. Unfortunately, this diversity is severely threatened by deforestation and agricultural conversion. By 1981, no ecological system had escaped undisturbed, with only 40 percent of the land remaining in its natural state. Even the country's protected areas, covering less than two percent of its territory, have been affected by human use.

The authors of the report, Oscar Flores-Villela and Patricia Gerez Fernandez, call for stepped-up research, stronger management and firm legal action to reduce the rate of habitat destruction. They have four major recommendations: 1. compiling complete regional and state plant and animal inventories, 2. developing criteria for use in laws to protect endangered species and defining land and resource use, management objectives, and appropriate boundaries for protected areas, 3. constructing a fuller and more detailed picture of the country's land-tenure and productive activities, monitoring current land use and rates of land conversion, and 4. promoting and establishing more protected areas in states and regions where there is need. It is hoped this work will stimulate further study of Mexico's natural biological resources and give conservationists and decision-makers a new and useful tool as they evaluate development plans which affect not only Mexican citizens, but thousands of plant and animal species in the country.

For information on the availability of the report, contact Conservation International, 1015 18th Street, NW Suite 1000,Washington DC 20036 (202)429-5660.

Bulletin board information provided in part by Jane Villa-Lobos, Smithsonian Institution.

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