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BIOSPHERE RESERVES IN ACTION

CASE STUDIES OF THE AMERICAN EXPERIENCE

U.S. MaB

The United States Man and the Biosphere Program (U.S. MAB) fosters harmonious relationships between humans and the biosphere through domestic and international cooperation in interdisciplinary research, education, biosphere reserves, and information exchange. U.S. MAB utilizes UNESCO designated biosphere reserves as sites for promoting ecosystem management by incorporating a program of ecosystem protection with sustainable human use and development; documenting global change and biological diversity through monitoring, inventorying, and scientific research; and organizing regional cooperative institutions for resolving complex issues of multipurpose land use.

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BIOSPHERE RESERVES IN ACTION

CASE STUDIES OF THE AMERICAN EXPERIENCE

United States Man and the Biosphere Program

The case studies presented in this booklet were written with contributions from managers and staff of the biosphere reserves. Nine of the studies were originally prepared by the Partners in Parks in October 1993 and have been updated in 1995. The case study on "Virginia Coast Biosphere Reserve" was prepared by The Nature Conservancy in November 1994; "New Jersey Pinelands Biosphere Reserve" was written by The Pinelands Commission, September 1994; and "Land Between the Lakes Biosphere Reserve" was written by Tim Merriman, October 1994. Antoinette J. Condo of the U.S. MAB Secretariat staff brought the 12 case studies together into this one volume.

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DEDICATION

This volume is dedicated to those around the world interested in biosphere reserves and the study of land management issues. The biosphere reserves of the United States are diverse in origin, purpose, and management. U.S. MAB envisions every biosphere reserve as a catalyst for cooperation among various interests and people. The following 12 case studies give a glimpse of efforts in communication among the local community, scientists, managers, and policymakers toward solving issues of sustainable development, conservation of biological diversity, and scientific investigation.

D. D. B.

FOREWORD

For nearly 20 years, biosphere reserves have offered a unique framework for building the knowledge, skills, and attitudes required for conservation and sustainable use of ecosystems. The 12 case studies in this volume chronicle many of the cooperative efforts to implement the biosphere reserve concept in the United States. Considered together, these efforts involve more than 20 types of protected areas, and the participation of all levels of government, and many private organizations, academic institutions, citizens groups, and individuals.

Biosphere reserves are multi-purpose areas that are nominated by the national committee of the Man and the Biosphere Program (MAB) and designated by the United Nations Educational, Scientific and Cultural Organization (UNESCO) to serve as demonstration areas for cooperation in building harmonious relationships between human activities and the conservation of ecosystems and biological diversity. Each biosphere reserve exemplifies the characteristic ecosystems of one of the world's biogeographical regions. It is a land or coastal/marine area involving human communities as integral components and including resources managed for objectives ranging from complete protection to intensive, yet sustainable development. A biosphere reserve is envisioned as a regional "landscape for learning" in which monitoring, research, education, and training are encouraged to support sustainable conservation of natural and managed ecosystems. It is a framework for regional cooperation involving government decisionmakers, scientists, resource managers, private organizations and local people (i.e., the biosphere reserve "stakeholders"). Finally, each biosphere reserve is part of a global network for sharing information and experience to help address complex problems of conservation and development.

Natural resource policies in the U.S. and other countries increasingly encourage cooperation in conserving biological diversity and meeting the needs of human communities for social and economic development. Biosphere reserves help implement these policies by providing international recognition of important regional efforts and a focus for stakeholders to cooperate in developing the knowledge, technologies, and perspectives needed to solve complex resource problems.

UNESCO designated the first U.S. biosphere reserves in 1976. These first reserves were properties managed by the National Park Service, the Forest Service, or the Agricultural Research Service. The parks served as strictly protected "core areas" for conservation and as benchmarks for monitoring ecological change against which to compare the effects of human activities in the surrounding region. The experimental research areas facilitated manipulations to improve understanding of these effects and develop ecologically sustainable management practices. Where possible, these separately designated biosphere reserves were paired to encourage cooperative research that could help regional interests formulate management goals.

In 1984, UNESCO approved the Action Plan for Biosphere Reserves, based on the recommendations of the First International Congress on Biosphere Reserves held in Minsk, Belarus, in 1983. The plan clarified the concerns, characteristics and objectives of biosphere reserves, and recommended implementing actions for consideration by international organizations and National MAB Committees.

Beginning in the early 1980s, U.S. MAB nominated multi-site biosphere reserves to strengthen regional cooperation in implementing biosphere reserve concepts. In recent years regional cooperative biosphere reserve programs have been established involving many agencies, private interests, and participating sites.

In 1993, the interagency U.S. National Committee for MAB approved convening a national workshop of biosphere reserve managers and stakeholders to develop recommendations for an integrated U.S. Biosphere Reserve Program that would take into account the

many differences among U.S. biosphere reserves. The workshop, involving more than 80 participants, was held in Estes Park, Colorado, in December 1993. To help workshop participants evaluate the U.S. experience, the National Park Service amended its cooperative agreement with Partners in Parks to provide for preparation of a series of case studies as examples of efforts to implement biosphere reserve concepts. The case studies focus on U.S. biosphere reserves that are actively developing cooperative biosphere reserve programs. The case study areas represent many terrestrial and coastal/marine biogeographic regions illustrating a variety of resource issues; ecological, social, and economic conditions; and different types and patterns of ecosystem uses, management strategies, and land ownerships. Each case study includes a brief description of the natural and human environment of the biosphere reserve and the significant resource issues of regional concern; a history of the initial designation of the biosphere reserve and subsequent planning and implementation of the biosphere reserve concept; an overview of accomplishments; and an assessment of benefits, constraints, and the lessons learned.

The initial nine case studies are based on information from the files of the National Park Service and from interviews of biosphere reserve managers and stakeholders conducted in mid-1993 by Dr. Sarah H. Bishop, President of Partners in Parks. These nine case studies prepared by Dr. Bishop and myself, were distributed to participants in the national workshop of biosphere reserve managers. Following the workshop, U.S. MAB convened a small working group to consider recommendations from the workshop in preparing a "Strategic Plan for the U.S. Biosphere Reserve Program." The plan sets forth the mission and goals of the Program and recommends actions for implementation by the National Committee and its member agencies, the Biosphere Reserve Directorate of U.S. MAB, and the biosphere reserves. The U.S. MAB National Committee approved the plan in July 1994 and established a Biosphere Reserve Directorate to facilitate implementation of the U.S. Biosphere Reserve Program.

The new Biosphere Reserve Directorate recommended publication of the original nine case studies, and additional studies for the Virginia Coast Reserve by Barry Truitt and John W. Humke, The New Jersey Pinelands by Terrence D. Moore, and Land Between The Lakes by Tim Merriman. All twelve case studies were updated by the reserve managers in late 1994.

Dr. William Gregg
Chief
International Affairs Office
National Biological Service

PREFACE

The Biosphere Reserve Directorate of the U.S. Man and the Biosphere Program is building a foundation upon which to base our activities in the coming few years. Our directorate is committed to serving the biosphere reserves of the U.S. in their efforts to improve communications with their stakeholders, with each other, and with other biosphere reserves around the world. We look forward to expanded cooperation among local interest groups and managers to develop a strong program of interdisciplinary research, education, and communication. These case studies are a glimpse into several of the cooperative programs already in progress in the U.S. Biosphere Reserves.

Hubert H. Hinote
Chairman
Biosphere Reserve Directorate
U.S. Man and the Biosphere Program

ACKNOWLEDGEMENT

The U.S. MAB Secretariat wishes to express appreciation to the many people who helped to make this publication possible. First we must recognize the many public and private managers of the biosphere reserves and of the stakeholder organizations whose work has produced "Biosphere Reserves in Action." These managers, along with their many partners in regional biosphere reserves programs contributed valuable information, perspectives, and substantive text and comments to make this volume possible. It is these activists who have turned goals and objectives into practical biosphere reserves.

Dr. F. Eugene Hester, former National Park Service Associate Director for Natural Resources and currently the Deputy Director of the National Biological Service deserves special acknowledgment for his continuing interest and support of biosphere reserves and for his direction of the National Park Service funding to make this project possible. Dr. Sarah H. Bishop, President of Partners in the Parks, also deserves special thanks for her professionalism in preparing the nine original comprehensive case studies in time for the national biosphere reserves managers' workshop. It would also be impossible to produce a publication on biosphere reserves in the United States without the valuable involvement of Dr. William Gregg, former National Park Service MAB Coordinator and currently Chief of the International Affairs Office of the National Biological Service. A special thanks must be given to Bill.

Roger E. Soles
Executive Director
U.S Man and The Biosphere Program

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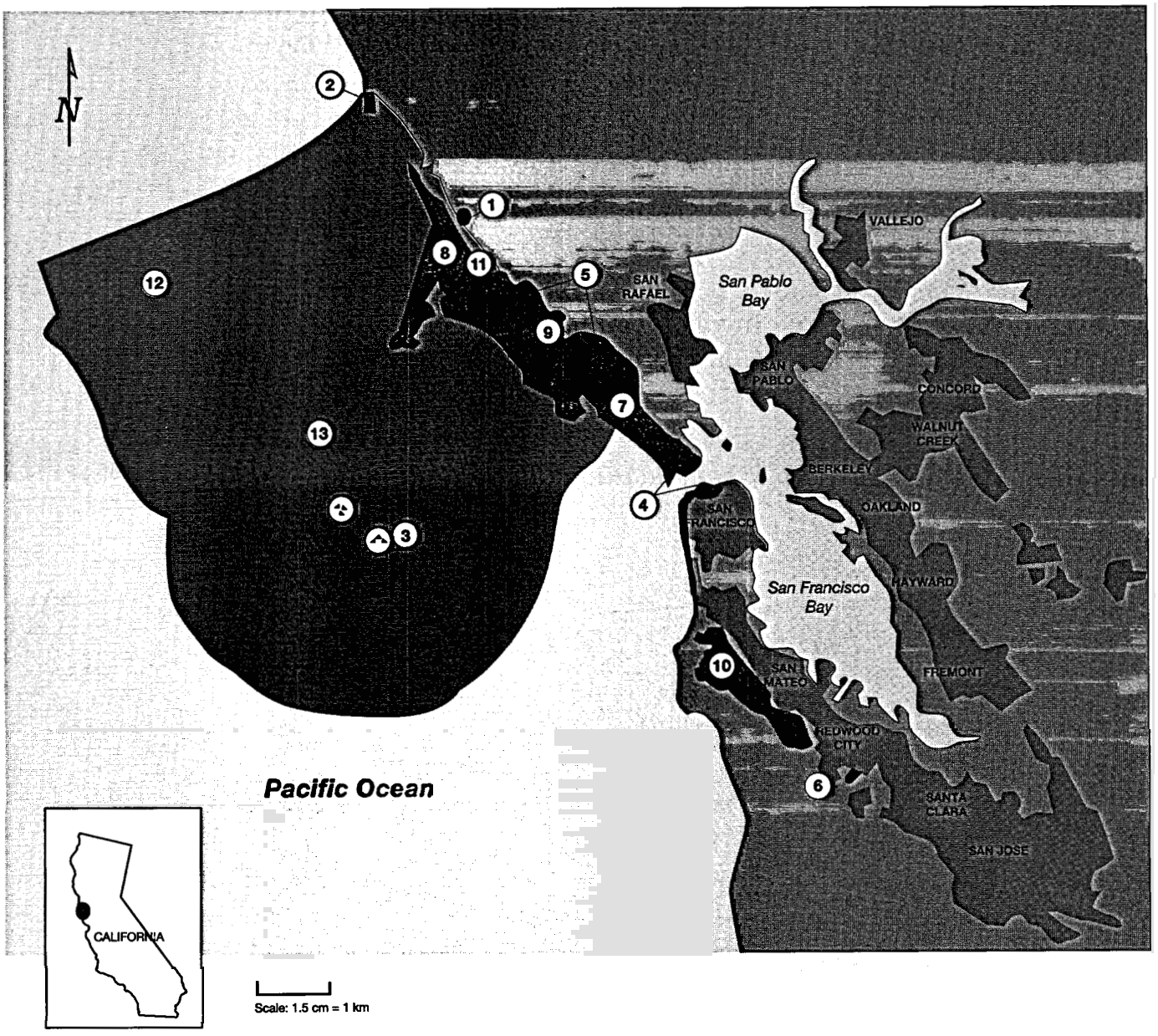

- Urban Areas
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Central California Coast Biosphere Reserve

The Central California Coast Biosphere Reserve (CCCBR) is a partnership of 13 units including federal, state, county, municipal, and private properties in four counties of the San Francisco Bay area. It is the first biosphere reserve to span marine, coastal, and upland resources all within close proximity to a large metropolitan area. The Board of the Association for the CCCBR organizes the participants through councils representing managerial, educational, and scientific groups. CCCBR members have involved more than 40 organizations concerned with outreach and training of urban youth for environmental professions.

I. Area Description

The 13 units of the Central California Coast Biosphere Reserve (CCCBR) include properties in Sonoma, Marin, San Francisco, and San Mateo Counties, California. The biosphere reserve (BR) includes a highly diverse complex of terrestrial, coastal, and marine ecosystems representing the Californian terrestrial and Californian-Temperate North Pacific coastal-marine biogeographic provinces. The terrestrial biome includes a large component of evergreen sclerophyllous woodland. The biosphere reserve includes the largest estuary in California.

The Pacific Coast of the U.S. is characterized by a steep slope from the coastline to deep water. A major upwelling of nutrient-rich marine waters along the California coast (one of only five eastern boundary current areas in the world) supports a great variety of marine life including 21 species of cetaceans. The Farallon Islands are host to the largest seabird and marine mammal colony in the continental U.S. The climate is Mediterranean, with mild dry summers, cool wet winters, and frequent coastal fog. Vegetation near the coast is a diverse mix of evergreen forests (primarily Douglas fir and coastal redwood including sequoia sempervirens), oak woodlands, and coastal grasslands. Inland, where it is warmer and drier, the landscape turns to chaparral and oak savanna.

The boundaries of Point Reyes National Seashore enclose a variety of terrain and vegetation with a rich biological and cultural diversity. Native land mammals number around 37 species along with another 12 species of marine mammals. In addition, over 430 species of avifauna have been recorded along this peninsula. That represents 45 percent of the species recorded in North America. Some 850 species of plants occur in this relatively small area of 71,000 acres. Historical sites abound on the peninsula. The Coast Miwok Indians have inhabited this area for nearly 5,000 years. Over 100 known village sites have been identified. In the early 1800's, the peninsula became a favorite landing place for the Spanish and several rancheros were established. The Spanish were followed by American ranching operations that continue to this day.

The cultural diversity of the greater San Francisco area parallels its biological diversity. American Indians lived in the area when the first Spanish colonists arrived in the early 1700's. Russians established fur trading outposts in the area in the late 1700's, followed by several waves of 19th century European immigration beginning with the Gold Rush (1850's). During the 20th century, San Francisco has been a major gateway for immigration to the United States of people representing the numerous racial, ethnic, and cultural groups of the Pacific Basin. The area includes large Chinese, Japanese, Filipino, Cambodian, Vietnamese, Thai, Korean, and Pacific Islander populations in addition to African Americans, Hispanics, and diverse peoples of European descent.

The San Francisco metropolitan area has a population of nine million people. The city is a focal point for Pacific Rim industry and trade and supports a large service industry. Tourism, some grazing and fisheries, transportation, manufacturing, military installations, and research and educational institutions are also important to the area economy.

II. Major Issues

The most significant issue facing the CCCBR is to develop among the agencies managing the protected areas a commitment to ecosystem management and cooperation in supporting the BR program. The challenge of preserving the biological diversity of the reserve is formidable, given the intense human pressure. Of particular concern is developing awareness among diverse urban communities of the conditions and trends of biological resources, what problems exist in the biosphere reserve, and how they can become partners in solving them.

III. Background

By the time the original 404,863 hectare CCCBR was designated by UNESCO in 1988, there was already a good understanding of biosphere reserve concepts and opportunities. Four additional management units subsequently requested nomination and were designated by UNESCO as units of the biosphere reserve, bringing the current number of designated units to 13 and doubling the area of the biosphere reserve to 857,103 hectares.

Formally established in 1991, the CCCBR Association works through councils which are forums for sharing information and for planning and coordinating the CCCBR program. The Management, Science, and Education Councils are established and actively involved in BR projects.

Appendix A provides a more detailed history of the CCCBR.

IV. Implementation

The current BR program consists of focused projects, primarily in the areas of research and education, that depend on partnerships with both public and private entities. These projects are demonstrating the role of local participation in BR activities that help support cooperative ecosystem management and sustainable development in an urban area where natural resource extraction and development are not controlling factors of the regional economy, as they are in most biosphere reserve areas.

The mission of the Science Council is to provide scientific advice for the conservation and sustainable use of the CCCBR based on periodic assessments of the status of biotic resources, ecosystem processes, abiotic inputs, and/or human influences within the biosphere reserve. The diversity of ecosystems and management authorities in the CCCBR has shaped the focus of the Science Council goals. It has proposed priorities for an integrated research program of basic and applied research that supports ecosystem management. The council has collected available information on existing data, research activities, and facilities, and is working with the Management Council to ensure that the proposed research meets management needs and to arrange financial and operational support for priority projects.

The biosphere reserve has a substantial record of scientific activity focusing on biological survey and collections, ecosystem process and restoration,

Designated Units of Central California Coast Biosphere Reserve

Federal

- Golden Gate National Recreation Area, National Park Service (NPS)
- Point Reyes National Seashore, NPS
- Gulf of the Farallones, National Marine Sanctuary (NMS), National Oceanic and Atmospheric Administration (NOAA)
- Farallon National Wildlife Sanctuary (NWR), U.S. Fish and Wildlife Service (USFWS)
- Cordell Bank NMS, NOAA

State

- Mt. Tamalpais State Park
- Samuel P. Taylor State Park
- Tomales Bay State Park
- Bodega Marine Reserve, University of California

County and City

- Marin Municipal Water District
- San Francisco Water District

Private

- Audubon Canyon Ranch
- Jasper Ridge Biological Preserve, Stanford University

marine/terrestrial interactions, rare/endangered species, traditional land-use systems, and wildlife population dynamics. Issues of particular concern in coastal/marine areas include pollution, the effects of sea level rise and erosion, habitat loss, sustaining the benefits of preservation of traditional marine and coastal uses, relationship of natural and human caused perturbations, and managing sustainable fisheries. The monitoring and research efforts in the BR units, which span as much as several decades, provide the foundation for the council's proposed program.

The Science Council's initial projects are well underway. The first is an assessment of the status of Geographical Information System (GIS) in the BR units. The second is a Symposium on Biodiversity of the Central California Coast, held March 13-15, 1995. The symposium brought together researchers, managers, and non-governmental organizations to assess status and trends in the region's biodiversity, identify resources at risk, and review management approaches for conserving and restoring biological diversity in the biosphere reserve.

Science and Education Projects

Project: Symposium on Biodiversity of the Central California Coast

Purpose: Convene scientists, managers, non-governmental organizations to consider biodiversity issues.

Sources of Support: Fred and Annette Gellert Foundation; Chevron Corporation; Pacific Gas and Electric; NOAA; University of California, Berkeley; The Gerbode Foundation

Topics:
- Cultural, economic, and ecological importance of biodiversity in CCCBR and threats to natural systems
- Status of biodiversity in CCCBR and human impacts on natural systems
- How scientists, government agencies, politicians, activists, and business people can collectively contribute to the management of the region's biodiversity

Project: Tidal Pool Monitoring and Public Education

Purpose: Provide data on tidal pool status and trends.

Partners: NOAA, Mt. Tamalpais State Park

Activities:
- Park permitted NOAA to set up tidal pool monitoring plots using permanent markers adjacent to their sanctuary and restricted public access to the monitoring area.
- NOAA provided research results to state.
- Park provided facilities for conferences.
- Park and NOAA provided signage and interpretive literature to public about project; partners hope to co-produce educational poster.

Project: Comparison of Coastal Ecosystem Recovery after Human Use Changes, between Two International Biosphere Reserves

Purpose: To understand the ecological processes and refine management recommendations at a global scale by comparing coastal biodiversity at two study sites located in biosphere reserves, Ile d' Ouessant, mer d' Iroise, France, and the Marin Headlands, Central California Coast, United States.

Partners: National Park Service, University Bretagne, Occidentale, National Biological Survey, Earthwatch

Activities:
- Extend the inventory and monitoring program to similar habitats.
- Examine the relationships of changing human use patterns to the distribution and abundance of plants and animals in moderate to heavily visited parks.
- Apply the latest GIS technology to hypothesis development and testing.
- Integrate technological capabilities with research and resource management problem-solving methods.
- Share study methods and learn new techniques.

The BR managers are beginning to look at the regional system as an integrated whole and are working toward an agreement on what the integrated research agenda should be. They are sharing information to develop a common set of understandings and approaches to managing similar resources. The Management Council is planning the regional GIS, talking about integrated watershed issues, and developing common approaches to exotic plant and animal control and erosion.

WORKSHOP ON LINKING COMMUNITY TO BIOSPHERE RESERVE

Purpose:	Involve educators in environmental education opportunities in the CCCBR
Source of Support:	San Francisco Foundation
Participants:	Teachers, professors, scientists, environmental managers, non-profit educational organizations
Objectives:	• Inventory environmental education programs. • Identify opportunities for cooperation. • Develop shared agendas where possible. • Provide connections between educational programs leading to opportunities in environmental careers. • Encourage scientists and teachers to develop additional environmental education programs. • Involve diverse cultural populations in environmental education. • Bring more diversity to regional environmental leadership.

Public education is a major program component. Education and outreach in the biosphere reserve focus on fostering the appreciation of local people and visitors for the region's natural and cultural diversity, how human activities influence these values, and the benefits of conservation and sustainable uses of the biosphere reserve. An important goal is to engage people from different cultural communities, who have not been involved in environmental issues, as partners in the BR program through the creative use of educational media, programs, and networks. The outreach program is concentrating initially on inner city schools and neighborhoods, a new arena for the BR participants. The Education Council is planning a workshop to introduce teachers to more than 40 organizations concerned with outreach and training of urban youth for environmental professions. A principal concern of the workshop is to expand the diversity of the environmental work force to reflect the population diversity of this multi-cultural area.

V. BENEFITS, CONSTRAINTS, OPPORTUNITIES

The CCCBR Association has opened avenues for the participating agencies and organizations to meet, discuss mutual interests, and plan cooperative programs. Biosphere reserve designation provides recognition and a catalyst for these collaborative activities and partnerships. It is providing a forum for the managers of the diverse BR units to consider environmental issues that some have never considered previously. The CCCBR Association has attracted more than $200,000 of mostly private funds to support programs that are creating a sense of regional ecological and cultural identity among its members.

Stakeholders benefit differently from participation in the CCCBR. Smaller agencies benefit from pooling their limited resources with the larger agencies to achieve shared objectives. Scientists have a forum in the Science Council for sharing information, developing projects and developing a collective voice on regional issues of concern. Providers of environmental education and outreach programs benefit from developing a network for sharing experience and reaching additional people in the metropolitan area.

Shared management concerns have been more difficult to identify than research or education issues, owing to the great diversity of BR participants. Although many of the CCCBR's federal, state, and private members have participated in cooperative projects of the type advanced by the biosphere reserve, county and local government agencies are less familiar with these kinds of activities and are approaching partnerships cautiously. The Management Council particularly depends on these

partnerships and will require more time to develop its program goals and projects. The uneven status of the councils and their programs temporarily limits opportunities for developing activities, such as a regional GIS, that require cooperation among the councils.

The CCCBR operates without a secretariat or administrative budget and depends on the leadership of the NPS and NOAA and strong volunteer support from the board members. As the other councils get organized, permanent staff will be required to aid and coordinate the activities of the participants on a broad range of issues and projects. CCCBR board members, foundations, and other groups supportive of the CCCBR have legitimately questioned the importance of the BR designation if it carries no programmatic support for BR operations. Most of the CCCBR's public funding comes from the discretionary contributions of the participating BR management units. Lack of a secure base of support through regional or national sources to cover each agency's fair share of CCCBR costs remains an important constraint to developing the BR program.

The CCCBR is improving communication among educators, managers, scientists, and administrators so that each group understands the needs of other sectors from a regional perspective. To promote cooperative action on a regional level in the biosphere reserve and its program, the CCCBR Association plans to become a registered non-profit organization to address complex issues of conservation and development.

VI. Observation

The CCCBR program is an ambitious and innovative approach to implementing the BR concept—a bold effort to bring together managers as well as resource people, scientists, and educators. The program, managed by the non-profit CCCBR Association, is organized into interest areas—science, management, education—because these functions provide a way to find common ground among the 13 units in the biosphere reserve, which are administered for different and sometimes conflicting purposes.

Some BR managers have yet to find ways for the BR program to assist them. For example, water district managers are concerned about water quality and delivery. Research, education, biodiversity conservation, and recreational activities have not been major concerns, yet the water districts provide potentially important areas for these activities. As the units are linked with other areas through their science and education programs, the real and apparent differences among them should diminish and management decisions that affect the entire region can be made.

The CCCBR program has been successful because of:

- The dedication of the board of the association
- A long and robust history of research
- The outstanding academic and scientific capabilities of participating universities
- The many institutions and organizations providing environmental education programs
- The availability of private sources of financial support
- A high degree of environmental awareness among several sectors of the community.

The CCCBR's greatest challenge is to increase agency commitment and support. There must be strong, national-level policy and program support to make the biosphere reserve fully functional. The private sector has provided substantial financial support to initiate CCCBR activities. To obtain and expand the community's continued support requires proportionate commitments from participating agencies. The experience of the CCCBR underscores the important role of U.S. MAB and its participating agencies in strengthening national support for cooperative BR programs.

Principal Contributors

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APPENDIX A: A BRIEF HISTORY OF THE CENTRAL CALIFORNIA COAST BIOSPHERE RESERVE

In 1985 the National Park Service at Golden Gate prepared and submitted the proposal to the U.S. MAB National Committee for the creation of a biosphere reserve at the Golden Gate. From 1985 to 1988, an interdisciplinary panel of scientists and managers, convened by U.S. MAB, reviewed the Californian biogeographical province for candidate biosphere reserves. The province includes most of central and southern California west of the Sierras. Serious discussion of a biosphere reserve among potential participants began in 1987. By the time the original 404,863 hectare CCCBR was designated by UNESCO in 1988, there was already a good understanding of BR concepts and opportunities. Civic pride motivated support for a dedication ceremony held in 1989 that drew considerable media attention and prompted additional management units to become participants in planning the BR program. Four subsequently requested nomination and were designated by UNESCO as units of the biosphere reserve, bringing the current number of designated units to 13 and doubling the area of the biosphere reserve to 857,103 hectares. Other units are under consideration for inclusion in CCCBR.

The designated core areas of the biosphere reserve, all in coastal and upland areas, are strictly protected under the legal authorities of various federal, state, and local agencies. Designated zones of managed use include marine areas supporting shipping and both recreational and commercial fishing, as well as terrestrial areas supporting pastoral grazing and public recreation. Very few people live in the zones of managed use, and human uses are regulated in accordance with the conservation and management goals of the administering agencies. Parts of these zones are undergoing intensive efforts to restore damaged ecosystems. A small multiple-use area—including public beaches with some experimental restoration zones and two islands with just a few residents—is designated as a zone of cooperation. The large upland and coastal-marine area of multiple uses surrounding the core and zone of managed use constitutes an undesignated open-ended zone of cooperation.

In 1990, BR stakeholders, with seed funds from U.S. MAB and a major grant from a local foundation, prepared a feasibility study for the biosphere reserve. The study sets forth operational goals and objectives, an organizational structure/framework, and a program development strategy for obtaining regional support for planning and implementing a BR program. The recommendations in the report reflected the results of surveys to determine the interests of many agencies, organizations, and other groups in, and their potential contributions to, the BR program. The report recommended an independent non-profit CCCBR Association to organize the many participating entities, establish the basis for collaboration through mutual interests, and select projects that best serve regional needs. The association, which was formally established in 1991, seeks to enlist the financial and technical assistance of program participants in research, educational, demonstration, and outreach activities in ways that fosters the shared ownership of the biosphere reserve and its projects. The association does not advocate policies and management practices, but provides a framework for making the best information and technology available to the participants.

The association is governed by a board of trustees, with representatives from important academic, political, conservation, and civic organizations of regional influence and from the CCCBR Councils. The board works with the councils to develop the general policy and funding for CCCBR activities. The councils are forums for sharing information and for planning and coordinating CCCBR activities. Each council is self-regulating in accordance with its own mission statement. Active councils, with broad agency and institutional representation, have been established for resource management (Management Council), monitoring and research (Science Council), and environmental education and professional training (Education Council). Additional councils—Economic Council and the Council of Associated Organizations—appear in the CCCBR organizational structure, but have not yet been organized.

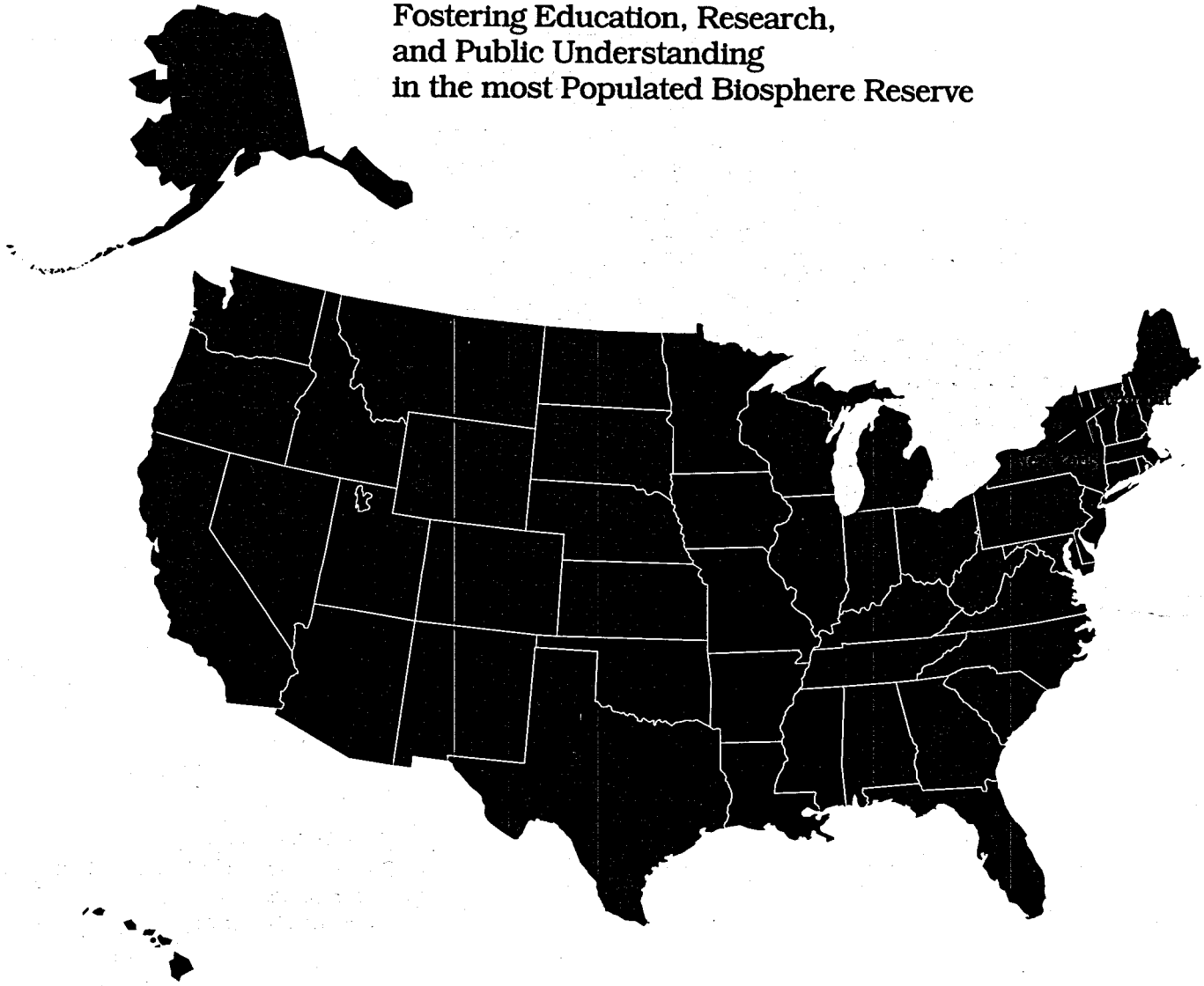
A Memorandum of Understanding (MOU) provides a framework for cooperation among federal, state, and local entities in establishing and operating the CCCBR. As of October 1993, the MOU was signed by representatives of all the units of the Central California Coast Biosphere Reserve.

OBJECTIVES OF MEMORANDUM OF UNDERSTANDING

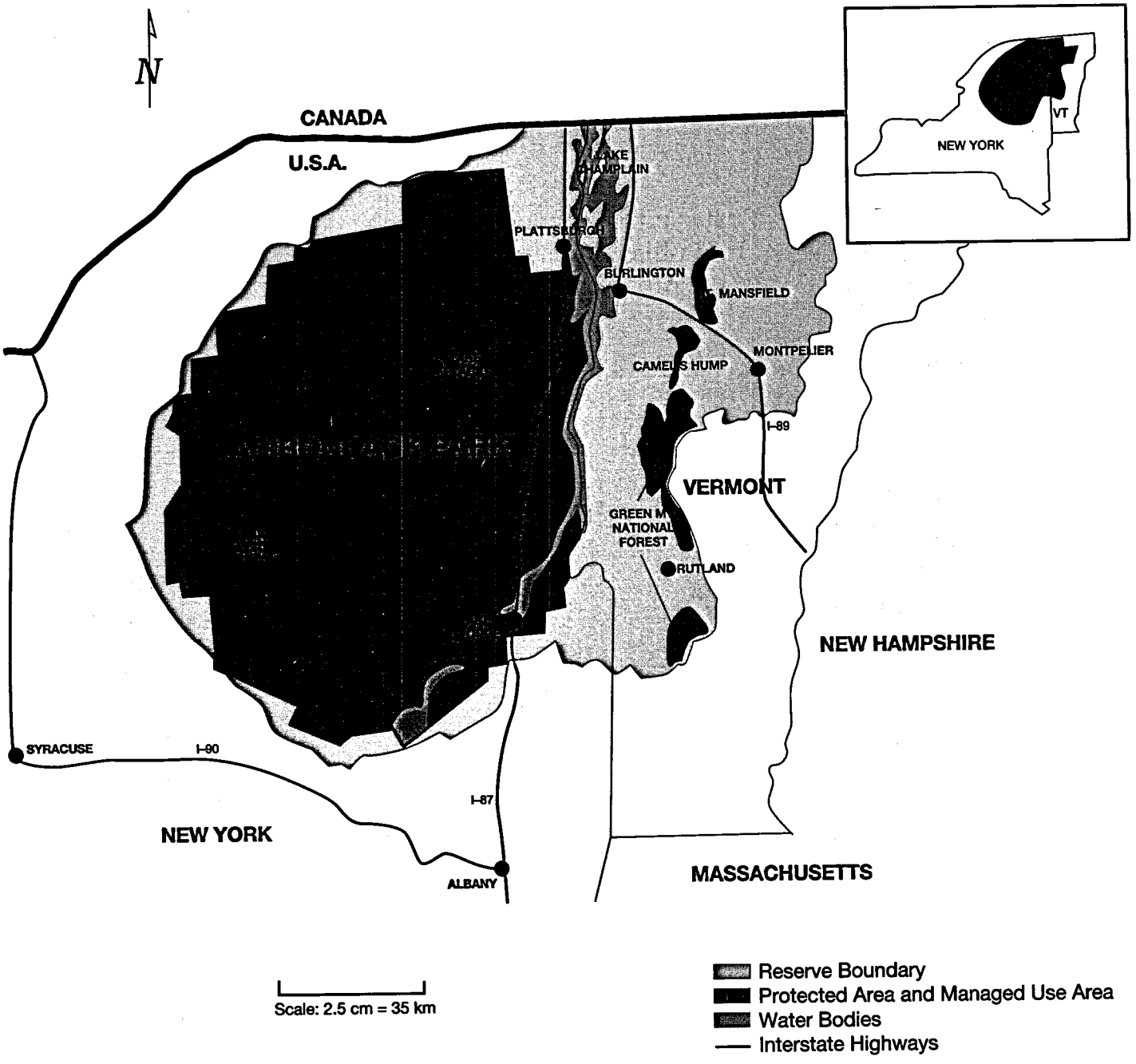
- Support ecologically sound management of natural and cultural resources.
- Identify principal environmental and economic development issues in the CCCBR.
- Develop and continue cooperative research and resource management initiatives.
- Promote environmental education programs and disseminate materials.
- Establish cooperative relationships with other public agencies in CCCBR.

CHAMPLAIN-ADIRONDACK BIOSPHERE RESERVE

Fostering Education, Research, and Public Understanding in the most Populated Biosphere Reserve



Champlain-Adirondack Biosphere Reserve



CHAMPLAIN-ADIRONDACK BIOSPHERE RESERVE

The Champlain-Adirondack Biosphere Reserve (CABR) is the largest and most populous biosphere reserve in the United States and the fourth largest in the world. The biosphere reserve boundary, which encompasses federal, state, local, and private lands, delineates a large area of managed use. The zone of cooperation includes the entire U.S. portion of Lake Champlain and its associated watershed. The biosphere reserve and its outlying areas are inhabited by over 400,000 people and are within a day's drive of 60 million people living in the U.S. and Canada. CABR is a large-scale, real-world example of how people live and interact with nature.

I. AREA DESCRIPTION

The Champlain-Adirondack Biosphere Reserve covers 3,990,000 hectares in 22 counties in north central New York and northwestern Vermont with a cooperative management arrangement developing across the Canadian border. Lake Champlain, the sixth largest lake in the United States, and the Adirondack and Green Mountains are the central features of the reserve. CABR includes extensive temperate coniferous and deciduous forests characteristic of the Lake Forest biogeographic province as well as large numbers of lakes, bogs, and freshwater wetlands. Precipitation is fairly evenly distributed throughout the year with maximum precipitation occurring in the summer months. The topography is hilly to mountainous, drained through geologic faults and with numerous glaciated lakes and ponds.

Forestry and tourism are the economic base in the Adirondack region and the New York side of Lake Champlain. The more diverse economy on the Vermont side of the lake is based on forestry, farming, tourism, light manufacturing, and production of specialty agricultural products.

II. MAJOR ISSUES

The primary issue facing the regional land managers is to build public interest and support for a biosphere reserve (BR) program that advocates a citizen/government partnership for resource conservation and development. The very large size and diversity of the BR favor a phased introduction of a BR program rather than a CABR-wide approach from the outset. As a first step, New York proposes to establish an independent, non-profit organization to represent the Adirondack portion of the BR. Vermont is organizing a local grass roots initiative rather than trying to inaugurate a formal BR program at this time.

The primary goal of the Champlain-Adirondack Biosphere Reserve is to establish a non-regulatory, non-advocacy program that uses education, research, and demonstration projects to encourage social and economic vitality and to preserve and improve the environmental health in the region. Other goals include:

- Find practical and environmentally sound solutions to problems of conflicting uses.
- Facilitate regional, interstate, and international cooperation in the areas of environmental education, scientific data exchange, and development of regional policies to address natural resource, social and economic development issues.
- Serve as a model of how a coordinated public/private effort at the regional scale can help protect biological diversity and promote sustained economic development.
- Build public awareness, understanding, and support of the relationship between preservation and protection of the unique, diverse, and special natural resources within the reserve and the sustained economic growth and vitality of this region.

III. Background

The core areas of the BR include New York's 2.4 million hectare Adirondack Park, 3,704 hectares in Vermont's Camel's Hump and Mount Mansfield State Natural Areas, and 7,462 hectares within the Green Mountain National Forest. The Adirondack Park includes the largest designated complex of wilderness areas in the eastern United States. Appendix A provides a brief history of CABR.

IV. Implementation

The Champlain-Adirondack region was designated a BR in 1989. The Steering Committee, represented by the land managers in the BR area, convened to prepare the BR nomination and consider alternative organizational structures. The initial proposal was to establish an independent, non-profit organization with two operational arms, one for the Champlain region and one for the Adirondacks. The organization was to be managed by private sector entities, with government agencies playing a support role. Preliminary plans were made to hold a conference to help set work priorities. Funding for the program was proposed to come from the fundraising activities of the non-profit organization. This proposal has not yet been fully implemented.

Proponents of a BR program are attempting to build public confidence through existing institutional frameworks, cooperative agreements, and programs in CABR. An ongoing public and private cooperative effort to deliver educational and interpretive programs in the region is manifest in a state funded Adirondack Park Visitor Interpretive Center Program. Operating from two facilities, it offers the public an opportunity to understand, enjoy, protect, and promote the park and to stimulate people to develop a sense of balance between use and protection of this special resource.

Cornell University, the Adirondack Park Agency, and the Rocky Mountain Institute are proposing a Rural Economic Renewal training project, which would complement a BR program. The objective of the demonstration project is to train community leaders to recognize opportunities to build community resources through sustainable development.

V. Benefits, Constraints, Opportunities

CABR designation helped persuade the U.S. Congress to pass the Lake Champlain Special Designation Act in 1990. The act established the Lake Champlain Basin Program, charged with developing a comprehensive pollution prevention, control, and restoration plan for the lake. The Basin Program has required a large resource commitment from the local population, eclipsing efforts to organize other activities leading to a BR program. The Basin Program has achieved many of the goals that CABR would have attempted. Its successes include bi-state cooperative regulatory review, establishment of uniform in-lake water quality standards, and coordination of an emergency response protocol. The program has also reached new levels of cooperation in regional research with the establishment of the Lake Champlain Research Consortium and has initiated an integrated education and training program for teachers throughout the basin. The Basin Program has received an average of $2.7 million in federal assistance a year for the last three years.

Another regional effort is also overshadowing CABR initiatives at this time. The Northern Forest Lands Project, begun in 1988 with U.S. Department of Agriculture funding, is an attempt by the states of New York, Vermont, New Hampshire, and Maine to identify risks to 26 million acres of productive forest land and to develop protection strategies to ensure continuity of this regional resource. These and other projects will be building blocks for the BR program.

One of the major hurdles BR proponents in each state have to overcome is lack of sufficient funding for a BR program. With other major regional programs well funded, the BR program will have little credibility unless it too is funded.

New York and Vermont have decided to organize separate BR programs. This decision is probably a wise one, as each state has different challenges to meet in developing public understanding and acceptance of a BR program. As the separate BR programs begin to emerge, planning for a comprehensive CABR program can be renewed.

VI. Observations

Political and cultural differences between the two states contribute to the difficulties in developing a single, comprehensive BR program. The Adirondack region has a history of conflict over the role of the state in regulating local land use in the park. These conflicts intensified, about the time the BR was nominated, when the state published a proposed vision statement for the future of the park. A small and outspoken group of Adirondack

residents is concerned about infringement of their property rights and believe the BR will increase government restrictions and regulations.

Initial planning of CABR involved primarily state and federal agencies and university scientists. The benefits of BR status have yet to be communicated effectively or demonstrated convincingly to the public. Some see it as a threat while others question the need for yet another "government program." Near-term progress in implementing BR concepts will require commitments by BR proponents to strengthen public education and participation in planning BR activities that meet local needs.

Principal Contributors

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Appendix A: A Brief History of the Champlain-Adirondack Biosphere Reserve

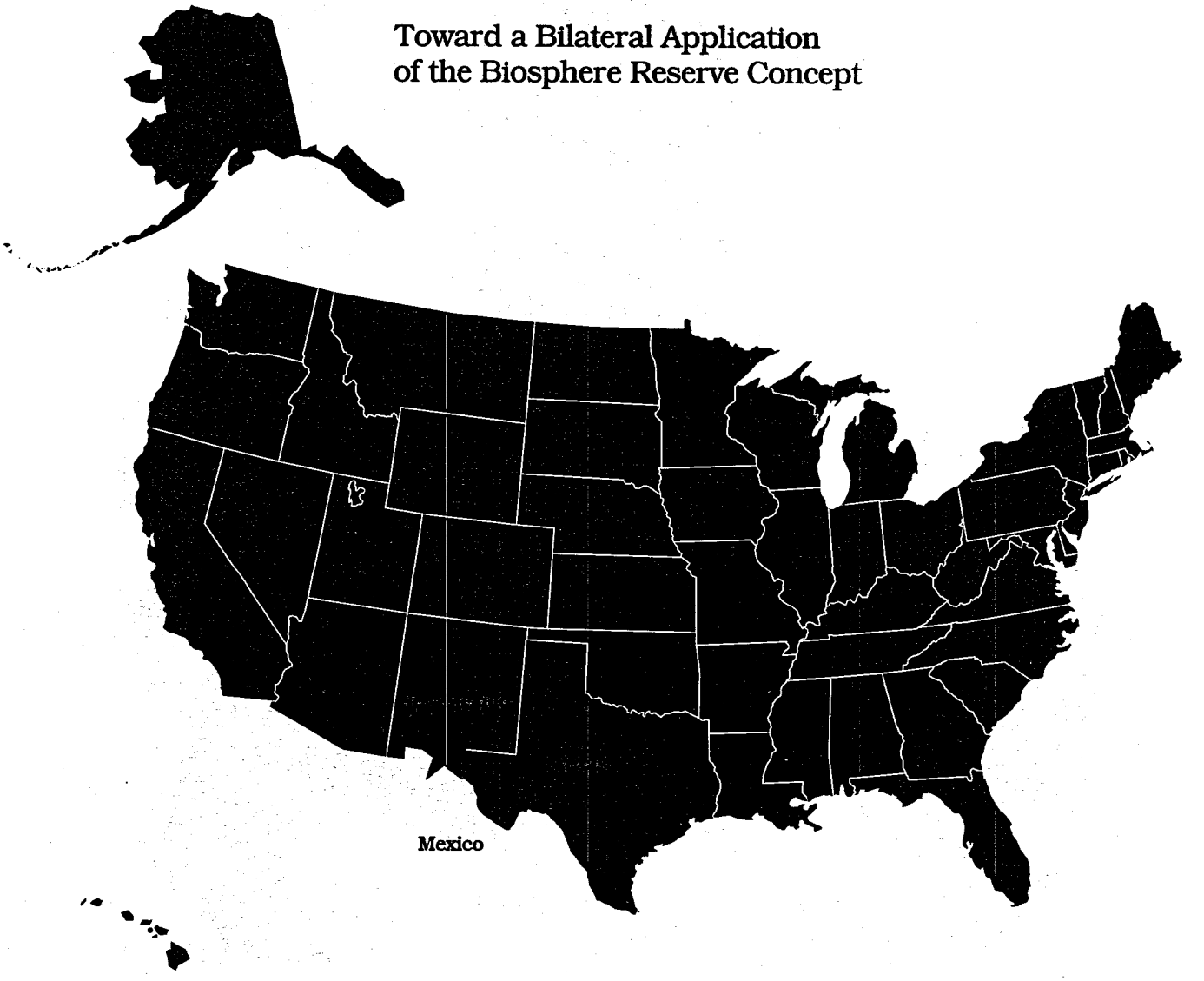
The Champlain-Adirondack area was recommended for consideration as a biosphere reserve in a U.S.-Canadian review to identify candidate biosphere reserves in the Lake Forest biogeographical province, which includes areas on both sides of the international boundary from Minnesota to the Canadian Maritime Provinces. To provide a forum for considering the recommendation, representatives of the managing agencies, universities, and non-governmental organizations formed a Steering Committee to consider BR sites, boundaries, and a process for developing a BR program. Nominations for sites in New York and Vermont were approved by the respective state governors. The land-use framework of the Adirondack Park, the existence of statewide land-use legislation in Vermont, and a remarkable history of bi-state and bi-national cooperation in the management of Lake Champlain were important considerations in the U.S. nominations of the BR, which was designated by UNESCO in 1989.

Following designation, the Steering Committee commissioned a study, with funds from U.S. MAB and other sources, to assess the feasibility of organizing a regional BR program. The preferred alternative was to establish a private, non-profit organization with two operational arms, one for the Champlain Basin, focusing on issues relevant to Lake Champlain, and the other for the Adirondack Mountains, focusing on the terrestrial resource and ecosystem management issues. The study recommended a regional conference to establish program priorities. The non-profit organization would raise funds for implementing the BR program.

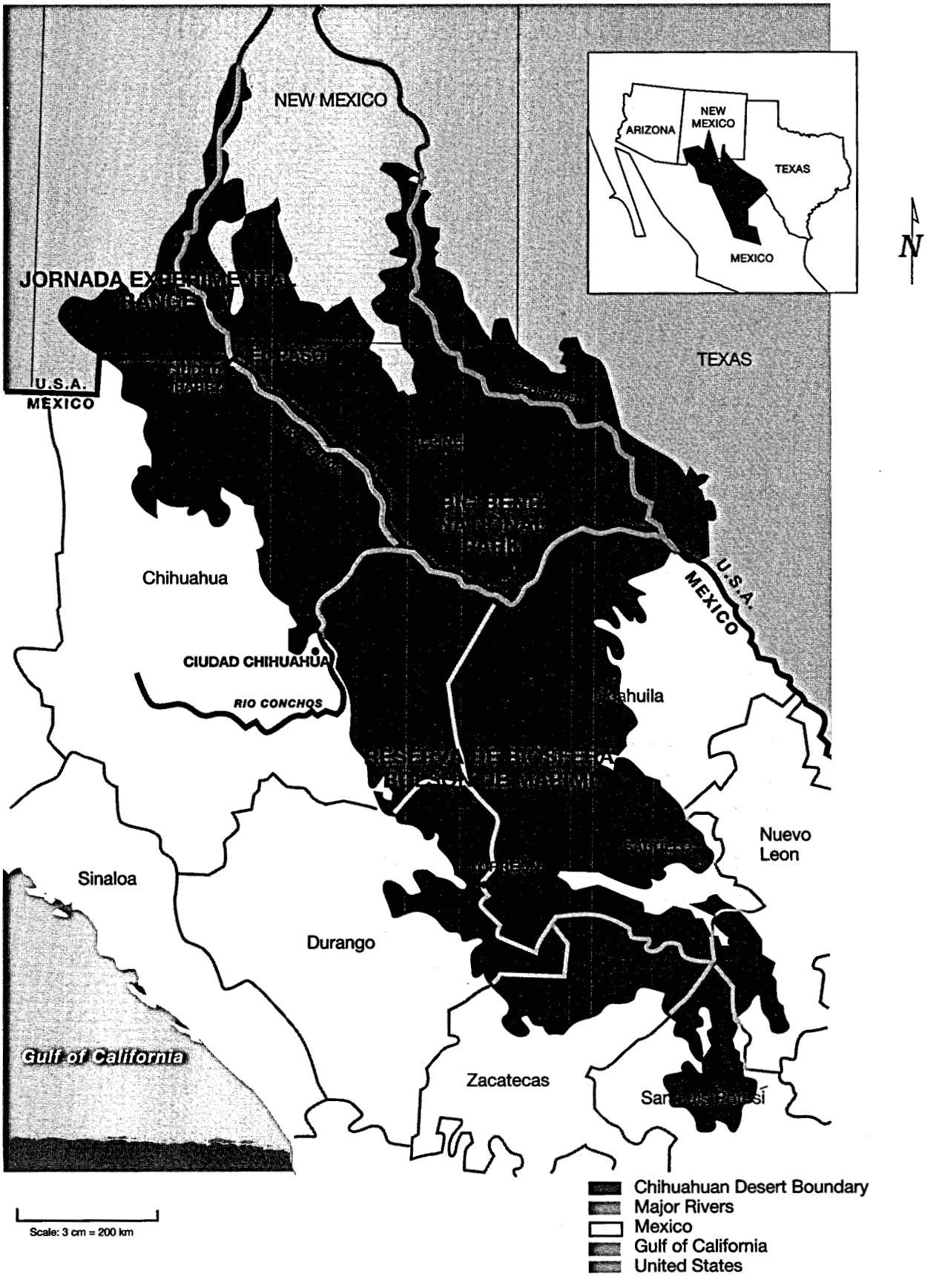
The Steering Committee experienced difficulty in agreeing on a structure for planning and implementing the BR program, in part due to the significant political and cultural differences between New York and Vermont. As an alternative to a single non-profit organization to represent the entire BR, BR proponents in New York are considering a New York incorporated non-profit BR cooperative. BR proponents in Vermont are promoting grassroots CABR initiatives among businesses, organizations, and schools to build support for establishing a BR cooperative.

CHIHUAHUAN DESERT BIOSPHERE RESERVES

Toward a Bilateral Application
of the Biosphere Reserve Concept



Chihuahuan Desert Biosphere Reserves



CHIHUAHUAN DESERT BIOSPHERE RESERVES

The Chihuahuan Desert biogeographical province contains a cluster of three biosphere reserves (BR). The 325,231 hectare Big Bend National Park (BIBE) in west Texas and the Agricultural Research Service's 78,226 hectare La Jornada Experimental Range (JER) in southern New Mexico were designated by UNESCO in 1976. The 103,000 hectare Mapimi Biosphere Reserve in the Mexican states of Chihuahua, Coahuila, and Durango, administered by Mexico's Institute of Ecology, was designated in 1977.

I. AREA DESCRIPTION

All three biosphere reserves are located in areas traditionally dominated by an agricultural (livestock raising) economy. La Jornada BR, while in a rural area, is becoming more and more influenced by the urban economies of Las Cruces, New Mexico and El Paso, Texas. A growing tourism industry is developing around Big Bend National Park. Mapimi BR at present remains primarily agricultural, but some influences from the cities of Torreon, Coahuila, and Gomez Palacio, Durango, are already apparent.

II. MAJOR ISSUES

The biosphere reserves face a variety of resource issues relating to sustainable development in desert ecosystems. All three face problems associated with grazing of livestock, air pollution, water quality, poaching of plants and animals, and loss of habitat. One of the major programs at BIBE is maintaining the park's remarkable biodiversity, exemplified by some 58 endangered, threatened, and listed species and the occurrence of over 430 species of birds. Mapimi is concerned about maintaining a population of, and habitat for, the Bolson tortoise, North America's largest living land reptile, and supporting sustainable use of the area's natural resources. Mapimi is involved in long-term monitoring and research as well. JER focuses on long-term experimental research directed toward range management and maintenance of healthy desert ecosystems.

III. BACKGROUND

BIBE and JER exemplify U.S. MAB's early approach of nominating a large securely protected conservation area, usually a national park, along with an outstanding field research area in the same biogeographical province. The conservation area provides baseline information from inventory and long-term monitoring against which the effects of human activities can be assessed. The field research area helps develop sustainable ecosystem use and management practices through manipulative research that could not be conducted in the conservation area. In nominating these biosphere reserves, U.S. MAB expected that cooperation would develop the knowledge and skills needed to manage the ecosystems of the Chihuahuan Desert for conservation and sustainable economic uses. However, the reserves are nearly 500 km apart and no inter-site cooperation occurred for roughly a decade after designation.

Prior to biosphere reserve designation, scientists from the Institute of Ecology started working with Mapimi residents to improve their cattle raising economy and diversify their means of subsistence. Their goal was to engage the people living on the land in its conservation, reduce their use of the endangered Bolson tortoise for food and to protect its habitat, and build a harmonious relationship between the people and the land. The resultant BR program involves local residents in germplasm conservation, incorporates regional socio-economic problems into the research and development work of the biosphere reserve, and employs a general research plan and land use activities for the entire

biosphere reserve. Involving local residents in research, environmental education, and demonstration of improved economic uses is called the "Mexican modality" for biosphere reserves, of which Mapimi is the prototype. Another equally important aspect of this is that a research institution is responsible for all these coordinated efforts.

During the 1981 dedication ceremony of BIBE as a biosphere reserve, the National Park Service opened an adobe building overlooking the Rio Grande as a BR research facility for the use of U.S. and Mexican scientists. The structure provides space for temporary lodging, small conferences, and processing and temporary storage of field samples. In conjunction with the dedication, the park joined with the local Mexican communities of Boquillas, San Vicente, and Santa Elena in a fiesta to celebrate the cultural and natural diversity of the Big Bend country through crafts, dance, music, art presentations, and a poster competition for local school children on BR themes. This celebration has been held annually and is an important BR activity.

IV. Implementation

Cooperation among the three Chihuahuan Desert biosphere reserves has developed in recent years. Research and environmental education projects characterize this cooperation, as do ongoing efforts to identify and include additional areas in Mexico and the U.S. into a Chihuahuan Desert Regional Biosphere Reserve.

The three Chihuahuan biosphere reserves are currently linked primarily through their research activities. JER, with its 80 years of range research, provides databases documenting natural and human induced changes in desert grassland and desert shrub landscape. BIBE has a 50 year record of research and hosts 80 to 100 research projects a year. During the last 17 years, scientists at Mapimi have studied ways to make the desert more productive and have engaged the local people in using and conserving its resources in ways that will sustain both the human and natural communities.

What distinguishes, and in some ways separates, the three biosphere reserves is their approach to implementing the BR concept. BIBE is largely a protected core area managed for conservation, public education, and resource-oriented recreation use; JER is an experimental landscape; Mapimi includes core, buffer, and transition zones and is managed cooperatively by scientists, policy makers, landowners, and ejidatarios. The Mapimi program more comprehensively integrates BR functions than the U.S. biosphere reserves.

V. Benefits, Constraints, Opportunities

Opportunities that could lead to the development of an expanded BR program in the Chihuahuan Desert ecoregion are becoming evident. The Texas Parks and Wildlife Department, the University of Texas at El Paso, the States of Chihuahua and Coahuila, and some private entities have expressed interest in participating in a larger BR program. Such an expanded BR program could provide the knowledge, skills, and perspectives needed to help administrators, land managers, and landowners on both sides of the international border in identifying programs for cooperative ecosystem management.

There are equally important opportunities for strengthening the partnership among the three existing Chihuahuan Desert biosphere reserves. Continued cooperation in research, environmental education, and demonstration programs can help support conservation and sustainable development in the vicinity of each biosphere reserve and in the entire Chihuahuan Desert biogeographical province. Building the infrastructure to support these linkages will be an evolutionary process, possibly a long and slow one. However, the collegial relationships being fostered within and among the three biosphere reserves are already contributing to this process.

In recent years, there has been increasing interest in the concept of developing a Chihuahuan Desert "ecoregion" BR program. The "greater ecosystem zone" might include the three existing biosphere reserves, along with lands managed by the Texas Parks and Wildlife Department (such as its 100,000 acre Black Gap Wildlife Management Area and approximately 300,000 acre Big Bend Ranch State Natural Area), the University of Texas' 38,000 acre Indio Mountain Research Station, and perhaps some private lands. In Mexico, the ecosystem zone might include lands in the Sierra del Carmen and Madera del Carmen mountain ranges, Casas Grandes Reserve, Rancho Sombreretillo, Cuatro Genegas, and possibly some ejido and private lands. A MAB/BR program is being discussed as a possible framework for cooperation among government agencies, nongovernmental organizations, and private land owners in developing the

shared understandings needed to establish realistic goals for cooperative management. During 1993-4 the Mexican government has supported a revision of priorities of the whole system of protected areas. Results of this action are expected to endorse recommendations for executive implementation conducive to effective protection in additional areas, such as those mentioned above. This would eventually mean the establishment of biological corridors on the Mexican side of the Chihuahuan Desert.

In 1989, BIBE convened a workshop to bring together managers and specialists from the three biosphere reserves to identify opportunities for cooperation. Several specific programs were discussed, among them were projects related to restoration of impacted desert grasslands, management of grazing impacts, and repatriation of the extirpated Bolson tortoise into BIBE from Mapimi. While none of the programs were brought to fruition, they served as the catalyst which brought together the staffs of the three biosphere reserves and opened communications among them.

The three biosphere reserves annually participate in a two-day symposium to discuss current research activities in the Chihuahuan Desert. BIBE is developing a newsletter about BR activities in the region and JER is developing an annual summary of current research updates from scientists involved in the three biosphere reserves. JER has also brought other agencies into its BR research program. The Environmental Protection Agency's Environmental Monitoring and Assessment Program and the National Science Foundation's Long-term Ecological Research Program have missions that complement activities in the three biosphere reserves.

Most recently, the three reserves have established the Chihuahuan Desert Biosphere Technical Group. This group was established to link all interested scientists, educators, and land managers for the purpose of enhancing multi-purpose land management through research and environmental education and to develop an information management system which will support resource use decisions in the Chihuahuan Desert. The group also hopes to gain international support for formalizing a Chihuahuan Desert Regional Biosphere Reserve, which will promote cooperation of all parties in protecting its biodiversity and supporting sustainable use of its natural resources.

PRINCIPAL CONTRIBUTORS

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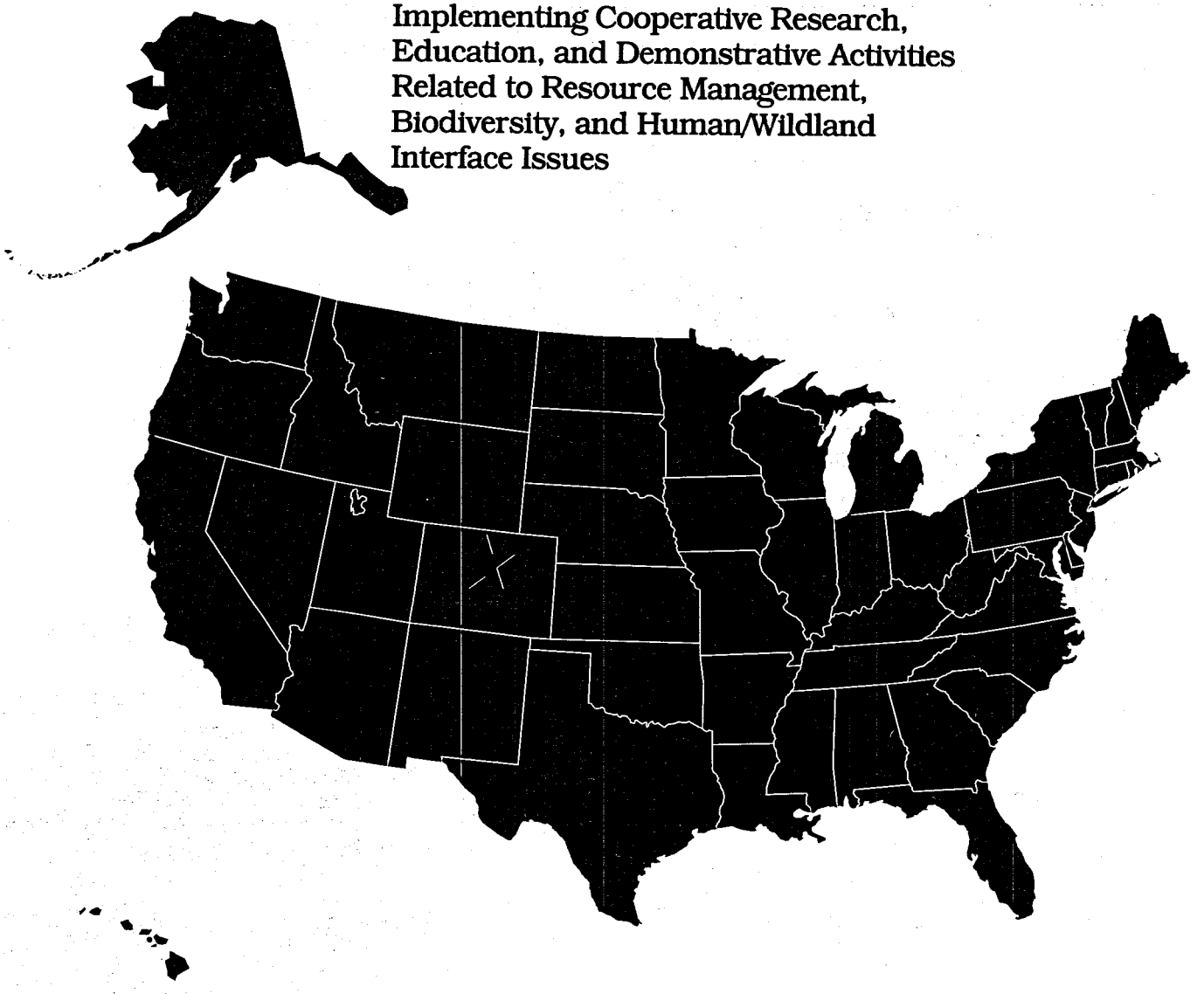
Jose A. Cisneros, Superintendent, Big Bend National Park

W. Philip Koepp, Chief, Science and Resources Management, Big Bend National Park

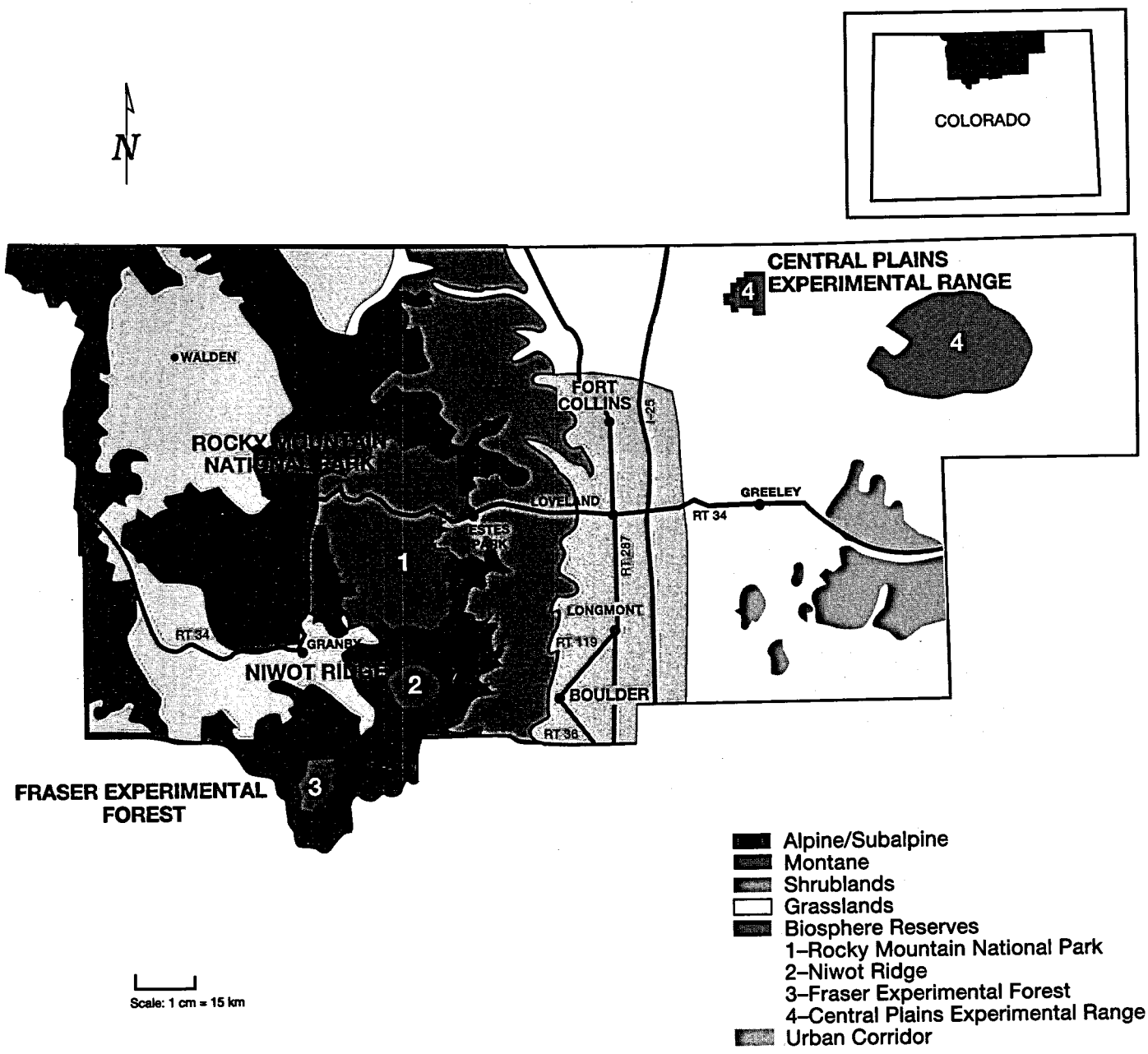
Kris Havstad, Site Manager, La Jornada Experimental Range

THE COLORADO ROCKIES REGIONAL COOPERATIVE

Implementing Cooperative Research, Education, and Demonstrative Activities Related to Resource Management, Biodiversity, and Human/Wildland Interface Issues



Colorado Rockies Regional Cooperative



THE COLORADO ROCKIES REGIONAL COOPERATIVE

The Colorado Rockies Regional Cooperative (CORRC) promotes research and application, plus education and demonstration activities related to biodiversity, resource management, and human/wildland interface issues in north central Colorado. CORRC is a grassroots effort involving 14 partners representing all levels of government and one private entity. Within the region are four biosphere reserves which individually have significant research and educational programs that appear to have been little influenced by biosphere reserve (BR) status. CORRC is an outgrowth of the need for cooperation on issues that transcend geopolitical boundaries and require unprecedented pooling of data, technical expertise, and financial resources.

I. AREA DESCRIPTION

The Colorado Rockies Regional Cooperative (CORRC) covers five counties in north central Colorado (Boulder, Grand, Jackson, Larimer, and Weld). The area includes parts of the Rocky Mountain high country, front ranges, and the high plains with a wide variety of protected natural sites, field research facilities, multiple use areas, agricultural lands, rangelands, and both rural and urban communities.

The area presently has four designated biosphere reserves (BR). The 106,710 hectare Rocky Mountain National Park BR (RMNP) is administered for nature conservation, environmental education, and resource-oriented public recreation. The 9,328 hectare Fraser Experimental Forest BR (FEF) is administered for experimental studies on the structure, function, and management of coniferous forests. The 1,200 hectare Niwot Ridge BR (NR) is administered cooperatively by the U.S. Forest Service and the University of Colorado for experimental and long-term studies of alpine tundra. In the UNESCO classification, these three biosphere reserves are classified as mixed mountain systems with complex zonation in the Rocky Mountain biogeographic province. Together, the biosphere reserves include outstanding examples of the region's alpine, subalpine, and montane coniferous forests and lower elevation woodlands, and their characteristic plants and animals.

The 6,210 hectare Central Plains Experimental Range BR (CPER), administered by the U.S. Department of Agriculture-Agricultural Research Service, completes the area's BR cluster. The area is classified as temperate grassland in the Grassland biogeographic province.

The area is undergoing rapid and in some places dramatic landscape changes associated with recreational development in the mountains, urbanization of the Boulder-Fort Collins corridor, and increasing changes to agricultural lands in the eastern plains. Projected population increases by the year 2010 range from negligible in Jackson County to nearly 33 percent in Larimer County.

II. MAJOR ISSUES

Through a scoping process, CORRC's participants have identified biodiversity, resource management, and the human-wildland interface as the broad categories of issues on which CORRC will focus. Financial support for the cooperative was established in the fall of 1994 to ensure the viability of the regional program and engage the participation of the four biosphere reserves in the program.

III. BACKGROUND

Rocky Mountain National Park and Fraser Experimental Forest were among the initial group of biosphere reserves designated in the U.S. in 1976; Niwot Ridge was designated a few years later in 1979. Niwot is also a unit of the National Science Foundation's network of Long-Term Ecological Research Sites. In recent years, RMNP has made important contributions to regional studies on

atmospheric pollution, acidic deposition, and climate change. In nominating the three ecologically and functionally complementary biosphere reserves in the Colorado Rockies, U.S. MAB hoped to provide a framework for cooperation in implementing BR concepts. The fourth biosphere reserve, the Central Plains Experimental Range—a former International Biological Program site—has a long history of research on shortgrass prairie ecosystems and the effects of range management practices. Although each biosphere reserve has an outstanding record of ecological research, substantial cooperation among the biosphere reserves has not occurred.

The idea for a regional cooperative was initiated in October 1989. Participants in a series of meetings included the City and County of Boulder, the University of Colorado, Colorado State University (CSU), the National Center for Atmospheric Research, the U.S. Geological Survey (USGS), the National Park Service, the U.S. Forest Service, and the Colorado Division of Wildlife. Early discussion centered around the status of nationally designated biosphere reserves in the region and their role in fostering cooperative research. This led to the idea of a regional biosphere cooperative affiliated with the U.S. Man and the Biosphere (MAB) program.

In 1990-91, the participants formed a steering committee, which developed and approved a vision statement for a regional cooperative. The purpose of the new organization would be to "promote knowledge and understanding of the natural and human resources of this region; to encourage wise use of these resources through research, data base development and integration, education, and the demonstration of principles of ecosystem management..." The cooperative would be administered to "create and develop means of cooperation among organizations involved in research, education, and resource management. These organizations include federal, state, county and city agencies; educational institutions; and private organizations." The vision statement called for establishment of a formal organizational structure composed of representatives from cooperating partners.

Concurrent with approval of the vision statement, the steering committee initiated a project to determine whether cooperation on sharing of information could be effective. A demonstration project was designed to share basic resource information on wildlife habitat and migrations, wildfire management, and other issues affecting biodiversity in an area bordering the east side of Rocky Mountain National Park.

In early 1991, the steering committee submitted a proposal to U.S. MAB requesting funds for a study to identify regional issues and ways to strengthen regional cooperation, including the role of MAB and the biosphere reserves as a potential framework. MAB decided not to fund planning projects until a national BR Action Plan was completed. The steering committee subsequently decided to proceed with its own cooperative effort, with funding from several of the participating agencies.

In late 1991, the steering committee held a regional workshop to identify current and near-term priority issues and the role of a regional cooperative. The more than 40 participants, representing a broad range of regional agencies and interests, affirmed the value of a regional cooperative in promoting research and information-sharing activities, encouraged formalization of the CORRC partnership, and recommended proceeding with a feasibility study to guide implementation of CORRC's regional program. The steering committee formalized the zonation of the region (core, management, and cooperation zones) to stratify issues on a geographical basis.

In 1992, 14 entities signed a Memorandum of Understanding (MOU) on CORRC through which they agreed to cooperate in developing and sharing information relating to priority regional issues of biodiversity, resource management, and the human/wildland interface. Only one of the biosphere reserves, Rocky Mountain National Park, signed the MOU and continues to participate with CORRC. The other three biosphere reserves have expressed interest in CORRC but have neither the staff nor the funds to contribute to it. The signatories agreed that CORRC's cooperative activities would not infringe on any partner's legal, managerial, research, or educational authorities. CORRC would have no authority to engage in resource management, land-use planning, or designation activities on behalf of itself or any partner.

In 1993, a feasibility study, funded by several CORRC participants, assessed CORRC capability and requirements for achieving the goals and objectives of a regional cooperative. The study followed interim U.S. MAB guidelines in order to aid future CORRC affiliation with MAB. The product from this study was a publication: "Guidelines to Establish the Colorado Rockies Regional Cooperative."

IV. Implementation

The Colorado Rockies Regional Cooperative is a voluntary organization of federal, state, and local agencies; private organizations; and universities working to address regional issues affecting ecosystems and biodiversity. These issues provide the context for scientific, educational, and demonstration projects to help address complex and often interacting problems, such as habitat fragmentation due to urbanization and land conversions, air pollution, increased demand for limited water resources, the environmental effects of agricultural and range management practices, the need to integrate environmental and biodiversity factors more fully in local and regional planning, and the changing relationships between human communities and the environment.

As of the fall of 1994, CORRC is a formal grassroots cooperative consistent with the draft bylaws. These draft bylaws are presently being reviewed by participating agencies prior to seeking 501C3 status. CORRC is administered by a board of directors comprised of agency partners who make financial or in-kind contributions toward CORRC program administration. The Board elects its own officers who serve staggered terms. A partnership coordinator, responsible to the board for facilitating and administering the cooperative program, is CORRC's only employee. Program committees for Education and Outreach, Research and Management, and Program and Finance will be responsible for planning, implementing, and obtaining support for CORRC activities.

The CORRC Board of Directors is implementing the feasibility study recommendations on program deliverables and administrative guidelines. Program deliverables are related to the priority regional issues identified through the CORRC scoping process and involve data gathering and sharing (including development of geographic information systems), joint research and management demonstration projects, outreach activities, and linkages with existing or emerging programs that have similar or related purposes.

Agency Participants Per CORRC Memorandum of Understanding

- Colorado State University, College of Natural Resources
- City of Boulder
- State of Colorado, Division of Wildlife
- The Nature Conservancy
- National Park Service, Rocky Mountain National Park
- USDA-Forest Service, Arapaho/Roosevelt National Forest
- University of Colorado
- National Biological Service
- City of Fort Collins
- Boulder County
- Larimer County
- Colorado State Forest Service
- U.S. Geological Survey, Rocky Mountain Mapping Center
- USDA-Forest Service, Rocky Mountain Forest and Range Experiment Station
- U.S. Fish and Wildlife Service, National Ecology Research Center

Deliverable Products Planned by CORRC Steering Committee 1994

Program Item: Geological Information System (GIS) Data Coop

Activity:
- Extend project agreement to 12/31/98.
- Colorado State U. to be data repository for access and use by CORRC.
- Select project leader(s).
- Develop short- and long-range products, support needs.

Cooperators: U.S. Forest Service, Colorado State U., Boulder County, City of Boulder, Larimer County, Rocky Mountain NP, U.S. Geological Survey, Colorado Division of Wildlife

Time Line: ongoing to 1998

Program Item: Coop Research

Activity: Core Zone—Habitat mapping for lynx and wolverine.

Cooperators: Colorado Division of Wildlife, U.S. Fish and Wildlife Service, Colorado State U., Rocky Mountain NP, U.S. Forest Service

Time Line: project on hold

Program Item: Coop Research

Activity: Management Zone—Natural variability of forest ecosystems.

Cooperators: Colorado Division of Wildlife, U.S. Fish and Wildlife Service, Colorado Forest Service, Colorado State U., Rocky Mountain NP, U.S. Forest Service

Time Line: funded 1994-96

Program Item: Coop Research

Activity: Cooperation Zone—Biodiversity of open space grasslands at suburban/agricultural interface.

Cooperators: U. of Colorado, City of Boulder, U.S. Fish and Wildlife Service, Colorado Division of Wildlife

Time Line: ongoing to 1997

Program Item: Coop Research

Activity: All Zones—Overview paper on biodiversity issues.

Cooperators: all CORRC participants

Time Line: ongoing to 1995

Program Item: Education and Outreach

Activity:
- Sponsor data sharing workshops.—in planning stage
- Produce research reports. —upon completion of projects
- Produce CORRC brochure and quarterly newsletter

Cooperators: all CORRC participants

Program Item: Affiliate with Other Programs

Activity: Seek formal "ties" with Terrestrial Ecosystems Regional Research and Analysis (TERRA) Colorado State U's Human Dimensions Lab, MAB Biosphere Reserves, NPS's Water Resources Division. Cooperative Park Service Research Unit (CPSU), Wildfire Subcommittee of the Colorado Natural Hazards Council.

Time Line: ongoing through 1995

V. Observations

CORRC reflects the circumstances present in north central Colorado—the need to address several priority regional resource issues by pooling the informational, technical, and financial resources of many agencies and organizations; the demands of public stakeholders for active participation; and the need for projects that demonstrate effective cooperation in generating and sharing information. The need for the regional cooperative has gained acceptance, resulting in agency funding for partnership activities.

CORRC partners are working together to accomplish more in data sharing, research and conservation than they could working as individuals. They have recognized the need to solve problems at the regional scale, rather than at isolated spots.

Although future MAB affiliation is a high priority with CORRC members, they have clearly decided that dealing with regional issues is their first priority. It is anticipated the four biosphere reserves in the area may participate in identifying new partnership activities. Rocky Mountain National Park BR is a valuable member of the data cooperative and is contributing funds and services to the project. Most of the cooperation with Rocky Mountain National Park, as well as with other CORRC participants, at this time is key information/data sharing to enhance research and management activities associated with biodiversity, ecosystem management, and the human-wildland interface. CORRC is at a new and significant plateau in its development. It will need continued successes to attract financial support as well as the participation of the biosphere reserves. CORRC partners are working to clarify how program management can effectively proceed. CORRC is carrying out the BR concept on a regional level that will be further enhanced with the involvement of the biosphere reserves. As CORRC continues to achieve success, it will be a very valuable model.

Principal Contributors

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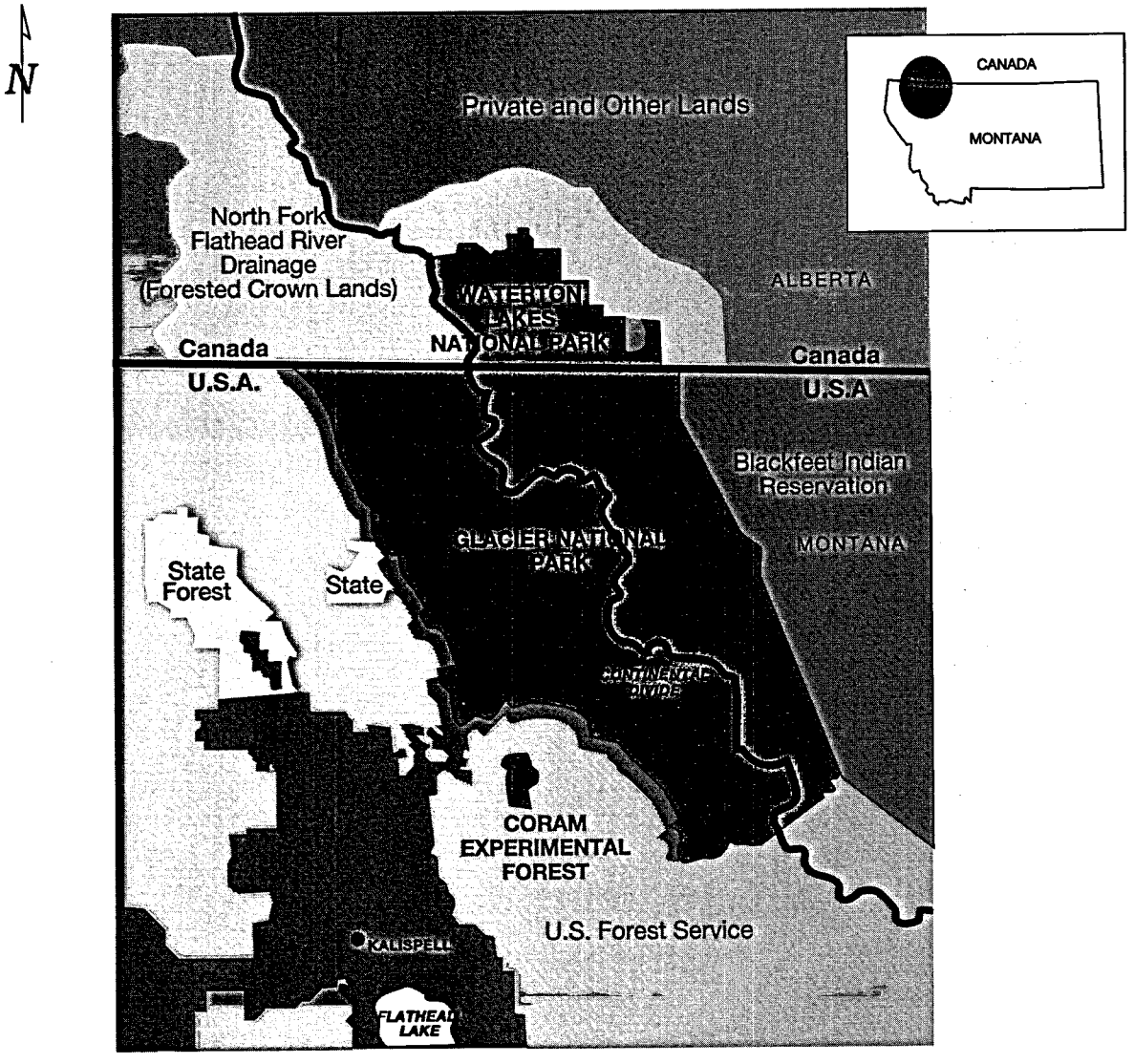
Crown of the Continent Biosphere Reserves

Linking Complementary
Biosphere Reserve Programs
to meet New Challenges

Crown of The Continent Biosphere Reserves



Crown of the Continent Biosphere Reserves

Three biosphere reserves (BR) in the transborder region along the Continental Divide, often referred to as the Crown of the Continent, are the 410,202 hectare Glacier National Park and the 3,010 hectare Coram Experimental Forest in northwestern Montana and the 52,597 hectare Waterton Lakes National Park in Alberta, Canada.

I. Area Description

According to UNESCO classification, the reserves are categorized as mixed mountain systems with complex zonation in the Rocky Mountains biogeographic province. Glacier, which lies on both sides of the continental divide, has an exceptional variety of terrestrial and aquatic habitats across large elevational gradients of temperature and precipitation. Alpine communities, subalpine and montane coniferous forests, and temperate rainforests (west slope); diverse land and stream communities; and grassland and woodland communities (east slope) are all well represented. Coram, which is managed by the U.S. Forest Service, is west of the continental divide and shares the montane conditions of Glacier. Waterton Lakes, which is managed by Parks Canada, is east of the continental divide and has a similar landscape to the east slope of Glacier. The region supports substantial populations of ungulates and several threatened or endangered large mammals including the grizzly bear and grey wolf.

II. Major Issues

The central issue facing the biosphere reserves managers is to engage a changing and rapidly growing population in understanding and supporting ecosystem uses that are compatible with sustaining the remarkable biological diversity in these watersheds.

III. Background

In 1932, Glacier and Waterton Lakes National Parks were recognized by the U.S. and Canadian governments as an International Peace Park to commemorate permanently the long-existing relationship of peace and goodwill existing between the people and governments of the U.S. and Canada. The concept of the International Peace Park has grown and expanded to include greater cooperation between the parks in adopting similar management practices and the recognition that ecosystems must be monitored and managed in a manner which is not dictated by political boundaries.

Prior to BR designation, Glacier and Waterton already had a long history of informal cooperation on research, resource management, and public educational activities.

The two U.S. sites were designated by UNESCO in 1976. Dedication of both sites occurred August 8, 1980, in ceremonies marking both the 70th anniversary of the National Park Service and the 75th anniversary of the U.S. Forest Service. Since then there has been close cooperation between both groups. The U.S. cluster paired a large protected natural area (Glacier) for ecosystem conservation, public education, and baseline monitoring with a field research site (Coram) which has nearly 50 years of manipulative research to understand the effects of alternative forest management practices, with particular emphasis on western larch (Larix occidentalis) ecosystems composed of larch and seven other conifer species. Waterton, designated in 1979 as Canada's second biosphere reserve, adjoins Glacier and is managed for similar conservation and public use objectives. The economy of the surrounding region, traditionally based on ranching and mineral and timber production, is changing rapidly as recreation and tourism have attracted increasing commercial development. Outstanding year-round natural amenities have made the region especially attractive for second home and retirement communities.

IV. IMPLEMENTATION

Prior to BR designation, the parks already had a long history of informal cooperation on research, resource management, and public educational activities, which BR status in recent years has helped to strengthen. For example, the annual superintendent's hike, which began in 1985, brings together park managers and other local leaders to spend three days of informal interaction in a wilderness setting to discuss the challenge of protecting these biosphere reserves.

In 1983, Waterton established a BR Management Committee. Chaired by local ranchers, it serves as a forum for identifying and addressing resource issues of mutual concern. Glacier staff serve on a technical committee which assists with research and monitoring.

Waterton's BR Management Committee headed by local ranchers interacted with private and public organizations and proved a successful vehicle for the park to look beyond its boundaries for the purposes of ecosystem management through research and monitoring programs as well as education initiatives. In one project, the Management Committee pioneered land-use and grazing practices that reduced the impact of elk on cattle ranching while preserving migration corridors for the elk herd. Unfortunately, as public funds to support the BR program dwindled, the Management Committee was able to support fewer and smaller projects. It has less visibility now and therefore a diminished capacity for building a constituency for the Waterton BR. In the past the Waterton BR Committee has been reluctant to join the Flathead Basin Commission or the Crown of the Continent Society, which are both involved with larger ecosystems, for fear it will lose its identity and for fear the concerns of its biosphere reserve will be overshadowed by larger issues.

The BR programs at Coram and Waterton Lakes have offered some immediate and tangible benefits to local residents and businesses. Glacier's BR program has been more focused on protecting the large regional ecosystem of which it is a part.

In the 1970's and 1980's, an open-pit coal mine was proposed on tributary streams to the North Fork of the Flathead River in British Columbia within eight miles of the Glacier and Waterton Biosphere Reserves. The North Fork forms the western boundary of Glacier. Widespread concern over potential degradation of water quality, fisheries, and other parameters led to a citizen-driven environment/economy study of the entire Flathead Basin and to a recommendation that the Flathead Basin Commission, a water quality advisory body, be formed. BR managers, the Flathead Basin Commission, and many others were ultimately successful in prevailing upon the federal governments in Canada and the U.S. to have the International Joint Commission (IJC) assess trans-boundary water and fishery impacts of the proposed coal mine.

In 1988, the IJC recommended that the coal mine not be constructed at that time and that the U.S. and Canada jointly develop management strategies for "compatible, equitable, and sustainable activities" in the drainage. The BR designations for Waterton and Glacier were an important factor in the IJC's decision. In 1991 and 1992, the Flathead Basin Commission developed consensus on a public/private sector strategic management plan for the U.S. portion of the drainage. During 1993, BR managers and scientists at both Glacier and Waterton participated in efforts to expand the strategic planning process into the Canadian portion of the North Fork drainage.

In 1983, the U.S. National Park Service and Parks Canada sponsored a symposium to explore relationships between parks and adjacent lands. The symposium was attended by representatives of all government levels, industry, conservation groups, universities, and local ranchers. For many participants, the symposium was their first introduction to the BR concept. At Waterton, the symposium was immediately followed by discussions between the park and local ranchers, which quickly led to the establishment of a BR Management Committee. Chaired by local ranchers, it serves as a forum for identifying and addressing resource issues of mutual concern, such as bear and ungulate management, ranching, and land development. Shortly after its establishment, the BR Management Committee invited representatives from Glacier and agencies administering adjacent lands in the U.S. and Canada to serve on a technical committee to help the Management Committee obtain and apply scientific information and technology to address identified problems. Through its projects, the Technical Committee also provides training and education, including field days for local people to become familiar with ongoing research activities. Research has helped local ranchers locate and control infestations of knapweed on rangelands, developed effective brush management techniques, and promoted development of a management plan to

minimize interactions between elk populations and domestic livestock, while preserving migration corridors for the elk herd. The BR program has expanded opportunities for specialists and local people to share their knowledge and experience with counterparts from other countries (e.g., one of the Management Committee co-chairs attended the first BR Congress, held in Russia).

Waterton Lakes BR is presently monitoring the effects of different levels of grazing on native vegetation as well as developing an action plan to become more involved in education and outreach programs in the local communities. BR managers are holding forums on sensitive environmental issues and undertaking a highway sign and exhibit program interpreting several of the unique features and land-use practices in the region.

V. Benefits, Constraints, Opportunities

When Glacier initiated its BR program and adopted an ecosystem management strategy, it embarked on a course of community involvement that has grown to cover a sizeable region. Glacier's past superintendent is the immediate past chair of the Flathead Basin Commission that acts in an advisory capacity to all public and private entities concerning management and development proposals that can affect water quality. With the quiet encouragement of the park, the communities in the area have begun a comprehensive planning process for the entire Flathead Basin that considers biodiversity and environmental factors in development decisions. The park has not promoted these activities as part of the BR program as the public equates the biosphere reserve with the International Peace Park, not with community development goals.

Glacier has conducted studies concerning preservation of particular species found within the Park, including west slope cutthroat trout and big horn sheep. These studies and associated activities support two primary BR goals: genetic conservation within a protected core area and the advancement of sustainable land uses through cooperative research within core, experimental, and developed areas near Glacier.

The Coram Experimental Forest is an outdoor laboratory that provides information on the ecology and management of western larch forests composed of a wide range of plant and animal species. Results of a long-term research program show the consequences of many natural and management-oriented treatments on vegetation succession, soil-water relations, birds, small mammals, climatology, and forest health. Information from Coram usually has important application and implications in most ecosystems within the natural range of western larch. Public and private landowners in the region use Coram's research as the scientific basis for management of their forested lands. Since BR designation, Coram has attracted public interest and support around which it has expanded its education program. Perhaps because it is small with a fairly narrow mission, Coram enjoys the active support of an informed public and has been highly successful in its BR role as an experimental management zone.

To pursue BR goals, Glacier initiated a joint effort with the Flathead National Forest to develop a regional geographic information system and habitat maps for public and private landowners. Glacier also initiated cooperation with the Blackfeet Indian Nation on wildlife issues. It strengthened cooperation with Waterton's research program to determine the cumulative environmental impact of development on the regional ecosystem. Managers from both parks want to sustain the ecosystem in as natural state as possible and to collect data to help secure more appropriate land-use practices on lands adjacent to the boundaries of Glacier and Waterton Lakes National Parks.

BR designation stimulated cooperation between personnel at Coram and Glacier. For example, BR scientists from Coram helped park planners select successful species to revegetate treated sites along the Lake McDonald section of the Going-to-the-Sun Highway. Cooperation between scientists of both areas continues as they study dispersal and viability of conifer seed falling along this section of the road. Also, they are determining germination and establishment of conifers on sites disturbed during road construction. In 1992, Coram personnel hosted an international Larix symposium that summarized the worldwide knowledge of Larix. Research at Coram will continue to emphasize the application of 50 years of research on the Experimental Forest to ecosystem management and to identify biodiversity of the area through long-term studies within new and old growth forests. Greater emphasis will be placed on showing results to more of the public including students in all grades, conservation groups, managers, scientists, and other interested groups or individuals.

VI. OBSERVATIONS

A 1987 case study of the Waterton Lakes BR reported several lessons learned from their BR program:

- The media must be well informed so the program can be properly portrayed to the public.
- Acceptance of the program by local people and some government agencies can be slow. Support by a few well-respected people from the local community will help eliminate fears of hidden agendas.
- BR managers must have an open management policy that encourages broad involvement, while encouraging others to respect the limits of shared decision making.
- Students should be involved at all levels, as they can be strong supporters.
- BR stakeholders should protect the neutrality of the program and discourage use of the biosphere reserve to lobby on controversial issues.
- BR Technical Committees should have good policy direction and need to keep each other informed.

The three BR programs are meeting important and compatible needs. Each could perhaps be strengthened by collaborating more with the others. Coram could use its strong public support to promote the linking of ecosystem management with sustainable development on a larger scale. Glacier could help Waterton Lakes extend its research and ecologically sound development program west into British Columbia. Waterton Lakes could share with Glacier some of the lessons learned about building local community support for ecosystem management. In an age and an area that has benefitted from partnerships and cooperation, linking three BR programs, perhaps through a formal mechanism, may have the salutary effect of making each one stronger.

PRINCIPAL CONTRIBUTORS

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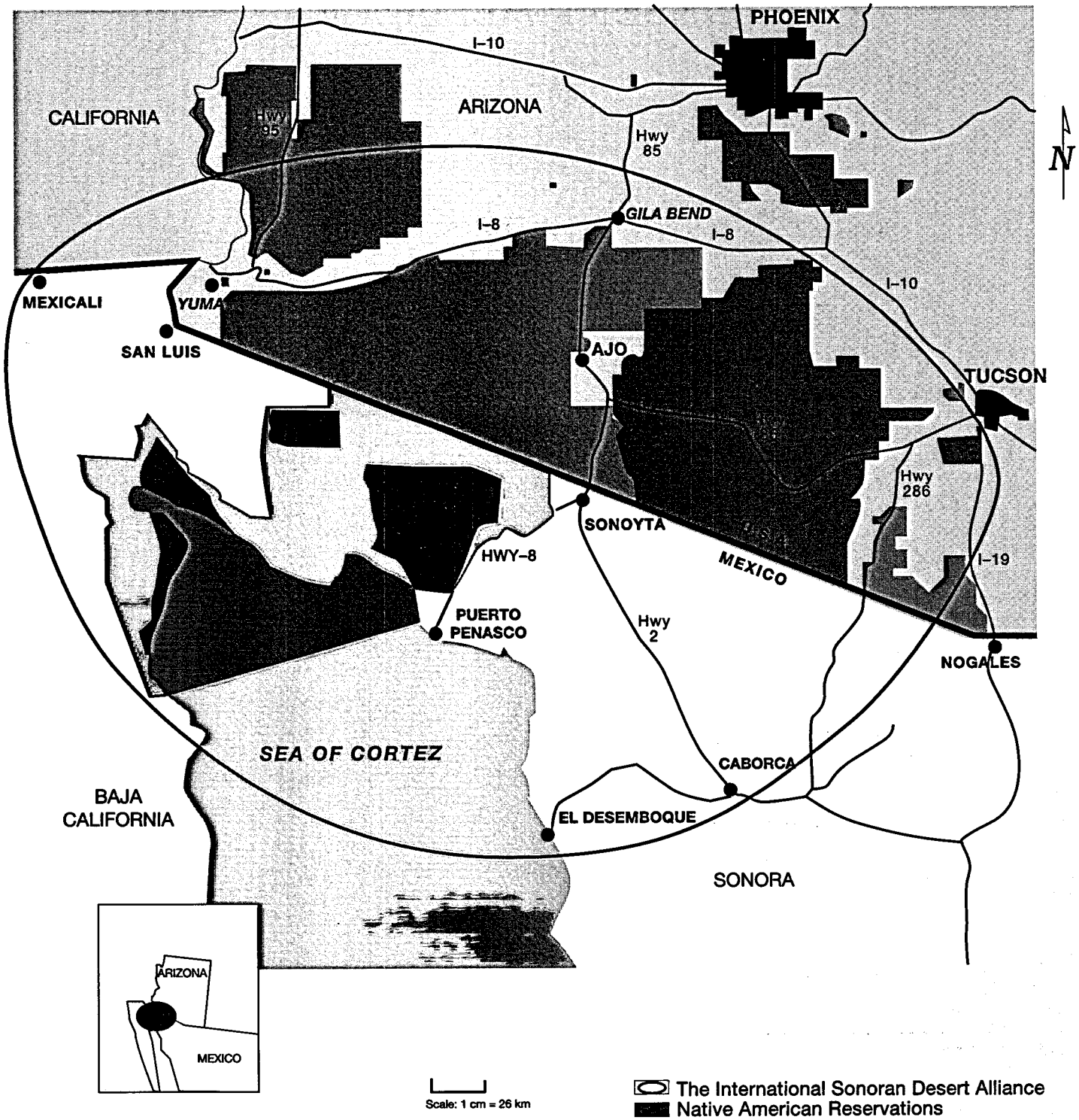
International Sonoran Desert Alliance

A Participatory Process to Support Conservation and Sustainable Use in a Tri-National Region

The International Sonoran Desert Alliance
La Alianza del Desierto Sonorense



International Sonoran Desert Alliance

The International Sonoran Desert Alliance, a recently incorporated tri-national and tri-cultural organization, is seeking to promote cooperative protection of resources, ecologically sound economic development, and improved responsiveness of public policy to local needs and is applying research and local indigenous knowledge to issues and needs. Despite the three nations and three languages, an international border dividing developed and developing economies, and uncontrolled development of a sparsely populated area spread over five million hectares, progress has been made.

I. Area Description

The transborder region of southwestern Arizona and the adjacent areas in Sonora and Baja California Norte in Mexico contain a cluster of three biosphere reserves (BR)—Organ Pipe Cactus National Monument (ORPI) in the United States and El Pinacate y El Gran Desierto de Altar and Alto Golfo de California y Delta del Rio Colorado in Mexico. According to UNESCO classification, the biosphere reserves are in the Sonoran biogeographical province of the warm desert/semidesert biome.

Much of the northern part of the area has basin and range topography with uplifted block type mountain ranges of volcanic origin. To the south are the volcanic craters of the Pinacate lava fields; several mountain ranges; the extensive high dunes of the Gran Desierto; and the riparian, estuarine, and marine areas of the northern Gulf of California. This is one of the world's most biologically rich warm deserts. The diverse fauna includes particularly large numbers of small mammals and reptiles. The flora includes a remarkable variety of succulents, including the columnar cacti, the Organ Pipe and Saguaro, which are widely recognized symbols of the Sonoran Desert region.

The area has been occupied by indigenous people for over 10,000 years, most recently by the Hia-Ced and Tohono O'odham who have lived here since pre-Columbian times. Father Kino arrived in the 17th century and established a mission near Sonoyta. European exploration continued into the 19th century, with one noteworthy explorer, R. W. H. Hardy. The first permanent white settlers were cattle ranchers and miners who moved to the area in the late 19th century. The rise and demise of the copper industry, steadily increasing tourism, recent development of agriculture in the Sonoyta Valley, and attractiveness as a retirement location have influenced current settlement patterns. The area is sparsely populated with a few communities located at some distance from each other.

II. Major Issues

The most significant issues are dealing with projected population growth and developing a regional economic base that includes an ecologically sustainable mix of traditional and contemporaneous land uses. Of particular concern are the actual and potential effects of the changing U.S.-Mexico trade relationships on the development of a sustainable regional economy.

Within the BR's zone of cooperation, the principal concerns are maintaining the traditional dry land farming and ranching practices of indigenous people, supporting ecologically sustainable commercial agriculture and farming in Mexico, and accommodating expanding tourism and establishing an economic base for small businesses in U.S. communities. Potential implementation of the North American Free Trade Agreement provides a strong catalyst for regional planning to accommodate anticipated needs for highway improvements, industrial and residential development, and tourist services in ways that enhance the well-being of the region's people without degrading the health and diversity of its ecosystems. The rural region lacks an effective governmental framework for coordinating economic

development and environmental protection. Increasing recognition of their vulnerability to the effects of rapid change has increased the interest of residents in identifying their shared regional interests and in working together to define their collective future.

III. Background

The transborder region of northwestern Sonora and southwestern Arizona has long been the focus of conservation interest in both the U.S. and Mexico. Established in 1976, the 133,278 hectare Organ Pipe Cactus BR was among the first designated in the U.S. By the late 1970's, Mexico's biosphere reserve program was well underway, although it was nearly 20 years later that two recently designated BR's were established in the state of Sonora. In 1982, a binational workshop of scientists and managers proposed the idea of a Sonoran Desert Biosphere Reserve.

In 1988, the Friends of PRONATURA (FPN) and ORPI held a conference that brought together Mexicans, O'odham, and other U.S. residents in an effort to identify mutual needs and interests compatible with the BR concept. With the assistance of the Sonoran Institute, a non-profit organization that seeks to reconcile conservation and development needs, residents in the BR zone of cooperation have established the International Sonoran Desert Alliance (ISDA).

The International Sonoran Desert Alliance
Open to all BR stakeholders
Grew out of need for new regional economic base
Overcame apathy and distrust
Developed recognition of regional interdependence
Created regional identity
Well supported by Mexicans, Indian Nation, and other U.S. residents
Building expanded BR program that will integrate conservation, research, education, and sustainable use

A 12-member governing board consisting of four residents each from Mexico, the United States, and the O'odham nation was elected to office in January 1994 and will serve to guide ISDA whose membership is open to all residents in the region. Public officials are not members of ISDA but serve in an advisory capacity. The concerns of ISDA are:

Consensus building and information sharing about ecologically sound economic development and shaping public policy to better serve a region divided by an international border.

Developing a framework for cooperation among the protected areas in the BR.

Expanding the scope of the BR program to include environmental education and go beyond traditional scientific studies to addressing a broad spectrum of regional needs and concerns.

Chronology for Establishment of Sonoran Desert Biosphere Reserves

1960's	to early 1970's Various proposals for establishing national and international parks discussed, but not implemented.
1976	UNESCO designates ORPI a biosphere reserve.
1977	Mexico establishes BR as a legal protected area category.
1980	Governor of Sonora begins study of Pinacate region as a possible BR.
1982	National Park Service (NPS) completes regional science program assessment. Regional meeting proposes further study of Sonoran Desert BR with units in U.S. and Mexico.
1986	ORPI dedicates Sonoran Biosphere Reserve Center and launches sensitive ecosystems research program.
1988	First International Symposium on the Pinacate, sponsored by the Sonoran-Arizona Commission and FPN.
1989-90	FPN documents broad support for BR concepts and proposes regional consultative forum. NPS incorporates BR into general management planning process for ORPI.

1992 Sonoran Institute (SI) and FPN coordinate a regional forum, offered by the Lincoln Institute of Land Policy, on regional land-use change and BR's.

1992-93 SI and FPN establish ISDA to coordinate anticipation in BR program. Two BR's are established under Mexico's federal system; nomination now being considered for inclusion in UNESCO BR system.

1994 ORPI received $300,000 from Congressionally appropriated funds to further the ongoing efforts of ISDA.

(See Appendix A for a more detailed history of BR's in the Sonoran Desert.)

IV. Implementation

The BR program began with a focus on conservation, education, and scientific activities within the ORPI BR. The park was one of the first to routinely include regional BR concepts in its public interpretation programs through a variety of media, including brochures (in Spanish and English), slide presentations, and ranger programs which emphasize ORPI's relationship to the surrounding ecological and multi-cultural region. BR status was an important factor in launching the Sensitive Ecosystems Program in 1986. This long-term program of inventory, monitoring, and research has collected information on the status of flora and fauna (including rare and endangered species), documented adjacent land-use trends, and initiated development of a geographic information system in cooperation with adjacent land managers.

In recent years, the BR program has increasingly pursued an ecosystem approach in understanding the co-evolution of people and the desert. The geographic scope of the research has expanded to include neighboring lands and involved researchers from both sides of the border. Important emphases include comparative ecology, risk assessment, ecosystem restoration, and watershed management. Recent studies by NPS and Mexican scientists on regional hydrology and irrigation practices on commercial farms have documented withdrawals far in excess of natural recharge. The project has strengthened the scientific basis for restructuring agricultural practices to reduce water use and contributed to a moratorium on drilling of new wells in the Sonoyta Valley adjacent to ORPI. These and other projects have helped provide the scientific basis for regional land-use planning and for improving the ability of area residents to make informed decisions on the use of their land.

ISDA provides the mechanism for expanding the BR program to involve an ever increasing number of regional interests. The ISDA serves as a regional cooperative that empowers its members to achieve community goals compatible with maintaining a healthy desert ecosystem. During the past several months, ISDA has collected information about regional economic trends, started work to change border management practices, and obtained funding for an environmental education program.

ISDA will seek incorporation as a non-profit with IRS 501c3 status. ISDA will act as an independent, international body that will guide future activities in the region. Incorporation as an asociación civil in Mexico, a counterpart to the U.S. non-profit designation, is now being pursued. Public officials from federal, state, local, and tribal governments will serve in an advisory capacity to the ISDA Board of Directors.

The Congressionally appropriated funds received by ORPI in 1994 are specifically for the following projects and are underway.

- Produce an action plan based upon the results of the ISDA conference held in January 1994, addressing health care, environmental education, tourism, protected areas, information exchange, trade and transportation, and economic development.
- Organize and carry out a series of public workshops to be held in rural communities and ejidos throughout the region to present the ISDA action plan.
- Carry out training programs in institutional management and similar needs.
- Produce materials informing resource managers and the public about conservation and economic development needs and activities in the western Sonoran Desert.
- Prepare a report assessing the historical, present, and projected economic activity in the region surrounding ORPI, including the role of tourism and other "clear" or non-extractive industries, and outline alternatives for sustainable economic development.

- Develop and carry out an environmental education curriculum for school children in Arizona, O'odham Nation, and Sonora. This multicultural curriculum will emphasize the unique heritage of the region, human impact on the natural environment, and changing land uses over time. Educators for the United States, Mexico, and Tohono O'odham school districts will participate. This includes program development, teacher training, and field trips.
- Prepare a report assessing the feasibility of establishing a facility that will serve as a center for interpreting the natural and cultural resources of the region and encourage binational cooperation in research.
- Prepare and widely distribute an easily accessible, well-illustrated, succinct report identifying the region's natural, cultural, and economic resources and explaining the alternatives in the region for enhancing collaboration among resource managers, residents, and other organizations.
- Inventory and analyze the status of mapped (digital and non-digital) information of the natural, cultural, and economic resources of the region. Prepare a report identifying known information relating to regional resources including detailed regional thematic maps (i.e., land use, vegetation, etc.). Produce a catalog of regional spatial data and resource information sources. Gather digital data and make available for use with ongoing planning, management, and research in the region. Identify gaps in the existing regional database and provide recommendations regarding future data acquisition.

V. Benefits, Constraints, and Opportunities

The primary benefit enjoyed by all BR stakeholders is their collective ability to shape and benefit from the expanded BR program. ISDA offers a forum for building a common understanding of the ecosystem and for resolving conflicts associated with the management and development of resources. By encouraging communication among people who have traditionally not spoken with each other, ISDA is building recognition of the BR as a meaningful concept of practical value in their lives. As the ISDA's Board of Directors continues to plan and implement activities that persuade remaining skeptics of its good will and effectiveness, the BR will become increasingly relevant to its members and to those it serves.

The recently designated BR's in Mexico offer a means to develop coordinated research and information systems with U.S. land managers to help define goals and objectives for cooperative management.

The new federally designated biosphere reserves in Mexico will attract cultural and ecotourists. The BR program can provide information to help communities take advantage of opportunities to encourage and accommodate increased tourism in ecologically sustainable ways. For example, the Chamber of Commerce of Ajo in the U.S. has received small grants and attracted new enterprises that increased visitation to the area for nature-oriented activities such as night sky watching.

Developing effective communication and an atmosphere of mutual trust and understanding is a long-term process. Diverse cultural backgrounds, philosophies, and languages among BR participants are constant reminders of the tri-national aspect of the region. Federal agency managers and residents of the BR are still learning to be open and comfortable with each other.

Lack of funds for ISDA to administer the BR program on behalf of its stakeholders remains an important constraint. More active participation by governmental agencies (other than the long-involved NPS) in program planning and implementation will also be needed.

VI. Observations

The International Sonoran Desert Alliance story is remarkable for the sizeable barriers it has overcome. Three nations, three languages, an international border, people spread over five million hectares, a depressed economy, and the imminent threat of uncontrolled development could not prevent the establishment of an alliance that has put the people more in control of their own destiny. Fundamentally a private, grass-roots initiative, ISDA has begun to find ways to improve the economic situation of the people living in the region while furthering the goals of nature conservation and environmental protection. ISDA relies upon its partners in BR protected areas for assistance in research and educational activities. Incorporating regional sustainable land use into a very successful conservation and

research based BR program has produced a framework for fully implementing the BR concept.

The BR program is working well in the Sonoran Desert because:

BR managers are willing to join as partners with ISDA in advancing the BR program, without taking a lead role.

ISDA grew out of a private, mostly local, initiative which has succeeded in building self-confidence and self-reliance among its members.

ISDA was able to build a regional identity and a common understanding and support for the BR program.

A well-established scientific database has supported a number of projects outside the protected areas of the BR.

Principal Contributors

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Appendix A: History of Biosphere Reserves in the Sonoran Desert

Organ Pipe Cactus National Monument was officially designated a biosphere reserve in 1976.

Unlike the United States where BR status entailed no legal obligations, Mexico established biosphere reserves by law as a separate legal category of protected area managed for conservation, research, sustainable economic uses, and local participation. Around 1980, the governor of Sonora sponsored resource studies for assessing the Pinacate region as a potential biosphere reserve.

During the early 1980's, the National Park Service prepared a history of scientific study for the ORPI area. In 1982, a binational workshop of scientists and managers reviewed the study, recommended future research directions, and proposed that the concept of a Sonoran Desert Biosphere Reserve, with areas in both countries, be considered for strengthening regional scientific cooperation.

In the mid-1980's, delays in the nomination of the Pinacate Biosphere Reserve in Mexico provided a catalyst for interagency meetings to explore possibilities for developing a regional BR program in the U.S. Linking ORPI with the Cabeza Prieta National Wildlife Refuge and perhaps other adjacent areas was recommended. To provide a base of operations for scientific cooperation, ORPI dedicated a facility near the international border crossing as the Sonoran Desert Biosphere Reserve Center. The park also initiated a major cooperative interdisciplinary research program to assess the status of sensitive ecosystems and support ecosystem management. However, the federal agencies (Department of Defense, Bureau of Land Management, Fish and Wildlife Service, and National Park Service) involved did not act on the BR expansion proposal.

In 1988, U.S. MAB provided a small grant to Friends of PRONATURA to study applications of the biosphere reserve concept in the region. (FPN is a U.S. non-profit organization established to assist its Mexican counterpart PRONATURA in promoting education, research, and information dissemination on environmental issues affecting southwestern North America). During the following year, FPN's president successfully expanded the discussions on the biosphere reserve to include leaders of the Tohono O'odham and local communities, state and local governments, and nongovernmental organizations. These efforts fostered a willingness to explore further the role of the BR in empowering these parties to work more effectively together in addressing shared problems.

In 1990 FPN and SI, with support from several agencies and organizations, proposed a regional town hall meeting to enable more than 40 potential BR stakeholders to define the geographic area for cooperation and to develop a coordinating structure for maintaining future dialogue.

A regional forum on land-use changes in the Western Sonoran Desert Border Area was held in October 1992. The forum focused on many complex issues, including the potential environmental and socioeconomic effects of the North American Free Trade Agreement, and expanded communication among interested agencies, organizations, and citizens on BR concepts and how to implement them.

Following the forum, SI and FPN organized a series of informal meetings through which area residents agreed to establish the International Sonoran Desert Alliance. ISDA's broad mission is to promote international and multi-cultural information

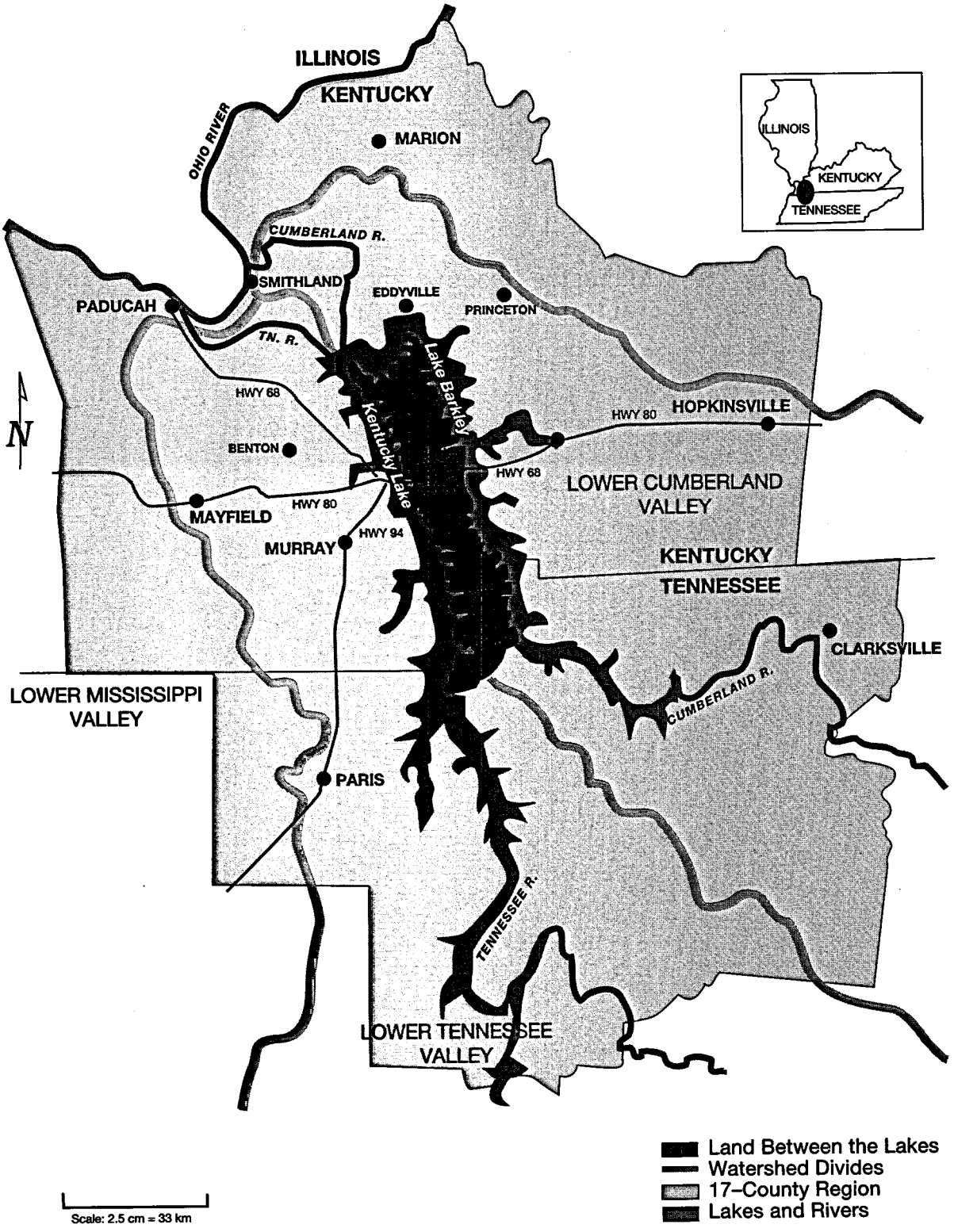
sharing and consensus-building at the grassroots level within the context of a regional biosphere reserve program.

In Mexico, government officials in Sonora and Mexico City have accelerated efforts to implement BR concepts. In October 1988, the First International Symposium on the Pinacate brought 220 participants to focus on regional resource issues and strengthened interest in establishing a BR in the Pinacate region. A series of meetings and conferences followed which led, in the spring of 1993, to the establishment of two federally protected BR's in Mexico with a total of 1.7 million hectares. El Pinacate y El Gran Desierto de Altar BR has two core areas—302,000 hectare Sierra El Pinacate y Bahía Adair and 42,000 hectare Sierra del Rosario; Alto Golfo de California y Delta del Rio Colorado BR has one core area—160,620 hectare Ciénega de Santa Clara. Mexican law requires that management plans for the BR zone of managed use be developed within one year after declaration. The plans are currently being developed with several academic and conservation groups in Sonora.

Land Between the Lakes Biosphere Reserve

Managing Resources for
Multi-use Recreation Areas

Land Between the Lakes Biosphere Reserve



Land Between The Lakes Biosphere Reserve

Land Between The Lakes Biosphere Reserve is a multiple-use recreation area managed by the Tennessee Valley Authority. The area has a long history of research, primarily by local universities. New programs of outreach to the community have begun.

I. Area Description

Land Between The Lakes (LBL) is a 68,800 hectare biosphere reserve in western Kentucky and Tennessee. It is bounded on the east by Lake Barkley, an impoundment of the Cumberland River, and on the west by Kentucky Lake, an impoundment of the Tennessee River. The LBL Area Biosphere Reserve (LBLABR) consists of a 17-county area made up of the lowermost drainage portions of the Tennessee and Cumberland River valleys, including LBL and the 101,175 hectares of waters in the two major lakes. It was dedicated by the United Nation's Educational, Scientific, and Cultural Organizations' (UNESCO) Man and the Biosphere Programme (MAB) in June 1991.

LBL is located in the Interior Low Plateaus biogeographical province which includes most of Kentucky and Tennessee and extends into southern Indiana, Illinois, and Ohio and northern Mississippi and Alabama. Eighty-nine percent of the vegetative cover is hardwood forest. Less than four percent of LBL land, 2,590 hectares, is developed with facilities for recreation, education, or administration. The relatively small amount of non-forested land, 5,079 hectares, is represented by a variety of open land types—row cropped fields, hay fields, wildlife woods openings, wildlife plantings, managed prairie areas, and utility easements.

This ecologically diverse area has been designated as an Experimental Ecological Reserve by the National Science Foundation. Austin Peay State University in Clarksville, Tennessee, documented 733 vascular plants on a 325 hectare natural area site within LBL. More than 1,300 species of plants have been found in the LBL area. The vertebrate fauna of the entire area includes documentation of 53 species of mammals, 232 species of birds, 30 species of amphibians, 42 species of reptiles, and 97 species of fish. Aquatic invertebrates include stone flies, mayflies, caddis flies, dragonflies, damselflies, and midges; but terrestrial invertebrates have not been extensively sampled. LBL is very well suited for large-scale manipulative research. About 40 research projects are currently in progress; and more than 240 studies have been conducted over the past 31 years, primarily in the area of natural resources.

II. Major Issues

Achieving sustainable development in the 17-county region while preserving the cultural and economic values and traditions of the area is the primary challenge of the LBLABR Cooperative.

III. Background

In June 1963, President John F. Kennedy directed the Tennessee Valley Authority (TVA) to "demonstrate how an area with limited timber, agricultural, and industrial resources can be converted into a recreation asset that will stimulate economic growth of the region." His rationale was that a recreation area in western Kentucky and Tennessee would attract large numbers of visitors and that resulting tourism expenditures would stimulate the regional economy. Prior to 1964, the LBL area was known as "between the rivers" and consisted of hill and bottomland farms, small communities, corporate woodlands, and considerable federal (U.S. Fish & Wildlife Service) holdings managed primarily for waterfowl and wildlife.

More than 2.2 million visitors annually make use of LBL's wide variety of recreational opportunities, including camping, hunting, fishing, swimming, hiking, bicycling, and sightseeing. Designated campsites number 1,191 and dispersed camping is permitted as well. Two group camps have total overnight capacity of 200 persons. The Homeplace 1850 is a living history farm with 18 authentic log structures as an attraction. Adjacent to The Homeplace 1850 is a fenced range for 85 American bison. Woodlands Nature Center is a wildlife oriented attraction with a captive breeding program for endangered red wolves and other native animals on display, including

eagles, owls, hawks, coyotes, and various reptiles and fish. A 1,012 hectare off-highway vehicle (OHV) area is available for motorized trail users.

Annual timber harvests produce about five million board feet of lumber. Approximately 15,000 hunter-use permits are sold each year allowing hunting for deer, turkey, waterfowl, fox, raccoons, and a variety of other small game animals. Consumptive resource uses at LBL are managed sustainably by the professional resource management staff, which also plans and implements wildlife restoration activities. Bald eagles, river otters, turkey, and ruffed grouse have been successfully reintroduced to LBL. Six active bald eagle nests were observed in 1993.

In the fall of 1994 the Environmental Impact Statement and Natural Resource Management Plan for LBL was completed. More than 2,800 public comments were collected in the review process and were used in shaping the preferred alternative for resource management of the area.

The staff of LBL numbers as many as 175 persons, including administrators, resource managers, programmers, planners, marketing personnel, office/clerical staff, maintenance workers, and seasonal employees. The staff operates facilities and programs with an annual budget of $9.5 million of which 30 percent is earned revenue from fees and sales.

IV. Implementation

Approximately 17,206 hectares in LBL have been placed in the protected status of "core" in the LBL Area Biosphere Reserve. These lands include seven blocks ranging from 1,012 to 4,413 hectares in size and numerous smaller, dispersed areas. This range of core sizes should facilitate greater understanding of factors determining optimum size of natural reserves for various wildlife populations or plant community types.

All LBL lands not designated as core areas are defined as the "managed use area" for the biosphere reserve zonation system. This amounts to just under 51,610 hectares. This area permits timber harvests, agriculture, and the wide variety of recreational activities offered in the area. Research and recreational uses are permitted in core areas but timber harvests, agriculture, and intensive uses are not allowed.

The entire LBL Area Biosphere Reserve encompasses 809,400 hectares and is comprised of the 17 counties surrounding LBL. Approximately 484,000 people live in this zone of cooperation, with small agricultural farms, rural communities, and small cities comprising the human populations. Clarksville, Tennessee, with 100,000 inhabitants, is the largest city in the LBLABR.

The economy of the region is built upon tourism, light industry, and agricultural commodities, including tobacco, soybeans, corn, wheat, cattle, and hogs. The large cities within 250 miles of the biosphere reserve include Nashville and Memphis, Tennessee; St. Louis, Missouri; and Louisville, Kentucky. The tourist economy of the region is primarily focused on Kentucky and Barkley Lakes and Land Between The Lakes with a variety of resorts, marinas, shopping centers, and restaurants serving customers in the area. Boating, fishing, hunting, and sightseeing are the primary recreational uses of the region.

In early 1994, approximately 350 stakeholders in the 17-county region were identified and invited to attend one of three initial workshops in Paris, Tennessee; Hopkinsville, Kentucky; and Gilbertsville, Kentucky, at nearby state park resorts. Approximately 77 people attended to learn more about biosphere reserves and to share their perspectives on issues and opportunities for the LBLABR. This group serves as the pool of stakeholders from which an executive committee, cooperative, and five committees are being formed. The following is a list of participants by general category:

Agricultural Professionals	3
Chamber of Commerce/Tourism	6
Congressional Staff	1
County Government	3
Development Districts	2
Educators	13
Environmental Organizations	6
Health Professionals	9
Industry	6
Media	3
Natural Resource Professionals	16
Police	2
Resource Clubs	5
Utilities	2

In trying to involve representatives from economic, environmental, and social sectors of the region, it was clear that some gaps exist between a group with balanced representation and the individuals who volunteered to be involved. With 1994 as the startup year for the LBLABR Cooperative, it was decided that a mission and basic organizational structure and objectives would be developed first. Then the group will pursue recruitment of stakeholders who provide balance among the three sectors—environmental, social, and economic.

A final decision has not been made about the legal status of the cooperative but one option is to seek non-profit status under the Internal Revenue Service law, 501c3.

Presently, five committees do the work of the cooperative: Education and Training, Ecological and Economic Research, Sustainable Development, Communications, Needs Assessment.

Program objectives are expressed in three clusters of activities.

1. Build harmonious relationships between humans and the environment through an international cooperative program.
2. Develop greater understanding in wise use of the area's renewable resources, in conserving and promoting the conservation of its unique and fragile attributes, and in supporting environmentally compatible economic development.
3. Enter into cooperative relationships with other biosphere reserves nationally and globally to attain common objectives.

V. Benefits, Constraints, Opportunities

LBLABR is intensively managed and consumptive uses of resources are permitted. Hunting, fishing, trapping, and firewood and Christmas tree-cutting are allowed with purchase of appropriate permits. Berry and mushroom picking, and nut gathering are allowed year round at no charge except in restricted areas. Off-highway vehicle use is permitted at no charge in the designated 1,012 hectare OHV area at Turkey Bay. These management activities offer ample opportunities for research and observation. Three university consortia bring undergraduate students to LBL each year to observe management practices and discuss the decision making environment.

In 1995, the organization faces an approximately 30 percent reduction in the appropriated budget with a mandate to operate more efficiently. Due to an early-retirement and early-out bonus package, coupled with the loss of other positions, about 60 staff members left at the end of fiscal year 1994. As with many other federal facilities, major changes in operations must be made to accommodate the fiscal austerity trend.

Since dedication of the LBLABR in 1991, the primary emphasis has been on identifying the core, managed use area, and zone of cooperation while completing the Environmental Impact Statement and Natural Resource Management Plan. The formation of the cooperative will require considerable effort by the stakeholders to be successful. Currently there is a limited commitment of staff time to the cooperative and much of the planning and development of the program will depend upon recently recruited stakeholders. It will require many years of cooperative effort to determine the roles of this group in improving communication and collaboration among diverse stakeholders.

Principal Contributors

Tim Merriman, Manager, Research and Innovations, Land Between The Lakes

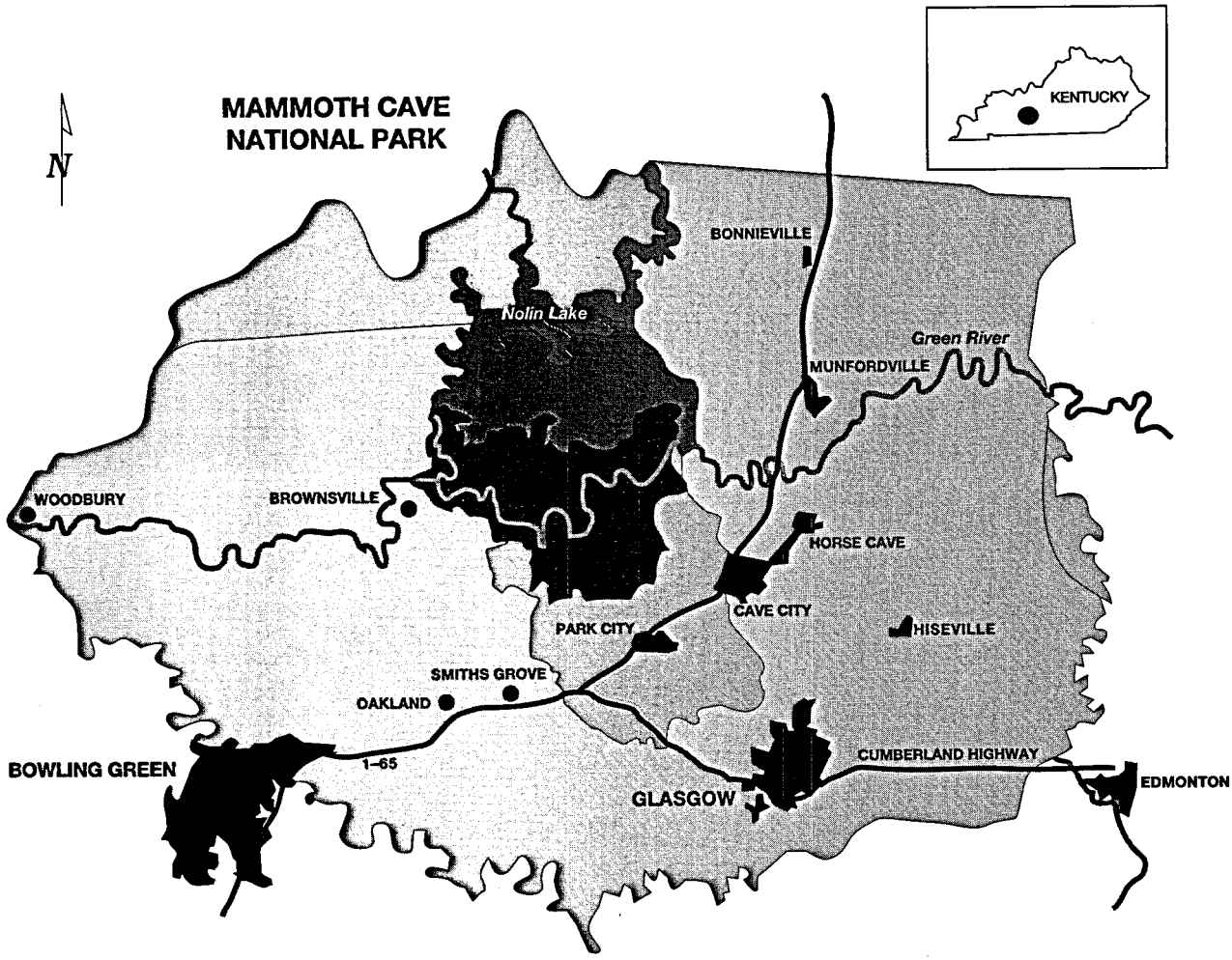
Charles E. Massey, Manager Property and Resource Services, Land Between The Lakes

Rick Lowe, Natural Resources Team Leader, Land Between The Lakes

Mammoth Cave Area Biosphere Reserve

Expanding the Local Constituency
for Conservation and
Sustainable Rural Development

Mammoth Cave Biosphere Reserve
Existing and Proposed Boundaries



Mammoth Cave Area Biosphere Reserve

The Mammoth Cave Area Biosphere Reserve is a karst system of underground water courses that includes the longest cave in the world. Long-term hydrological studies have delineated the extent of the system. Mammoth Cave National Park is the core of the biosphere reserve while the groundwater recharge area for the park's caves is the zone of cooperation. A Biosphere Reserve Cooperative administered by the regional development authority coordinates the biosphere reserve program that features monitoring for water pollution sources, establishing a regional geographic information system, and educational and cultural heritage projects. These projects complement ongoing park research and have attracted considerable financial support. A major emphasis of the biosphere reserve program is to assist area landowners in improving their land-use practices. Partnerships are developing in support of ecosystem management and sustainable development goals.

I. Area Description

The Mammoth Cave Area Biosphere Reserve (MCABR) is located in Edmonson, Barren, and Hart counties, Kentucky. The biome is temperate broad-leaf forest and the biogeographic province is eastern forest. The area is a karst system typified by complex underground water courses and a multilayered cave system (longest in the world) with unique fauna and mineralization features.

There is evidence that prehistoric peoples explored and extracted minerals from the caves, used them for shelter, and cultivated the surface area. Post-Columbian American Indians resided in the area. Europeans began to settle the region during the Revolutionary War period. Later westward migration through the Ohio River Valley slowly developed the area and began to affect its ecology. Mammoth Cave has been a tourist attraction since the early 19th century.

The rural area includes small towns and farms and a fairly stable population. Farming has been an economic mainstay since prehistory. Saltpetre mining in Mammoth Cave and other area caves peaked during the War of 1812 and is no longer an economic activity. Commercial development along major highways, tourist services, some light manufacturing, and agriculture are the basis of the regional economy.

II. Major Issues

The most significant issue for the MCABR is achieving a sustainable economy within the zone of cooperation that improves the economic and social well-being of local people and is compatible with the core area values. Of particular concern to Mammoth Cave National Park is the impact of agricultural, commercial, and residential land use on ecosystems—especially with respect to the effects of groundwater pollution on cave biota.

III. Background

The U.S. Man and the Biosphere Program nominated the Mammoth Cave Area Biosphere Reserve for several reasons. There is a long history of research on the regional hydrological system and the relationship between human uses of the land surface and groundwater quality. There is a local development authority that is willing to consider the results of this research in regional planning. The designated biosphere reserve (BR) includes both Mammoth Cave National Park (core area) and the surrounding region (zone of cooperation).

The 83,377 hectare MCABR was designated in 1990. The protected core area of the biosphere reserve is Mammoth Cave National Park, which is the only officially designated administrative site in

the BR. The biosphere reserve has no delineated zone of managed use (i.e., buffer zone). The zone of cooperation (transition zone) is the groundwater recharge area that surrounds the park.

The principal monitoring and research themes of the BR are groundwater hydrology, water quality, the effects of agricultural land uses, the health of freshwater ecosystems, and atmospheric pollutants. Long-term hydrological and ecosystem research projects were initiated in the park and surrounding region decades ago. The hydrological studies have produced a precise map of the groundwater basin that locates specific surface and subsurface water sources. Cave ecosystem studies have described the underground physical and biological environment so that natural or human induced changes can be detected and understood. The research has produced a substantial knowledge base that is available for use in planning development projects in the zone of cooperation.

Within the zone of cooperation, the principal economic issues are sustainable agriculture and sustainable development for small tourist-oriented businesses as well as light industry. Unlike most other U.S. biosphere reserves, the zone of cooperation—the groundwater recharge area for the Mammoth Cave System—has a well delineated boundary. Rural development in this area is coordinated through the Barren River Area Development District (BRADD) in accordance with broad goals for sustaining the regional ecosystem and taking into account the results of the long-term research program. BRADD was established by state statute and is composed of local officials and representatives of economic interests and human welfare.

Following designation of the biosphere reserve by the United Nations Education, Scientific, and Cultural Organization, the MCABR Cooperative was established as an adjunct to the Natural Resources Planning Council of BRADD. The members of the Cooperative have signed a Memorandum of Understanding concerning establishing and coordinating the BR program. BRADD serves as the biosphere reserve secretariat.

The BR program is jointly planned and coordinated by the partners in the Cooperative. The objectives of the Cooperative as stated in the Memorandum of Understanding are:

> To cooperate at all levels to develop a land ethic that recognizes the importance of wisely managing the natural and cultural resources of the region;
>
> To coordinate efforts to identify long-term, sustainable, and ecologically sound, economic development opportunities;
>
> To sponsor, coordinate, or support research and demonstration projects that contribute to sustainable development, agriculture, and ecosystem management and to promote dissemination of information;
>
> To develop education programs about the local and international MAB program.

PARTNERS IN THE COOPERATIVE

BRADD—10 Counties

- Elected Officials
  - City
  - County
  - State
- Council Chairs
- Special Advisors
  - State-agency heads
  - Federal-regional agency heads

BRADD Natural Resources Planning Council

- Agencies and Citizens
  - Concerned about Natural Resources

Mammoth Cave Area BR Cooperative

- State of Kentucky
- Tennessee Valley Authority
- Western Kentucky U.
- Soil Conservation Service
- Agriculture Stabilization and Conservation Service
- National Park Service
- BRADD
- Resource Conservation & Development District
- Army Corps of Engineers
- Economic Development Administration
- Kentucky Nature Preserves Commission

IV. Implementation

The BR program supports cooperative ecosystem management of the Mammoth Cave region and specific efforts to address the effects of regional land use and development on surface and groundwater resources. Through the MCABR Cooperative, federal, state, and local agencies have joined Mammoth Cave National Park, local landowners, and citizens in supporting cooperative projects that address shared concerns. The Cooperative encourages the stakeholders to understand the park and the surrounding region as an ecological, economic, and cultural unit and to use consultation and cooperation—and information—as the guideposts for its management and development.

The BR program is providing the framework for cooperative regional monitoring and assessment of water quality to support human needs and those of the unique aquatic biology. It is also promoting the joint development of a regional geographic information system and regional cultural heritage projects. These regional activities complement ongoing research conducted by agency scientists, university researchers, and non-governmental organizations. The scientific activities contribute directly to a public environmental education program and the development of a Resource Conservation and Development District (RC&D), which receives technical and funding support from participants in the BR program. Since 1990, the BR program has received significant funding from a growing number of agencies, such as the Soil Conservation Service (SCS) and the Agriculture Stabilization and Conservation Service (ASCS). Specific projects which the BR program has initiated or significantly influenced are:

Projects Initiated Through the Biosphere Reserve Program

Project: Regional Geographic Information System (GIS)

Purpose: Develop GIS for BR and adjacent areas to support planning and ecosystem management.

Partners: BRADD, National Park Service (NPS), RC&D, Western Kentucky U., Kentucky Division of Conservation, SCS

Funding: $50,000 in federal, state and local funds

Activities:
- Data collection to link cultural and natural features, update existing state maps of natural features, locate and describe cultural features.
- Process information using shared equipment, software, and personnel and integrate existing information into a unified regional program.

Unique Feature: Local, state, and federal agencies will work together to document regional cultural resources interpretation, and development (tourism) of those resources without any government ownership.

Project: Economic Impact Study (completed)

Purpose: Assess potential for sustainable industrial development along major transportation corridor.

Partners: Economic Development Administration, BRADD

Funding: $22,500

Activities:
- Information has been collected that assesses present and future water pollution potential and other environmental risks from business and industrial development along I-65.

Project: Environmental Education Program

Purpose: Present regional environmental issues to park visitor, local students, and teachers throughout the state focusing on the schools within BRADD.

Partners: NPS, local school districts, Kentucky Department of Education, SCS, RC&D

Activities:
- Adapt program to meet adult education needs.
- Establish cooperative program with SCS.

Project: Resource Conservation and Development District (RC&D)

Location: 10 BRADD counties including MCABR

Purpose: Develop and carry out plans that improve the general welfare, health, and economy of the area through resources management.

Partners: SCS, BR Cooperative, local citizens committees, NPS (Special Water Project)

Funding: $30 million from federal and other sources have been requested.

Activities:
- Rural water development systems.
- Rural sewage systems.
- Coordination with Mammoth Cave Area Special Water Quality Project.
- Adult and environmental education on best management practices and water quality protection.

Projects Expanded or Facilitated by the Biosphere Reserve Program

Project: Mammoth Cave Area Special Water Quality Project

Purpose: Assess, monitor and mitigate non-point source pollution on water quality in watershed.

Partners: NPS, Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), ASCS, SCS, University of Kentucky, Kentucky Divisions of Water and Conservation, and Kentucky Geological Survey

Changes Due to BR
- Funding increased by $950,000 when ASCS and SCS joined in a partnership to constrict on-farm pollution from pesticide and animal waste through containment and recycling.
- Focus moved from park to entire region in assessing water quality through monitoring surface and subsurface waters in zone of cooperation and monitoring downstream in park.

Participation of Mammoth Cave National Park in the BR program has substantially influenced planning and management of the park itself. The goals of the biosphere reserve are an important consideration in the biennial updating of the park's Statement for Management, which identifies important resource issues, assesses the relationship of the park to the surrounding region, and establishes the objectives that provide the basis for park planning and management. Biosphere reserve status and the BR program have helped the park articulate its role in the larger region and attract the technical and financial resources to strengthen support for cooperative ecosystem management. The biosphere reserve was a catalyst for integrating all science and management functions relating to natural and cultural resources into a single organization. The biosphere reserve has also influenced the biennial revision of the park's Land Protection Plan, which establishes the strategy for protecting park resources. The BR program has helped the park work with land owners to achieve conservation objectives in ways that reduce the traditional reliance on land acquisition to reduce threats from development outside the park.

V. Benefits, Constraints, Opportunities

Mammoth Cave National Park and the region surrounding it have benefited from its biosphere reserve status. BR stakeholders—federal, state, and local governments, and citizens—have joined in partnerships supporting ecosystem management and sustainable development and have attracted resources to the area. As local land owners derive tangible benefits from these projects and discover better ways to manage their properties, the park enjoys an extra mantle of protection. Where once there was apathy, if not antipathy toward the park, there is now a growing understanding and willingness to pursue mutual interests that serve the conservation goals of the park.

Several factors influenced the development of the BR program. The biosphere reserve designation and attendant program was not viewed as a federal program; therefore, local citizens and communities felt comfortable participating. Public acceptance was due in part to the early efforts of the park and BRADD to focus the BR program on meeting the needs of the surrounding community (zone of cooperation) and then assessing the benefits to the park.

With park managers playing a cooperator role rather than asserting a leadership role, other members of the BR Cooperative and the local people perceived the federal presence as demonstrating open, honest government. The people who are benefiting from the BR program recognize that it is largely the presence of the core area that has generated these benefits.

Learning from the experiences of the Southern Appalachian MAB Cooperative (SAMAB) and BR program and more recently working with the Tennessee Valley Authority (TVA) Land Between The Lakes BR, has helped stakeholders adapt the BR concept to the particular conditions in the Mammoth Cave Area. One of the TVA specialists from Land Between The Lakes has been added to the BR Cooperative to facilitate the exchange of ideas. Land Between The Lakes offers years of experience in environmental education; the MCABR Cooperative offers experience in working cooperatively with area residents.

The BR program has nurtured the community's land and conservation ethics. As the farming and rural resident community became more involved with groundwater issues, their consciousness has been raised on what groundwater is and where it goes. In the more urban areas, the Caveland Sanitation Authority, a local sewerage, through planning and construction of a regional wastewater system has heightened awareness of how sewage can enter the groundwater system and its impact to local aquifers.

The park and the BR Cooperative have noted the following areas for emphasis in future development of the BR program.

Needs	Park	BR Cooperative
Policy guidance	X	X
National program plan	X	
Increased emphasis on inventory and monitoring of biodiversity	X	X
Increased emphasis on long-term ecological research	X	X
Enthusiastic local constituency	X	X
Financial and human resources to implement and coordinate BR program	X	X

In addition, there is a need to involve rural residential landowners, who are not farmers. The BR Cooperative will look for opportunities to bring these stakeholders into new or existing partnerships concerning water quality and sustainable economic development. The BR program can provide information and management skills to these stakeholders to help them deal with air, water, soil, and land-use issues.

The National Association of Development Organizations has given an innovation award to the BR Cooperative. The award recognizes the BR program as a model for consideration in other areas. The RC&D has produced a videotape that highlights the successes of the water quality projects in the biosphere reserve. It promotes the MCABR as a framework for demonstrating sustainable approaches to ecosystem management. BRADD has nominated the biosphere reserve for a Governor's award as an outstanding example of coordination among government units.

The BR Cooperative has submitted a proposal to expand the zone of cooperation of the biosphere reserve. The expanded biosphere reserve would include a proposed state park and an Army Corps of Engineers recreation area. The proposed addition to the biosphere reserve is outside the Mammoth Cave watershed, but within regional hydrologic boundaries and within the area in which development has impact on natural and cultural resources as well as the economy of the current MCABR region.

VI. Observations

The story of the Mammoth Cave Area Biosphere Reserve is an encouraging one. Where once there was resentment there are now cooperative efforts such as experimental farms where the objective is to improve crop production as well as protect the watershed which is the life blood of the park and its caves.

The BR Cooperative focused its attention on the zone of cooperation in the belief that solving problems and meeting needs there would benefit the core area and the resource values it seeks to conserve. The BR has served as a framework for supporting the local community's needs for economic development within the context of ecosystem management.

The approach used for implementing the BR concept was to form a regional cooperative that linked a national park with a regional development authority and focused the BR program on meeting

needs in the zone of cooperation. This approach was successful because:

The MCABR is a well-defined ecological and hydrological unit for which ecosystem management goals can be established.

The national park has an important role in the local economy.

The former park superintendent's commitment to and prior experience in applying BR concepts motivated others to participate in the BR program.

BRADD is a well-established and trusted regional authority that provides a suitable home for the BR Cooperative.

The zone of cooperation has a fairly stable, homogeneous population that is concerned about its economic well-being and quality of life.

As with any cooperative effort, there needs to be dedicated and effective leaders. BRADD is managed by an executive director who has held his position for years. The stability of this organization was instrumental in setting up the regional cooperative. Park managers have been willing to challenge and change traditional methods for attaining park goals. In a region where the federal presence is viewed with suspicion, park management has shown an enthusiastic willingness to help solve regional problems as the route to protecting park values.

Principal Contributors

David Mihalic, Former Superintendent, Mammoth Cave National Park

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Other Contributors

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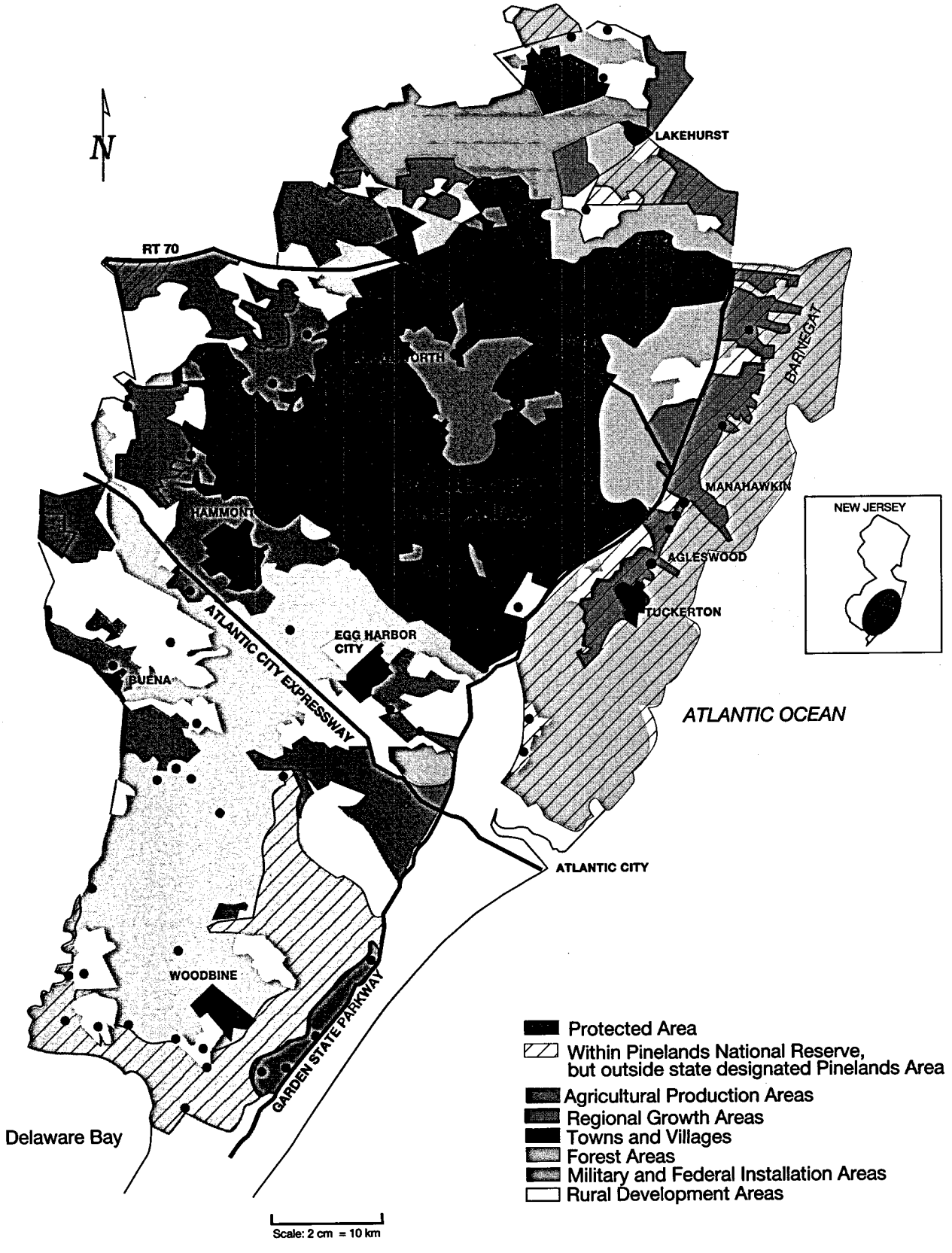
Dr. Wayne Hoffman, Chairman, Natural Resources Planning Council, BRADD

New Jersey Pinelands Biosphere Reserve

A Testing Ground for
Ecological Sustainability
and Growth Management

New Jersey Pinelands Biosphere Reserve



NEW JERSEY PINELANDS BIOSPHERE RESERVE

The New Jersey Pinelands National Reserve is a cooperative effort of federal, state, and local governments to preserve, protect, and enhance the resources of a region of national and international significance. Legislatively defined boundaries set forth the protected area, and the zone of cooperation. The New Jersey Pinelands Commission, an independent state agency with federal, state, and local representation, manages the biosphere reserve. The Pinelands serves as an on-going national experiment in the development of innovative land management techniques for resource protection and growth management.

I. AREA DESCRIPTION

The New Jersey Pinelands forms a portion of the Outer Coastal Plain in the heavily urbanized northeastern section of the United States. It comprises the largest body of open space between Richmond, Virginia and Boston, Massachusetts, on the Mid-Atlantic coast. Consisting of approximately 450,000 hectares, the region is a mosaic of upland, wetland, and aquatic environments. Soils are sandy, acid, and nutrient poor. Wildfires have been common favoring the pitch pine (Pinus Rigida) in the uplands. While pine-dominated forests are found in the central area of the region, oak-dominated forests are the norm in the southern and western areas. The Pine Plains, a pygmy forest of pitch pine, blackjack, and scrub oaks, is world-renowned and probably the result of frequent fires. Wetlands account for approximately 20 percent of the Pinelands. Here, suitable habitat exists for 80 percent of the rare and endangered plant and animal species of the region. Streams in the area are fed mainly from ground water supplies, including a huge aquifer underlying most of southern New Jersey, estimated to contain up to 17 trillion gallons.

II. BACKGROUND

The Pinelands has been intensively used by man since the early days of colonization and before that by Amerindian inhabitants. Resource-related industries, including timbering, ship building, bog iron based manufacturing, and glass making, dominated the early Colonial and post-Revolutionary period. Conventional agricultural activities continue to be found at the periphery of the region, while cranberry and blueberry agriculture in the central portion are important economic enterprises dependent on the acid soils and waters. The cultivated blueberry was first established here early in this century.

In the post-World War II era, residential development threatened the region in the form of large retirement communities and spreading suburbanization emanating from nearby Philadelphia. Plans for a jetport and a new city were discussed and planned in the 1960's. The advent of casino gambling in Atlantic City, to the east of the Pinelands, created more pressure for development in the coastal and adjacent sections. It appeared in the mid-1970's that the region would go the way of most of the rest of the urbanized northeastern United States. The region is two-thirds privately owned, with the remaining one-third in public parks, forests, and wildlife management areas.

As urbanization began to encroach upon New Jersey's last vestige of wilderness, local citizens joined with state and national environmental organizations to demand action to save the fragile Pinelands. The U.S. Department of the Interior also expressed an interest in the region as a location to test a new concept in land management where various levels of government would use their land use authorities, combined with limited acquisition of the most critical places, to protect areas of national concern. In 1978, Congress designated the Pinelands as the country's first national reserve and invited the State of New Jersey to devise a comprehensive management plan for the region which, if approved by the Secretary of the Interior, would entitle the state to federal funding for acquisition.

In 1979, New Jersey responded to the federal invitation by enacting the Pinelands Protection Act, still perhaps the strongest state land-use legislation in the country. The Pinelands Commission was created, made up of federal, state, and local representatives. Charged with developing a comprehensive management plan, the commission was also empowered to ensure that all local governments (seven counties and 53 municipalities) include the elements of the regional plan in their own master plans and land-use regulations. Once this was completed, the commission would monitor local decisions to ensure consistency with the comprehensive management plan and could disapprove development not meeting necessary environmental standards. Development sponsored by governmental agencies would also be subject to the commission's approval. In this cooperative intergovernmental scheme, all participants were to "preserve, protect, and enhance the resources of the Pinelands" and permit only that development that was consistent with that purpose.

III. IMPLEMENTATION

The Pinelands Comprehensive Management Plan is an ecosystems approach to land management that classifies areas of the Pinelands based upon the interrelationships of its resources. It determines that type and intensity of development that is permitted in a manner that sustains the ecosystem while providing economic growth in appropriate locations. The existence of the management plan was an integral factor in the designation of the Pinelands National Reserve as a UNESCO designated Biosphere Reserve in 1983.

The core of the Pinelands is designated as the Preservation Area where development is strictly limited. Surrounding the core is the Protection Area where development types and intensities are determined, based on their location in a series of six management areas. Depending on the resource values of the management area, permitted developments range from very low-density uses in more pristine sections to those areas where future growth in the region is being directed. All development is subject to a wide range of environmental and cultural resource standards to protect water quality, wetlands, rare and endangered plant and animal species, prehistoric resources, and scenic values. The plan includes a number of innovative land management techniques, including the only regional transfer-of-development-rights program (TDR) in the country.

All seven counties and 51 of the 53 municipalities have revised their local master plans and zoning regulations to conform to the regional plan. The effectiveness of the program as a growth management device is best described by the fact that, since 1981, 96 percent of all development approved in the region has been located in those areas designated for future growth. Additionally, 26,315 hectares of ecologically sensitive lands have been acquired and 4,050 hectares deed restricted in perpetuity through the transfer of development rights program. The Pinelands serves as a model for many other regional land-use programs in the United States, particularly those involving a mix of public and private properties.

The Pinelands involves all levels of government and many private organizations in its management strategies and implementation programs. Partnerships have been developed with area universities to promote research and educational endeavors. Rutgers University established a Division of Pinelands Research to advance scientific knowledge about the region. The University also conducts, in cooperation with the Pinelands Commission, an early Pinelands Workshop covering a wide variety of topics to benefit the educational community. Pinelands curriculum guides have been developed with private foundation funding and are used in schools throughout New Jersey. Video and slide/tape programs and informative brochures and posters have also been produced with private financing.

The research component of the Pinelands Commission is an important factor in gaining a better understanding of the ecology of the region and in devising future policies to protect its resources. A Pinelands Research Council, representing academic and governmental organizations, has devised a plan to guide researchers and funding sources in priority research needs. A long-term ecological and economic monitoring program has been developed to measure the effectiveness of the plan as it unfolds. Recent funding from the National Park Service has enhanced the scale of the monitoring effort. Grants have also been secured for the development of Geographic Information Systems (GIS) capabilities, Atlantic White Cedar succession models, and a watershed-based study of the long-term ecological sustainability of wetlands systems. First-phase modeling to determine the potential location of prehistoric sites using environmental factors has

been completed. Alternative design, on-site wastewater systems are being evaluated by the commission to determine their nitrogen removal efficiency.

In 1987, the commission initiated a cooperative surface water quality monitoring program with county health agencies involving 133 stream stations. Wetlands buffer delineation models have been developed and evaluated. Other research endeavors by the commission include an analysis of fire history in the Pine Plains, a study of factors shaping pitch pine lowland vegetational gradients, and a preliminary analysis of the ecological implications of exporting waters from the region's aquifer system.

Future research projects will expand the ecological monitoring program and evaluate the effects of alteration of the Pinelands hydrology caused by water supply needs of the Pinelands and adjacent areas. Educational efforts are now centered on the development of an interpretive program for the Pinelands, a project being cooperatively undertaken by the commission, the National Park Service, and the New Jersey Department of Environmental Protection.

IV. Observations

The Pinelands model enables governments at all levels to plan for future growth in a manner that sustains a fragile ecological resource. Plans are implemented in a coordinated approach that permits consistency of decision-making based on common land use policies. Public investments in infrastructure are undertaken in an efficient and economical way since areas for growth are well-defined and better prepared to support more intensive development.

The State of New Jersey has enacted a number of support programs that enable the plan to accomplish its objectives. In 1987, a Pinelands Infrastructure Trust Fund was established to provide for wastewater treatment systems in Regional Growth management areas to accommodate projected development. A Municipal Property Tax Stabilization Act provided limited funds for in-lieu-of-tax payments to municipalities that could demonstrate fiscal stress because of the inability to develop lands programmed for conservation. New legislation often exempts the Pinelands when objectives of those statutes are inconsistent with the comprehensive management plan or, as in the case of the New Jersey Development and Redevelopment Plan, when policies in the Pinelands are more stringent than elsewhere in the state.

What has really been learned in the Pinelands Biosphere Reserve is that in the United States, at least, a combination of economic growth and ecological sustainability is possible when regions are planned to accommodate both objectives. The emphasis of the comprehensive management plan is to preserve, protect, and enhance the resources of the Pinelands. That ecological imperative, however, permits continued economic viability of a region while maintaining the integrity of its natural resources. The future challenge is to secure permanent protection for those remaining areas of critical ecological concern, either through continued acquisition or the application of alternative land protection techniques. As a biosphere reserve, involving issues related to both public and private land holdings, intergovernmental and public/private partnerships, and ecological sustainability and growth management, the Pinelands remains a testing ground for new approaches to land management.

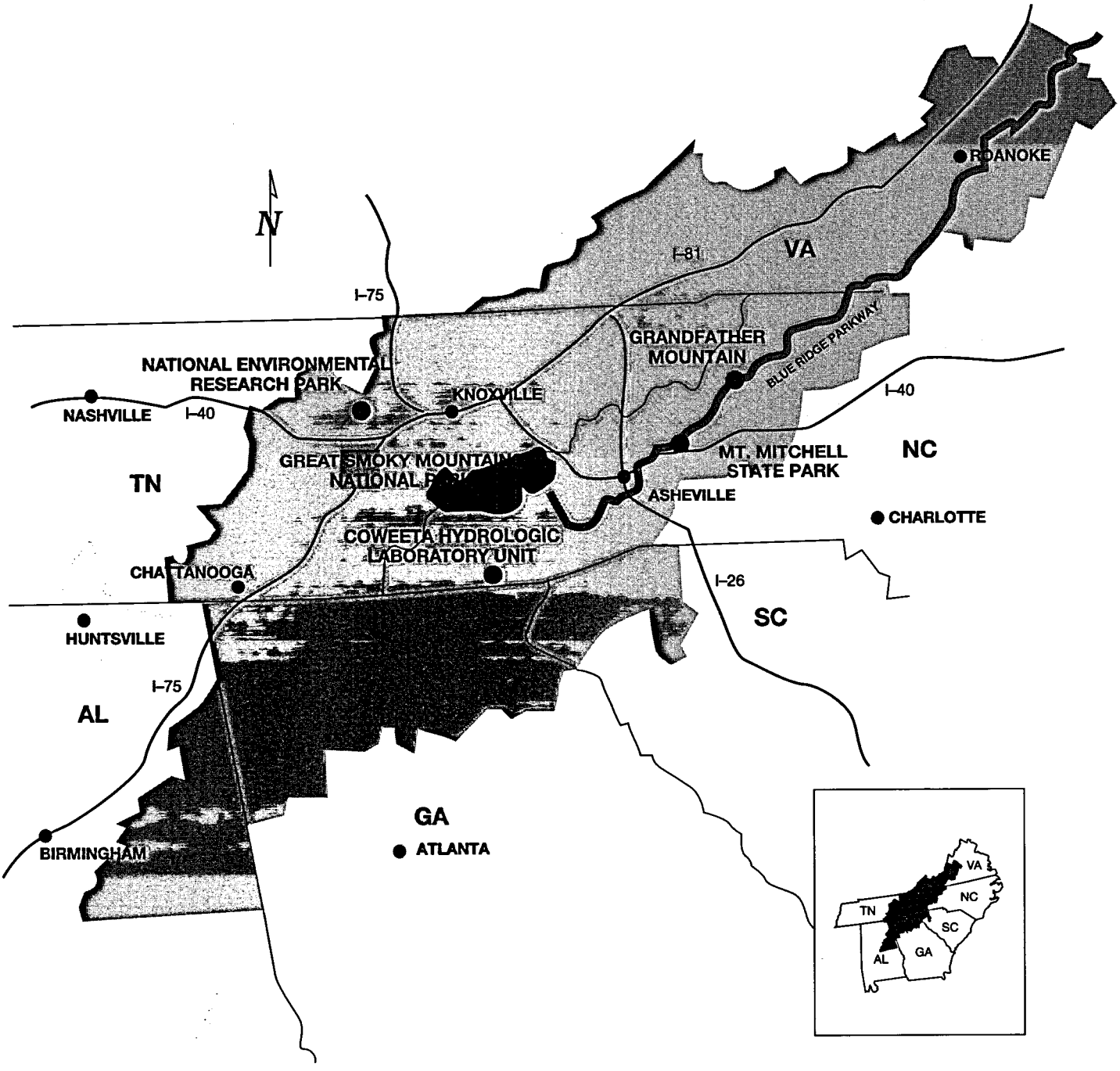
Principal Contributor

Terrence D. Moore, Executive Director, New Jersey Pinelands Commission

Southern Appalachian Biosphere Reserve

Building a Model for
Bio-Regional Cooperation

Southern Appalachian Biosphere Reserve



SOUTHERN APPALACHIAN BIOSPHERE RESERVE

The Southern Appalachian Biosphere Reserve (SABR) covers part of six states. In 1976, Great Smoky Mountains National Park and Coweeta Hydrological Laboratory were designated biosphere reserves and became the laboratory for U.S. MAB program development. These two biosphere reserves, along with the Oak Ridge National Environmental Research Park, were the founding units of both SABR and the Southern Appalachian Man and the Biosphere (SAMAB) regional cooperative. Mt. Mitchell State Park (NC) and Grandfather Mountain have now been added as sites. This model MAB cooperative promotes programs initiated and funded by its member agencies. SABR and SAMAB's primary concerns are demographic changes in the region and their impact on natural resources.

I. AREA DESCRIPTION

The Southern Appalachian Biosphere Reserve (SABR) encompasses a series of ancient mountain ranges in six states—the highland portions of northern Georgia, northeastern Alabama, western South Carolina, eastern Tennessee, western North Carolina, and southwestern Virginia—an area of 247,028 hectares. The region contains a variety of national and state parks, recreational and wildlife areas, national and state forests, experimental forests, lands administered by the Tennessee Valley Authority (TVA), and Cherokee Indian lands. About a third of the land in the region is owned by federal and state agencies.

The Southern Appalachians are recognized as having perhaps the greatest diversity of tree and shrub species in North America. In the UNESCO classification system the biome is temperate broadleaf forest and the biogeographic province is eastern forest. This region is primarily second growth temperate forests and contains a diversity of habitats ranging from remnant prairie grasslands and swamp forests to high elevation spruce-fir forests and grassy meadows. More than 130 species of trees and 1,500 species of flowering plants are found in the region.

From 1890 to 1930, a growing market for timber prompted deforestation; and virtually all of the old growth forests at lower elevations were cleared for farms or lumber. Large pockets of old growth remained in the mountains, however; and in 1923 leading citizens began a movement to establish a national park. This effort culminated in 1940 with the dedication of Great Smoky Mountains National Park (GRSM)..."to protect the largest remaining tract of virgin forest in the eastern United States." During the same period, several national forests and forestry research and training programs were also established; and forest management practices began to improve. Another major action to reverse the trend of natural resource devastation was the establishment of the TVA in 1933 with a mission to plan for the proper use of all the resources of the Tennessee River drainage basin.

Since World War II, the region has attracted many newcomers. Regional population growth exceeds the national average but is unevenly distributed. Good health care facilities and recreational opportunities are attracting retirees. Younger, well-educated people are finding jobs in cities. However, many of the long-term residents with less formal education are finding fewer job opportunities as the traditional resource extraction and textile industries decline. These factors contribute to poorly planned land development and degradation of natural resources.

II. MAJOR ISSUES

Today, with growing population and tourism pressures, the Southern Appalachian region's future is again at risk. It faces a wide range of impacts on its ecosystems and natural resources,

with adverse consequences for future economic development. These include the effects of air and water pollution, changing patterns of land use, urbanization, tourism, fragmentation of wildlife habitats, and invasion of natural habitats by non-native species.

There is a need for more effective government action to address vital public needs in developing a sound economy and enhancing and maintaining a healthy environment. Existing resources could be used more effectively and efficiently. SAMAB has the challenging task of focusing the resources of its participating agencies to address these issues. It can provide the training and information exchange necessary to establish an effective model for sustainable growth and effective ecosystem management.

III. Background

The Southern Appalachian region is a unique mix of scenic beauty, rich biodiversity, traditional mountain cultures, and modern development. Because of its related flora, fauna, climate, geology, and culture, it could be characterized as a "bioregion."

Its biological, geographic, economic, and cultural characteristics make it an appropriate area in which to address issues that can best be resolved through interagency cooperation and public/private partnerships, rather than through separate outreach programs. SABR has been designated as the primary zone of cooperation under the auspices of the Southern Appalachian Man and the Biosphere (SAMAB) program. In 1986, U.S. MAB endorsed the nomination of the SABR and initiated planning for a model biosphere reserve regional project.

In the 1986-1988 period, a series of interagency meetings was held and consensus was reached on creating a regional MAB organization. The proposed organization consisted of an interagency cooperative to enable broad federal and state participation; a non-profit foundation for involving the private sector; and an office, funded by the participating agencies, to coordinate and administer the SABR program on behalf of the participants. In August 1988, six federal agencies signed an Interagency and Cooperative Agreement for the Establishment and Operation of the SAMAB Cooperative.

The SAMAB agreement calls for cooperation on activities consistent with MAB and BR goals. 1989-1991 was essentially a development period as organizational and administrative structures were developed for the SAMAB Cooperative, program goals were defined, and a few projects were initiated with funds made available principally by the federal member agencies. Also, during this period the non-profit SAMAB Foundation was put in place.

Since 1991 many projects have been successfully launched and membership in SAMAB has grown. Eleven federal agencies and three state agencies are now members of the SAMAB Cooperative. Signatories are: Tennessee Valley Authority, U.S. Department of Agriculture-Forest Service, National Park Service (NPS), Environmental Protection Agency, Economic Development Administration, U.S. Department of Energy (through Oak Ridge National Laboratory), U.S. Fish and Wildlife Service, U.S. Geological Survey, the U.S. Army Corps of Engineers, The Appalachian Regional Commission, State of Georgia, State of North Carolina, and State of Tennessee. Other participants are: Tennessee Aquarium, World Wildlife Fund, Tennessee Nurseryman Association, U.S. MAB, and SAMAB Foundation. Appendix A provides a more detailed history of the development of the SAMAB program.

IV. Implementation

SAMAB has promoted many projects and programs with its participating and cooperating agencies. In its Air Quality program, SAMAB sponsored regional forums for reviewing policies, regulations, research, and monitoring activities, which led to closer cooperation among regulatory agencies. It also coordinates regional participation in the Forest Health Monitoring Program.

SAMAB-assisted research projects improve understanding of the regional ecosystem and the scientific basis for ecosystem management. These projects include reintroduction of the red wolf into the Great Smoky Mountains National Park and a habitat assessment for neo-tropical migratory birds. SAMAB participants conducted important monitoring and research programs for threatened and endangered species, invasive species, environmental biotechnology geosciences, fresh water ecosystems, long-term ecosystem processes, landscape studies, human resources, and the potential regional effects of global climate change. One important near-term SAMAB goal is the development of a regional geographic information system that serves the ecosystem management and sustainable development objectives of SAMAB participants.

The BR cooperative has successfully promoted public awareness and understanding of important resource issues through development of educational material for schools and public education programs. SAMAB is a regional clearinghouse for information on environmental education and training programs; and has distributed its directory of these programs to 2,000 schools. SAMAB and the Knoxville NBC affiliate sponsored an Emmy award-winning documentary on the restoration of the endangered red wolf to the Southern Appalachians. A viewer's guide for teachers was widely distributed, and a poster was sent to all local schools and public libraries.

During the past several years, SAMAB members have appeared in numerous forums throughout the United States and overseas to explain the value of the SAMAB Program. A number of international groups have visited the region to examine the SAMAB model. Sponsors of these groups have included the World Bank, U.S. Agency for International Development, U.S. Information Agency, and the Hubert Humphrey Fellowship Program.

Short-range goals of the SAMAB program are to:

- Increase member agencies' cooperation on common issues.
- Enhance public recognition of and appreciation for SAMAB's activities.
- Design and initiate an effective marketing plan to promote the SAMAB model and obtain secure sources of financial support.

Longer-range goals of the SAMAB program are to:

- Develop an expanded program of support for phased, large-scale research, management, and educational projects and programs concerned with priority natural resource and economic development issues.
- Seek significant continuing federal support for an expanded program with an increasing interface and exchange with programs in the United States and overseas.
- Provide full staffing and office facilities to manage and coordinate the program.
- Develop the membership and support for an expanded SAMAB Foundation program.

SELECTED LIST OF SAMAB ACTIVITIES

Project:	Forums on Air Quality
Purpose:	Identify strategies for monitoring, research and state collaboration concerning air quality in Class I areas of Southern Appalachians (SA).
Participants:	More than 250 in two forums: federal, state, and local governments; industry, and non-governmental organizations
Results:	• Formation of Southern Appalachian Mountain Initiative (SAMI)—a multi-agency, multi-state initiative focusing on air quality in SA. • SAMAB to assist National Park Service to develop a regional air quality management plan. • Publication of SAMAB supported brochure on "Understanding Air Quality in SA."
Benefits:	• SAMI developed and received support because of SAMAB sponsoring. • SAMI can deal with air pollution sources in several states at once rather than source by source. • Should lead to regional approach to air quality management.

Project:	Forest Health Monitoring in SA (category under EPA's EMAP Program)
Purpose:	Monitor ecological change and forest health on ecosystem basis (usually initiated on state-by-state basis)
Participants:	TVA, US Forest Service, SCS, NPS, and contractors (EPA grant to SAMAB administered by TVA)
Results:	• About 50 plots in place and collecting data after two years • Another 50-60 plots in SA over next two years
Benefits:	After all plots are in place, ecological change can be monitored for SA ecosystem.

Project: *Front Runner:* The Red Wolf Recovery Effort

Purpose: To educate the public on the recovery of the endangered red wolf in GRSM

Participants: SAMAB agencies, TV stations, schools, and public libraries in SAMAB zone of cooperation.

Results:
- Emmy award winning 30-min. TV program
- Award winning education poster
- Teachers Guide

Benefits: Increased public awareness and education on endangered species and the importance of reintroduction of the red wolf.

Project: Threats to the SA Forest: Dogwood Anthracnose

Purpose: To educate the public on how to grow and maintain healthy flowering dogwood trees

Participants: Workshops held in three cities for nurseries, landscapers, and citizens—more than 250 participants

Results:
- Video on controlling dogwood anthracnose
- Education poster and information packet
- 500,000 brochures disseminated.
- Three additional workshops are planned on other threats to SA forests.

Benefits:
- Revitalization of sales by nurseries.
- Increased understanding by public of this disease and how to grow and maintain dogwoods.

Project: Sustainable development strategies for local communities with tourist-based economies

Purpose: To develop strategies that local communities may follow in determining their future

Participants: The first community was Pittman Center, TN. It has formed a local chapter of SAMAB with about 75 members. 700 copies of the report have been distributed to other communities in the U.S. and Canada.

Results: Pittman Center, TN, is following the strategic plan it developed. The community has received two other grants to support the implementation of the plan.

Benefits: Project illustrates the importance of communities developing a strategic plan to guide their future

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Project: SAMAB Annual Conference

Purpose: To exchange research management and educational data

Participants: Conference attracts 200-250 regional participants each year.

Results: Regional exchange of information between participants and the public.

Benefits: Information exchange benefits the region.

V. Benefits, Constraints, Opportunities

SAMAB benefits each of the units in the SABR by providing a cooperative institutional structure for planning and carrying out projects that support resource management. The SAMAB umbrella enables participants to share ownership of large-scale projects that require coordinated action. These projects are often beyond the capability of individual participants. SAMAB plays a growing role in disseminating scientific and technical information to users. It is becoming a significant source of environmental education materials for the region's schools.

The regional cooperative has brought federal and state agency employees together, allowing them to seek collective solutions to long-standing as well as new problems. Tensions and suspicions have faded as SAMAB members learn more about each other's agencies and their missions and goals.

The reluctance of regional and national agency administrators to commit time, attention, and money to support SAMAB efforts limits its effectiveness in addressing a larger variety of regional issues. Higher level managers have not always fully recognized the benefits of SAMAB's regional approaches as useful and necessary for achieving their agencies' mission.

SAMAB still lacks a reliable financial base. Local managers support SAMAB from their own budgets because they have had difficulty obtaining funds for cooperative regional projects. Although participants have supported a number of research and education projects, follow-up on SAMAB's community development initiative, for example, has lagged for lack of investment. The SAMAB Foundation is expected to help raise funds, but to date it has not been successful in providing needed staff and administrative expenses.

Despite these financial constraints, SAMAB continues to build on the growing confidence of the public. Its education programs are informing the public and encouraging better management practices. A formal relationship with a regional network of universities is being developed to increase the flow of reliable scientific information to public and private users. SAMAB has submitted proposals to the National Biological Service and others to do regional studies. Several national forests are using the SAMAB umbrella to seek recognition as Regional Ecosystem Management Units and become eligible for additional agency funds for projects that contribute to BR objectives. The SAMAB Foundation is working to attract more private-sector partners and to involve local people more directly in SAMAB activities.

VI. Observations

Several factors have contributed to SAMAB's significant progress in implementing the biosphere reserve concept:

The interdisciplinary scientific expertise available in regional universities, institutions, and government agencies.

A cohesive region having a unique physiographic, biological, and cultural identity.

The willingness of representatives of federal and state agencies, non-governmental organizations, and private enterprises to contribute their time and talents to SAMAB forums and projects.

The important roles of "native sons" in developing and administering the BR program and fostering credibility with local people.

The sustained support of the TVA, NPS, U.S. Forest Service, and Oak Ridge National Laboratory core area managers and staff for implementing BR concepts.

U.S. MAB's funding for early BR planning and research projects.

The high visibility of SAMAB's educational and outreach programs.

The SABR area is diverse. Modern cities with well educated and highly skilled residents contrast with small towns with limited economic opportunities. Some rural areas are being flooded with new residents eager to buy "the best spot" but unconcerned about their impact on the local environment. Local governments are ill prepared to manage this new and sometimes destructive growth. In view of the lack of leadership in promoting ecologically sound local development, SAMAB needs the resources to focus its attention on building local alliances.

As the first Regional MAB Cooperative, the SAMAB program provides a model for involving many agencies and interests in cooperative research, educational, and demonstration programs to support ecosystem management and regional planning.

Principal Contributors

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Vernon C. Gilbert, Retired, National Park Service

Appendix A: Background—Southern Appalachian Man and the Biosphere Program

The SABR and the SAMAB program evolved from a long series of activities to develop and implement the biosphere reserve concept. In 1974, when UNESCO and the United Nations Environment Program (UNEP) prepared to jointly organize the Task Force on *Criteria and Guidelines for the Choice and Establishment of Biosphere Reserves*, Great Smoky Mountains National Park (GRSM) with its cooperative relationships with communities, agencies, and institutions in the region was used as an example of the proposed biosphere reserve concept. In 1976, GRSM, and the Coweeta Hydrological Laboratory (U.S. Forest Service) were among the first biosphere reserves designated by UNESCO.

As a large securely protected area, GRSM fulfilled the role of a core area to conserve natural ecosystems and provide benchmarks for monitoring. The Coweeta Hydrological Laboratory, with its long record of experimental research, fulfilled the need to investigate the effects of natural disturbance and human manipulations of forest ecosystems. The Oak Ridge National Laboratory and its National Environmental Research Park participated in this cooperative arrangement from the beginning and was officially designated a biosphere reserve unit in 1988.

A Brief Chronology of Some Major SABR Events

1976: First Regional MAB workshop. Coweeta Hydrological Laboratory and GRSM designated as biosphere reserves.

1977: Pilot testing of multimedia pollutant monitoring methodology. First pilot study sites in GRSM.

1978: International workshop on long-term ecological monitoring in biosphere reserves. Southern Appalachian Research and Resource Management Consortium formed (six universities and four federal agencies) based on MAB concept.

1980 U.S. MAB report on history of scientific activities in GRSM.

1981: GRSM selected as MAB pilot study site for mutispectral scanner land-use/land-cover mapping.

1983 Pilot study ethnobotanical survey. Automated data base created for GRSM.

1984: National conference on management of biosphere reserves held as part of GRSM 50th anniversary. GRSM, Coweeta, and two other BR study sites chosen for coupling ecological study with remote sensing.

1985: U.S. MAB Biosphere Reserve Selection Board on biosphere reserves in eastern forests recommended expansion of BR network.

1986: UNESCO recognized Southern Appalachia as one of two areas in the U.S. which best exemplified BR concepts. NPS began process of linking parks, adjacent lands, and regional interests to identify and address regional issues. GRSM developed BR education modules on resource issues for grades K-8. U.S. MAB identified proposed SABR as candidate site for testing Smithsonian/MAB biological diversity protocol.

1987: Site managers and administrators in Southern Appalachia met to explore cooperative project. Interagency Committee established to develop a plan for a regional pilot project. U.S. MAB awarded $10,000 grant to support planning effort.

1988: SAMAB Cooperative established by Interagency and Cooperative Agreement. SABR designated by UNESCO.

1989: SAMAB Coordinating Office established and Executive Director selected. First Cooperative activities initiated.

1990: U.S. MAB officially recognized SAMAB as a regional program. Council on Environmental Quality (21st Annual Report) used SAMAB as an example of ecosystem management. SAMAB Foundation officially established.

1991: SAMAB nominated for President's Partnership award. SAMAB received "Natural Resources Conservation Education Award" from U.S. Forest Service. Senator Sasser, Chairman of the Governmental Affairs Subcommittee on General Services, wrote letters to SAMAB signatory agencies complimenting them on their important contribution to the conservation awareness of the area.

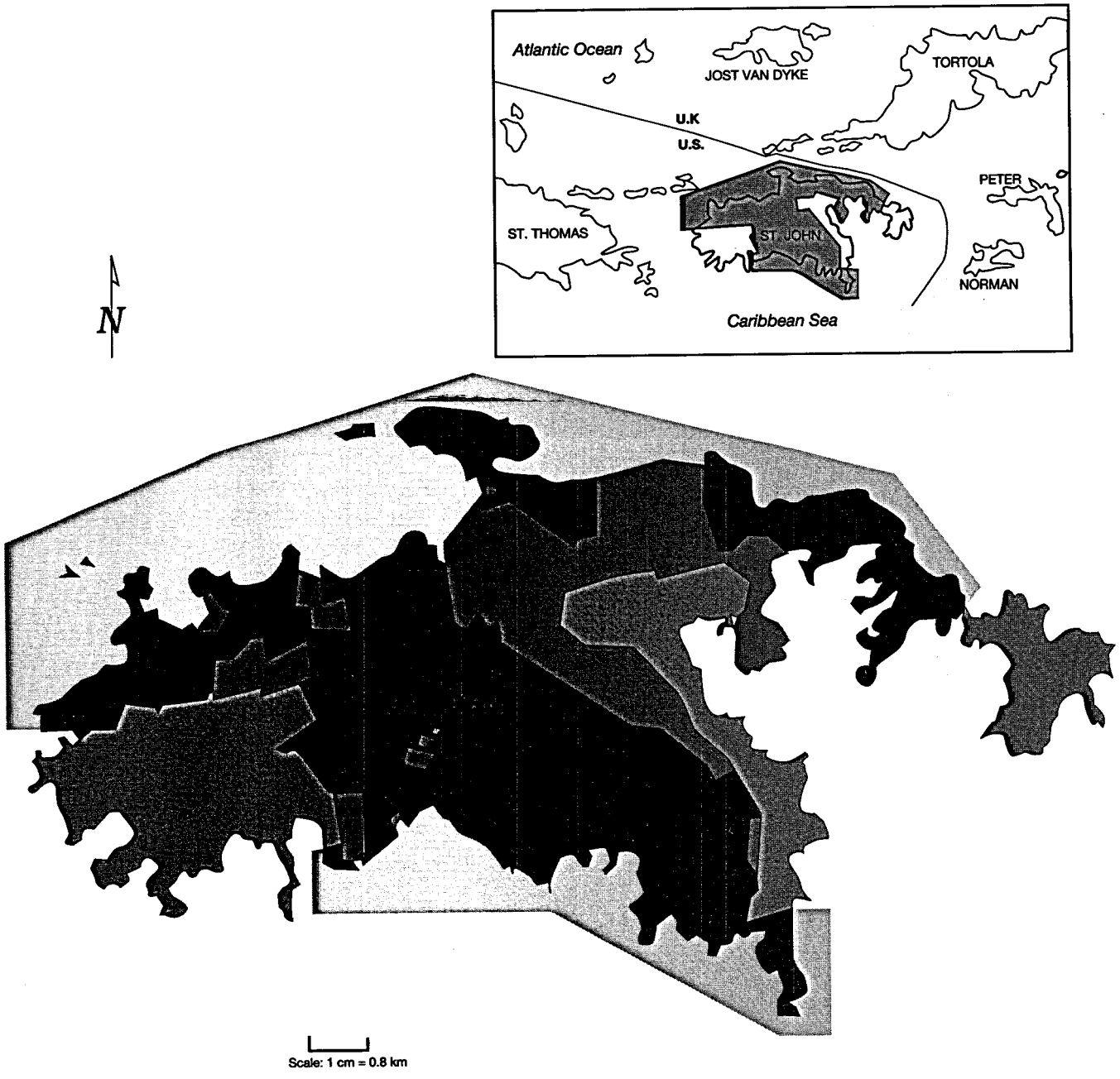
1992: SAMAB and WBIR-TV (NBC affiliate in Knoxville) won an EMMY award for production of "Front Runner." SAMAB's poster, "Back from the Brink," named one of top 20 posters by Urban America. Governor Miller, Georgia, sent letter to fellow governors in SAMAB region complimenting the SAMAB program.

1993: Mount Mitchell State Park (managed by North Carolina Department of Natural Resources) and privately owned Grandfather Mountain designated by UNESCO as management units of the Southern Appalachian Biosphere Reserve.

Virgin Islands Biosphere Reserve

Moving Toward Integrating Research and Community Interests on a Small Caribbean Island

Virgin Islands National Park and Biosphere Reserve



Virgin Islands Biosphere Reserve

The boundaries of the designated biosphere reserve coincide with Virgin Islands National Park (VINP). The park has not yet prepared a biosphere reserve (BR) zonation to delineate Protected Area and Zone of Managed Use within the designated BR boundaries. There is both a domestic and international Zone of Cooperation. During the past decade, there have been various efforts to implement the BR concept on St. John and to develop linkages with the small-island territories and nations in the Lesser Antilles and the Caribbean basin. Because these efforts have relied heavily on National Park Service (NPS) resources and participation, the NPS has been a dominant influence in the early efforts to develop a BR program.

I. Area Description

The 5118 hectare Virgin Islands National Park, approximately half of the island of St. John (the smallest of the three principal U.S. Virgin Islands), and some adjacent marine waters constitutes the Virgin Islands Biosphere Reserve. The biosphere reserve includes diverse terrestrial, coastal, and marine habitats, including dry and moist tropical forests, cactus scrub, sandy beaches, rocky shorelines, numerous offshore cays, mangroves, seagrass beds, and coral reefs. The area is classified as a mixed island system in the Lesser Antillean biogeographic province.

II. Major Issues

The island now faces serious environmental problems from increasing tourism and residential development, including destruction of wildlife habitat, damage to reefs from anchorage and recreational uses, commercial fishing activities, water pollution from ships and land-based sources, as well as land erosion and related sedimentation in coral reefs and other nearshore habitats.

III. Background

Virgin Islands National Park was designated a biosphere reserve (BR) by UNESCO in 1976.

In 1983, UNESCO, in cooperation with U.S. MAB, the NPS, the Caribbean Conservation Association, and other regional agencies and organizations, sponsored an international workshop on St. John. The forum focused on the role of protected areas in the sustainable development of small Caribbean islands. The workshop provided the first exposure to BR concepts for most of the region's conservation and economic development interests. Various possibilities for establishing biosphere reserves to help build models of sustainable ecosystem uses were discussed, including the idea of a multi-site biosphere reserve with cooperating units on several islands.

About the time of the workshop, NPS—with the help of scientists and administrators who had recently established a multi-university cooperative in the Southern Appalachians—helped establish the Virgin Islands Resource Management Cooperative (VIRMC). The cooperative brought together representatives from federal agencies; regional agencies in the U.S. Virgin Islands, Puerto Rico, and the British Virgin Islands (BVI); nongovernmental organizations; and several universities to obtain baseline data on natural resources in the national park, on St. John, Buck Island Reef National Monument, St. Croix, and in the BVI. VIRMC, like its Southern Appalachian counterpart, was influenced by BR concepts, but was not chartered specifically to conduct a BR program.

With strong NPS financial support, VIRMC began a research program to improve basic understanding of interacting natural and human systems and to explore the best way to implement a BR program. VIRMC initiated 31 projects to which more than 10 agencies and institutions ultimately contributed funds or in-kind support. The projects

included a study of the applications of BR concepts in the St. John/BVI region that recommended participation of local people in developing demonstration projects integrating conservation and local needs. The NPS published the results of the projects as a special biosphere reserve report series. The last volume is a comprehensive summary of the marine and terrestrial research which had been done up until 1988, with major emphasis on the VIRMC studies and provides useful information for conservation, economic, and scientific interests throughout the region.

IV. Implementation

In 1986, the NPS constructed the Virgin Islands Biosphere Reserve Center (VIIS/BR) to support BR goals. The Center provides space for offices for research scientists and resource managers, laboratories, research collections, conferences, training facilities, public education programs, community development activities, and lodging for researchers working in the park. The Center's activities have fostered recognition of the biosphere reserve in the Virgin Islands and the Caribbean basin.

In the absence of additional funding for VIRMC, the park continued to carry out a multi-disciplinary research and monitoring program that builds upon the VIRMC projects. For example, BR researchers have coordinated the testing and protocols for monitoring the status of coral reef communities and are now using this "low-tech" methodology to train specialists from other islands in developing reef-monitoring programs. Extensive long term monitoring continues of coral reefs damaged by Hurricane Hugo and by boat anchors. Other research includes documentation of baseline water quality and reef conditions near an upland construction site, and conducting studies of the effects of trap fishing around the park. Researchers sponsored by the Smithsonian are conducting long-term monitoring of the forests of St. John.

Island Resources Foundation recently received a grant from the MacArthur Foundation to implement a BR program that meets regional needs, including the restructuring of VIRMC to address regional (versus park) issues. The project will identify and involve all community leaders, federal and regional agencies, university researchers, resource managers, and other potential stakeholders in reaching broad consensus on the goals, objectives, and structure of their BR program.

V. Observations

The BR program has not yet produced a framework for involving all sectors in a participatory BR program. The existing BR program is a resource management, research, and training program, which is being coordinated by the research biologist from the newly formed National Biological Service and park resource managers. VIIS/BR has conducted an outstanding program of interdisciplinary research, long-term monitoring, and training that will contribute significantly to building a broad-based BR program. The park's extensive data bases will help stakeholders design a BR program that supports development of realistic ecosystem management goals while meeting the community's needs for sustainable social and economic development. The BR program is already meeting needs of NPS managers, as well as assisting resource managers from other protected lands in the Caribbean basin.

As Virgin Islands National Park has a long history of looking beyond park boundaries to work with others in the Caribbean area, so too is VIIS/BR serving as a model for others who are establishing protected areas in the Caribbean. People from BVI, Belize, Saba, Venezuela, St. Vincent, Jamaica, Turks and Caicos, and other countries have participated in training programs sponsored by the biosphere reserve. Resource managers from 12 marine parks in the region have attended training sessions at VIIS/BR that helped them set up programs for their new parks. Close coordination is maintained with The Nature Conservancy in providing these international training programs for countries throughout the Caribbean.

A likely area of stakeholder concern is the rapid pace of development and the expanding tourism industry on St. John. The national park is a mixed blessing. It has spurred economic development, but has also altered traditional patterns of resource use through its control over a large portion of land and nearshore waters. The VINP priority to serve the needs of visitors while protecting park resources differs from the biosphere reserve's priority to serve the needs of the ecosystem and the residents within it. A BR coordinator is needed to champion BR priorities while maintaining the appropriate balance of National Park preservation mandates and visitor/ecosystem requirements.

A revitalized VIRMC could be the institutional vehicle to undertake projects leading to a greater

BR program. The intent is to reach out to the community and develop truly cooperative projects. To date, the local government has been ineffectual in helping shape the BR program. Perhaps community leaders working through VIRMC and using NPS resource management and NBS research and training assistance can bring their government to assume a more responsive role for designing and supporting BR projects.

A key concern is to empower public and private entities to participate in planning and implementing the BR program. A revitalized and restructured VIRMC may enable stakeholders to design their BR program, which can become an important mechanism for improving park relations with the community.

VIRMC's current funding is for three years. By selecting some specific areas of strong interest for demonstration projects, a successful venture might show how the BR program provides a framework for effective resource management. Then the Virgin Island government, non-governmental organizations, and private individuals would be better prepared to plan ecologically sound economic development on St. John.

Principal Contributors

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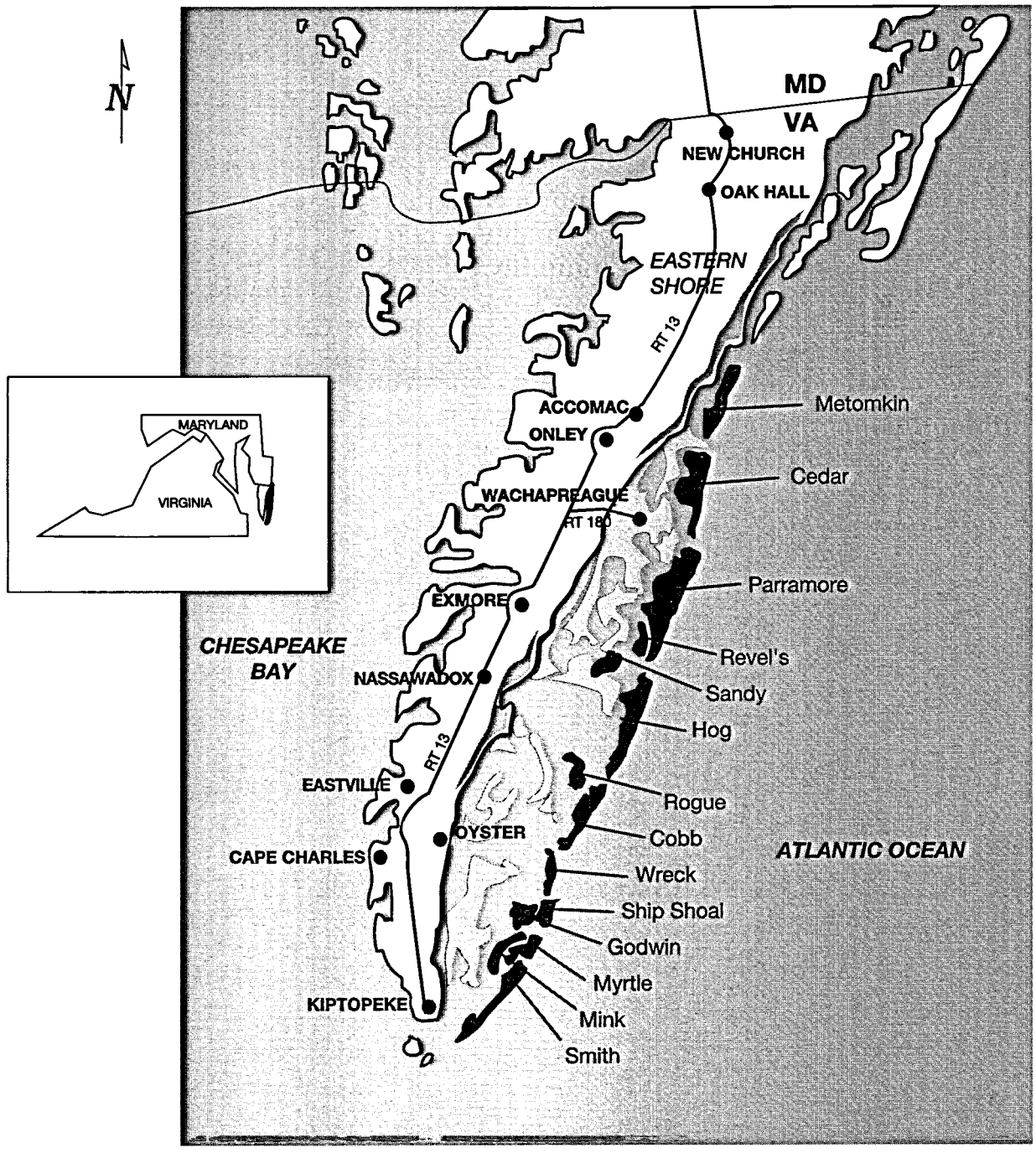
THE VIRGINIA COAST BIOSPHERE RESERVE

A Protected Natural System
Enhancing the Quality of Life for
the Local Community

Virginia Coast Biosphere Reserve



The Virginia Coast Biosphere Reserve

The Virginia Coast Biosphere Reserve is owned entirely by The Nature Conservancy. Educational outreach to the surrounding communities has taken on increasing importance with the publication of a quarterly newsletter, programs designed for school participation, and workshops for teachers and other community leaders.

I. Area Description

The Virginia Coast Reserve is composed of barrier islands with adjacent estuaries, marshlands, and mainland buffer areas. The Virginia Barrier Islands run from Assateague Island in the north 80 miles south to Fisherman's Island at the mouth of Chesapeake Bay. The Nature Conservancy owns all or part of 14 of the 18 barrier islands. The landscape changes season to season due to action of wind and sea. The biogeographic province is Virginian-Mid Atlantic, almost entirely grasses and shrubs with scattered pine and oak maritime forests.

II. Major Issues

Barrier island migration and marshland dynamics due to rising sea level are facts which influence habitat study and conservation.

Sustainable economic development of the surrounding rural area is a major concern.

III. Background

European activity began with settlers who pastured livestock on the islands. In the 19th century, Nathan Cobb and his family settled on Cobb Island. They built a lucrative hotel business, but by 1897 winter storms had pounded the coast and the resort was gone. In the early 20th century, a village called Broadwater, complete with 40-50 homes, a school and church, existed on Hog Island. The hurricane of 1933 submerged the island and forced the inhabitants to float their homes to the mainland. During this period, lavish hunt clubs were established on several of the islands. They succumbed to a different type of ecological impact, the loss of habitat and over exploitation of migratory species. Year-round human habitation does not appear to be a sustainable use of the islands.

In 1969, a group of New York investors announced the development of a luxurious multi-million-dollar recreation and retirement community on the three southernmost barrier islands. There was talk of bridging the entire chain of barrier islands and opening them to development. Several factors conspired, however, to give the islands a reprieve: a major recession, passage of new state wetland laws, and outcry from environmentalists.

The Nature Conservancy purchased the three islands and since 1969 has purchased some 45,000 acres of barrier islands, marshes, and mainland seaside farms, as property came on the market. It was called the Virginia Coast Reserve, and a small management staff was hired.

The Nature Conservancy realizes that nearby incompatible economic activities can damage, if not destroy, ecological conditions and processes upon which reserve goals depend. A major goal of the Virginia Coast Reserve was to retain the high water quality in the bays. This high water quality is essential for maintaining commercial watermen activities as well as for feeding use by the rare colonial nesting birds that summer on the islands biosphere reserve.

In the late 1980's, The Nature Conservancy launched a major program and capital campaign called the "Last Great Places." The basic idea was to expand The Conservancy's traditional work of buying land and establishing nature preserves to one of operating in larger landscapes or ecosystems. Since 1985, the Virginia Coast Reserve has served as The Nature Conservancy's national flagship project for ecosystem conservation and sustainable development. Virginia Coast Reserve has adopted the Man and the Biosphere concept of achieving a sustainable balance between the conservation of biological diversity, economic development, and maintenance of associated cultural values.

IV. Implementation

For more than 20 years, it has been a goal of The Nature Conservancy to protect this last U.S. intact coastal system on the Atlantic. However, it

became apparent that this would involve more than simply buying land, erecting fences, and posting signs. The islands and marshes have been used by humans for centuries. They constitute a valuable economic resource, and local people depend upon the clean waters for fish and shellfish for the table and the market. The Nature Conservancy's activities began to factor in human use, not only for economic reasons, but for historic and cultural ones as well. The staff of the Virginia Coast Reserve has launched six initiatives, or priorities, on which to focus its energies.

1. Protection. Preservation of the core preserve, the barrier islands, salt marshes, and the productive seaside bays. This is the most fundamental priority. The other five support it. The core consists of 34,000 acres; and while it is still being added to by purchases and donations, the basic protection job is largely done. Between The Nature Conservancy, the U.S. Fish and Wildlife Service, and the State of Virginia, it is 90 percent protected.

2. Buffer lands. Adjacent to the bays are mainland farms, woodlands, and marshes which protect the core natural area and the island ecosystem. Appropriate uses in these areas can protect the seaside marshes and estuaries, while providing jobs and economic vitality. The Nature Conservancy has bought and resold with conservation easements several seaside farms. The Conservancy continues its research and planning efforts to improve techniques for seaside farm conservation and compatible sustainable development and to expand the resulting protection.

3. Research. Protection of the core area is science driven. Research monitors the health of the ecosystem and is one of the major tools of protection. Research also provides economic benefits by helping to protect and enhance the populations of valuable fish and shellfish. Research facilities create demand for services, housing, and other necessities that benefit the community. The Department of Environmental Sciences of the University of Virginia (UVA) and The Nature Conservancy initiated a long-term interdisciplinary coastal research program on the Eastern Shore of Virginia. The program is one of 17 ecological research programs selected by the National Science Foundation for long-term support. The research projects of the Virginia Coast Long-Term Ecological Research (LTER) are selected to cover changes within a broad domain of space and time: from millennial to monthly in time; from microscopic to landscape in scale. UVA's LTER scientists focus on long-term research that helps form the basis of our understanding of this complex ecosystem. Recently, Old Dominion University and The Nature Conservancy initiated a partnership to create the Virginia Coast Institute, a multidisciplinary research and education facility devoted to the field of sustainable economic development on the Eastern Shore of Virginia. Building on existing Eastern Shore community initiatives, the Virginia Coast Institute will ultimately demonstrate ways in which a community can preserve the environment while promoting compatible economic development.

4. Education. The Virginia Coast Reserve offers various outreach programs designed specifically for students and local community groups. The goal of all programs is to interpret the importance of preserving Virginia's barrier islands and marshes as an intact wilderness coastal ecosystem and to inform people about the significance of a biosphere reserve on the Eastern Shore. As a reinforcement to the outreach programs, outdoor programs, hikes, and field trips are conducted at Brownsville, the reserve's headquarters, and seasonally to the barrier islands. The Conservancy also participates in partnerships with other local agencies and organizations to develop and offer educational projects which provide opportunities to share resources and offer a broad conservation and environmental education experience for local participants. A special new educational initiative, the Legacy Program, has developed from a partnership between the Northampton County Schools and The Nature Conservancy. The Legacy Program was modeled on the Foxfire philosophy of instruction. Legacy involves students in the decisionmaking process and gives them responsibility for their own learning. The program focuses on the unique historical, cultural, and natural heritage of the Eastern Shore. Legacy students are encouraged to use the community as a primary resource in their

investigations and projects, allowing The Conservancy to continue to offer support to the program in a variety of ways.

5. Partnerships. The biosphere reserve program cannot exist without the involvement of the entire community. The Virginia Coast Reserve project includes local individuals; farmers; business people; federal, state and local governments; colleges and universities, and community groups willing to invest time and dollars in a project that protects a rural way of life yet includes a vision for sustainable economic growth and vitality that will benefit all members of the community.

6. Economic vitality. The biosphere reserve plan means people living in harmony with nature. Central to this is the belief that protection of a natural system will enhance the local economy and provide a better quality of life for people in the community. In 1993, The Nature Conservancy Board of Governors approved the establishment of the Virginia Eastern Shore Sustainable Development Corporation. Over a 5-year period, the corporation will be developed as a holding company with three operating entities: the Eastern Shore Product and Development Marketing Company will have an initial focus on launching two product lines, nature-based tourism, and specialty agricultural products, which draw upon the Eastern Shore's strengths; the Eastern Shore Sustainable Venture Fund will provide loans, loan guarantees, and venture capital to local enterprises which are ecologically compatible and meet criteria for sustainability; the Eastern Shore Lands Company will serve as the vehicle to implement sustainable development of the landscape of the shore, just as the product development company and venture fund will help develop a sustainable local economy.

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AFTERWORD

The 12 case studies presented here represent only a few of the possible evolutions of a biosphere reserve in its efforts to reach out to the local and regional community. As you have read, some have had great success, while others consider their successes almost negligible. All document tremendous effort from many people to improve the communication among landowners, land managers, scientists, and any others interested in the health and well-being of the natural and human environment of the biosphere reserve.

U.S. MAB, through its scientific and biosphere reserve directorates, will continue to strive to integrate the best ideals of development, conservation, and scientific investigation. We will continue to learn and create new opportunities for progress toward a sustainable world in the early 21st century.

D. Dean Bibles
Chair
National Committee of the
U.S. Man and the Biosphere Program

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Hungry Horse Eighth Grade Class at Coram Experimental Forest, Montana 1992
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