Conserving Biological Diversity in Bulgaria

The National Biological Diversity Conservation Strategy

Developed through the joint efforts of the Government and People of the Republic of Bulgaria, the U.S. Agency for International Development, and The Biodiversity Support Program

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The Biodiversity Support Program is a Consortium of World Wildlife Fund, The Nature Conservancy, and World Resources Institute,

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WWF

The Nature Conservancy

USAID

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The maps in this document were prepared by Dr. Iva Apostolova, Dr. Gergin Blagoev, Dr. Stoyan Blagoev, Charles Convis and James Henderson on a geographical information system (GIS) using Arc/INFO™. Arc/INFO™ was developed by Environmental Systems Research Institute, Inc.

A full list of the papers on which this strategy was based is provided in Appendix B.

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FOREWORD

It is to my deep satisfaction that Bulgaria is among the first countries in the world to have developed a National Biological Diversity Conservation Strategy.

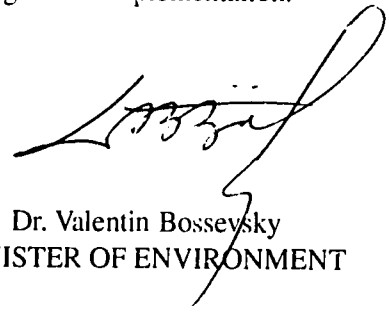
It is my firm belief that this document will contribute to the long-term protection of Bulgaria's natural heritage, to its sustainable use, and to the implementation of the principles of the Biodiveristy Convention, signed by Bulgaria during the Rio Summit '92.

This strategy was developed with the invaluable assistance of the Government of the United States. It is the result of the joint efforts of many Bulgarian and American scientists, conservationists, government officials and NGO's.

Bulgaria's natural endowment is unique, with a great variety of wildlife species, habitats and ecosystems. Our country is home to many endemic and relict plants and animals whose conservation is of international importance. Bulgaria also fascinates with its pristine landscapes, from the Black sea coast to the marvelous high mountains, and with the richness of its renewable natural resources. The most precious of these features are safeguarded in a well-developed system of protected areas.

It is our duty to preserve and leave all the heritage and gifts of Nature to our children. We will hand down to them the Bulgarian knowledge and tradition of nature conservation, started more that a century ago.

I express my sincerest gratitude to all those who inspired, supported and contributed to the elaboration of the National Biological Diversity Conservation Strategy. We are now faced with the challenge of its implementation.



Dr. Valentin Bossevsky
MINISTER OF ENVIRONMENT

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Dr. Curt Meine, principle writer of the NBDCS, whose knowledge, organizational and linguistic skills, and patience forged a strategy document out of the formidable amount of information that emerged from the workshop;

Christie Feral, BSP project coordinator for Eastern Europe, for stepping in on short notice and diligently assuring the completion of the NBDCS project and publication of the strategy and companion papers.

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EXECUTIVE SUMMARY

Efforts to conserve Bulgaria's biological diversity are at a critical stage. Centuries of intensive human land use, decades of mismanagement of natural resources under the former regime, and the impacts of recent economic and political changes present tremendous challenges to conservation. Unless a concerted program of conservation actions is initiated, Bulgaria stands to lose a substantial portion of its biological diversity over the next several decades. Such losses pose a significant threat both to Bulgaria's long-term economic well-being and to the ecological health of the Bulgarian landscape.

Fortunately, Bulgaria possesses a dedicated body of conservation advocates, scientists, and administrators in its nongovernmental organizations (NGOs), universities, and government agencies, and in the citizenry at large. Furthermore, with its stable population, solid foundation of scientific information and expertise, newly established democratic political structures, and extensive tracts of natural forest and other landscape features, Bulgaria has many advantages that bode well for the future.

In March 1993, more than 75 Bulgarian scientists, government officials, and NGO representatives gathered at a special workshop to discuss the status and fate of Bulgaria's biological diversity. Their goals were to assemble and analyze relevant scientific information, define conservation goals, present recommendations, and identify the next steps needed to conserve biological diversity in Bulgaria. This document is the product of their presentations and discussions.

Bulgaria's Biological Diversity

Although Bulgaria is relatively small in size (110, 912 km^2), it is rich in biological diversity due to its highly varied climatic, geologic, topographic, and hydrologic conditions. These conditions allow Bulgaria to support a biota that includes 94 species of mammals, 383 birds, 36 reptiles, 16 amphibians, 207 Black Sea and freshwater fish, an estimated 27,000 insects and other invertebrate species, between 3,550 and 3,750 species of vascular plants, and more than 6,500 nonvascular plants and fungi. Bulgaria thus ranks among the most biologically diverse countries in Europe.

Bulgaria's biota includes significant numbers of endemic species and subspecies. Endemic plant species constitute about 5 percent of the total flora, a high proportion compared with other, larger European countries. The available information on invertebrate taxa indicate that 8.8 percent of all noninsect species and 4.3 percent of insect species are endemic. Further research on these groups is likely to boost these percentages. Known endemic vertebrates include 12 freshwater fishes, 1 amphibian subspecies, 4 reptile subspecies, and at least 4 subspecies of mammals.

The degree of rarity varies significantly among the taxonomic groups. The rare flora and fauna include more than 700 vascular plants, many of which are endemic species found in the high mountain regions; 567 species of noninsect invertebrates (about 23 percent of all known species); more than 1,500 insect species; 29 species of Black Sea and freshwater fish; 2 species of snakes; 78 birds (including 16 from the World Conservation Union's [IUCN] 1993 List of Globally Threatened Species); and at least 10 large mammals, including the Black Sea monk seal, endemic subspecies of harbor porpoise and bottle-nosed dolphin, chamois, brown bear, wolf, otter, and European marbled polecat.

As a result of anthropogenic pressures, a number of Bulgarian species have in recent decades diminished to the point of extinction. These include at least 31 species of vascular plants, 7 invertebrates, 3 fish, 2 snakes, 3 birds, 2 (possibly 3) mammals, and 6 indigenous animal breeds.

Bulgaria is characterized by a wide variety of plant and animal communities, and supports examples of almost all of the main habitat types found in Europe. Bulgaria has a number of unique and representative communities and ecosystems that are highly valuable in terms of biological diversity, including alpine and subalpine coniferous forests, meadows, wetlands, peat bogs, and lakes; mature coniferous and beech forests; oak woodlands; caves and mountain gorges; Mediterranean and sub-Mediterranean plant communities; steppe grasslands; riparian shrub and forest vegetation along the Danube and smaller rivers; important inland, riparian, and coastal wetlands; sand dunes, coastal limestone communities, and other unique habitats along the Black Sea coast; and the pelagic, littoral, sublittoral, and benthic communities of the Black Sea itself. Of special note are Bulgaria's forests, which cover 3.9 million hectares (35 percent of the nation's total land base). Of this area, 60 percent consists of forests of natural origin.

Bulgaria's biological diversity includes species and genetic resources that are widely used for both commercial and noncommercial purposes and that have the potential to confer important economic and environmental benefits. In addition to economically important species of plants and animals (including timber trees, Black Sea and freshwater fish species, more than 200 species of edible fungi, and several hundred native medicinal plants), Bulgaria is home to many traditional and rare cultivars and breeds, and many wild relatives of domesticated species. Bulgaria's biological diversity also provides ecological services important to the country's environmental health, including nutrient cycling, pest control, pollination, soil and water conservation, recycling of wastes, and regulation of hydrological and biogeochemical cycles.

Threats to Bulgaria's Biological Diversity

Bulgaria's biological diversity faces a broad array of anthropogenic threats. The loss and degradation of both aquatic and terrestrial habitats constitute the most significant threats to biological diversity in Bulgaria, affecting all ecosystems from the high mountain forests and lakes to the open waters and benthic communities of the Black Sea.

Pollution of Bulgaria's air, soil, groundwater, freshwater, and coastal waters has (as in other countries) intensified over the last five decades and constitutes a significant threat to both biological diversity and human health. Virtually all forms of point and non-point source pollution -- household, agricultural, petroleum and petrochemical, industrial, and nuclear -- are present in the Bulgarian landscape and threaten biological diversity to varying degrees.

Direct exploitation, and especially overexploitation of economically valuable species, affects many ecosystems, habitats, and taxa. This includes such specific threats as illegal gathering (and export) of edible fungi, medicinal plants, snails, and several reptiles and amphibians; overharvesting of commercial fish species in the Black Sea coastal and open waters; poach-

ing and sport hunting of large mammals and birds (especially waterfowl and birds of prey); and the control of predators, especially those (such as the wolf and cormorant) that subsist on game animals and commercially valuable fish species.

As a European country long occupied by humans and their domesticated plants and animals, the invasion of exotic species is a less critical threat. Nevertheless, invasions (for example, of the Black Sea by a new species of ctenophore) have significantly affected the dynamics of major ecosystems. The intentional introduction of nonnative fish, game, and timber trees has also had detrimental impacts on indigenous ecosystems, species, and subspecies. Bulgaria's unique genetic resources -- local crop varieties, wild relatives of cultivated plants, and local and primitive domestic animal breeds -- have diminished as a result of changes in land use and in the agricultural economy.

Changing land tenure constitutes an important *potential* threat to biological diversity as citizens and communities regain title to land through the process of land restitution. Restitution offers significant opportunities for conservation. However, if citizens and local governments are not fully informed or encouraged to adopt conservative or restorative land use practices, the restitution process may have adverse impacts on biological diversity both in protected areas and on nonreserved lands.

Accelerated rates of global climate change could have far-reaching effects on Bulgaria's biological diversity, given its transitional position amid three major bioclimatic regions. If global warming should result in a rise in sea levels, the adverse effects along the Black Sea coast would also be substantial.

Lack of knowledge and ineffective policies can also be considered threats. While the foundation of scientific information on Bulgaria's biological diversity is one of the nation's most significant strengths, it has a number of gaps. The most significant are insufficient information on species richness, distribution, current populations, and population trends for many taxonomic groups; insufficient information on biological diversity in specific geographic regions; and insufficient information on the impact of various anthropogenic threats and on mitigation methods and restoration procedures. In addition, there is inadequate public understanding of biological diversity and the threats to it. Reliable and accessible information that might allow the public to achieve a higher level of awareness is lacking. Policy-related weaknesses include poor enforcement of conservation laws and environmental regulations; ineffective management and administration of protected areas; ineffective (or nonexistent) penalties and sanctions; and lack of registration and effective monitoring of harvested biological resources.

Developing a Comprehensive Conservation Program

None of the threats to Bulgaria's biological diversity can be easily addressed. In most ecosystems, various threats interact and diminish the ability of species and communities to perpetuate themselves. To prevent future losses of biological diversity, the many threats must be addressed in a coordinated and mutually reinforcing manner. A comprehensive conservation program, entailing a wide variety of activities, is needed. The recommendations summarized below reflect two overriding criteria: these actions are both *urgently needed* and largely *achievable with existing institutions, financial resources, and personnel.*

Land and Resource Management

The key to conserving biological diversity in Bulgaria is the adoption of an approach to land and resource management that recognizes the value of retaining and restoring diversity at all scales, on both reserved and nonreserved lands, and under various management regimes. The recommendations offered under this category stress the need to better integrate the management of all land, water, and biological re-

sources in order to protect and renew the ecological processes on which biological diversity depends.

Protected Areas

The foundation of Bulgaria's efforts to conserve biological diversity is its network of protected areas. This network needs to be both expanded and strengthened to provide protection for Bulgaria's most important and threatened natural areas. High-priority regions for new or expanded protected areas are the Rhodope Mountains; the Black Sea coast; Strandzha Mountain; areas surrounding and connecting the existing national parks in the Rila, Pirin, Vitosha, and Stara Planina Mountains; and the valley of the Strouma River. Further steps should immediately be taken to delineate new protected areas and to review the goals and methods of the network as a whole. In addition, measures should be taken to strengthen the administrative capabilities of the network. These measures should emphasize improvements in land management, law enforcement, biodiversity monitoring, education and interpretation, training of personnel, information services, and research capabilities.

Nonreserved Lands

Even if the official goal of placing 7.5 percent of Bulgaria's land base in protected areas is met, the protected areas network will still be able to protect only a small portion of the nation's biological diversity. Moreover, the fate of the protected areas and the biological diversity they contain is influenced to a great degree by actions within the surrounding landscape. Greater attention must be given to managing lands beyond the protected areas, especially those that are soon to be returned to private or municipal ownership. Conservation on nonreserved lands should be encouraged through new economic incentives, better integrated resource management programs, effective environmental assessments and modified benefit-cost analyses, appropriate regulations, and other policy reforms.

Sustainable Resource Management

To ensure that economically important species, habitat types, and soil and water resources are used in a sustainable manner, their management must be based on sound ecological principles. The sustainable management of fisheries, commercial forests, wildlife populations, and agricultural lands should be promoted through the enactment of new laws regulating domestic use and export of important species; the adoption of stronger pollution controls and improved forestry and agricultural practices; unilateral and regional actions to protect the fish and water resources of the Black Sea; and Balkan-wide cooperative conservation initiatives.

Habitat Restoration

Extensive areas of Bulgaria -- especially wetlands, forests, lands supporting intensive crop agriculture, pastures, riparian zones, and industrial zones -- have been degraded or even destroyed in the past by unwise management practices. To restore biological diversity, vitality, and productivity to these lands, greater investments of time, labor, skill, and knowledge are required. Restoration should be promoted by adopting economic incentives, disseminating information on restoration ecology and management techniques, developing seed banks and nurseries, and collaborating with other countries on transboundary restoration projects, among other measures.

Ex Situ *Conservation*

Ex situ facilities -- seed banks, experimental farms, aquaculture structures, captive propagation centers, and other facilities (including herbaria, arboreta, aquaria, botanical gardens, zoos, and museums) -- are needed to bolster and complement *in situ* conservation programs. These institutions should be strengthened and their activities integrated into the broader conservation strategy, supporting appropriate commercial development of biological resources as well as sustainable agriculture, reintroduction, public education, and ecological restoration projects.

Legislative Initiatives and International Agreements

Law is an essential tool for ensuring that public policy and governmental actions accurately and consistently reflect scientific information, public opinion, and social values. New and revised national laws, and the ratification and implementation of international agreements, are needed to ensure the protection and sustainable use of biological diversity in Bulgaria. As specific legislation and implementation provisions are developed, lawmakers should strive to create laws that are well coordinated, consistent, and enforceable, and that anticipate advances in scientific knowledge and changing social conditions. NGO involvement is especially important if the laws are to reflect existing scientific expertise and the full range of viewpoints among conservationists and the public at large.

Conservation Administration and Policy

The formulation of effective conservation policies and the execution of laws affecting biological diversity require a solid administrative structure. A critical goal of this national strategy must be to secure a stronger and better coordinated administrative structure to conserve biological diversity *both within and outside the protected areas*. There are various models that the Bulgarian Ministry of Environment (MOE), the Committee of Forests (COF), other government agencies and NGOs can adopt to manage more effectively the nation's protected areas, and to cooperate in the conservation of biodiversity on private, municipal, and state-owned lands. As a high priority, the agencies should examine these different modes of collaboration to determine which fit existing needs and emerging mandates.

Research and Technical Support

Scientific information on Bulgaria's biological diversity and its conservation is the foundation on which this strategy is built. Fortunately, the body of existing knowledge about Bulgaria's biodiversity is relatively extensive and detailed. However, conservation is hindered by numerous knowledge gaps and technical constraints. To provide a stronger scientific and technical basis for conservation policy and action in Bulgaria, support should be given to research that fills these gaps, as detailed in the research recommendations of this report and in the background scientific papers.

Environmental Education

This strategy will not succeed without strong public understanding and support. These, in turn, can only be fostered by communicating information about the values, status, and conservation of biological diversity in Bulgaria in the public school curriculum, in professional training and development programs, and in various public forums (including museums, zoos, national parks, information and visitors' centers, and the mass media). Conservation education programs should aim to increase public awareness of biological diversity issues, stimulate pride in and enjoyment of Bulgaria's unique biota, communicate existing and emerging scientific information about biodiversity, convey new concepts in conservation, and foster constructive debate over conservation strategies. Finally, education about biological diversity should be undertaken as part of a still broader national environmental education program.

Ecotourism

Bulgaria, with its many mountain ranges, national parks and other protected areas, Black Sea coast, wine-producing regions, monasteries, and other cultural and historical sites, presents abundant ecotourism opportunities. These opportunities, if developed in an appropriate manner, can encourage broad interest in the protection and restoration of biological diversity while providing economic returns for conservation at the local level. Bulgaria has recently taken steps to promote ecotourism. It should build on these

by adopting a national policy on ecotourism and by integrating ecotourism into the municipal and regional planning process, environmental assessments, and environmental education programs.

Collaborative Partnerships

Partnerships involving a wide range of individuals and organizations can and should play a key role in conserving biological diversity in Bulgaria. Partnerships can be formed to support many conservation activities, including park and trail maintenance, education and interpretation programs, biological inventory and monitoring, and fund raising. In Bulgaria, innovative conservation partnerships are still relatively uncommon. However, it is a country rich in the human skills, knowledge, and commitment needed to build successful partnerships.

The program outlined here must evolve continually. All of the components will require constant public involvement and feedback, and will need to change as they are implemented and as new opportunities and constraints arise. Implementation must involve all who have a stake in the future of Bulgaria's biological diversity, including farmers, land managers, agency officials, recreationists, educators, students, scientists, environmental advocates, and decision makers. All must contribute if this program is to succeed. Finally, successful implementation will require different activities at the international, regional (European and Balkan), national, municipal, and local levels. If properly coordinated, activities at these different levels can promote and reinforce one another.

Priorities for Immediate Action and Support

Several activities are key to the overall success of this conservation strategy and deserve immediate support within Bulgaria and from the international community. The following seven areas are of urgent importance, offer diverse long-term benefits, and provide much of the foundation for the full conservation strategy.

Strengthening the Scientific Basis for Conservation

Support should be given to strengthen the scientific understanding of biological diversity in Bulgaria. These efforts should focus on the gaps identified within the strategy, especially the need for basic information on specific taxonomic groups, geographic areas, anthropogenic threats and impacts, and mitigation and restoration methods. Other high-priority needs include improvements in basic scientific equipment and supplies; revision of the Bulgarian *Red Data Books* and creation of new red data books for taxonomic categories that lack them; additional species- and community-level information; encouragement of interdisciplinary research; greater access to, and more effective dissemination of, existing scientific information.

Support for Legislative Initiatives

Legal reforms and initiatives related to conservation in Bulgaria have reached a critical stage. New laws, and revisions of existing laws, are now being formulated. These proposals include a new protected areas act, a new forestry law, a new game law, a comprehensive biodiversity law, and legislation implementing the Convention on International Trade in Endangered Species. To ensure that these laws are based on the most complete scientific information and that they reflect the broadest possible public input and NGO involvement, support should be given to the in-country legal experts and non-Bulgarian advisers that have been working with Bulgarian scientists, NGO representatives, and government officials to draft these laws. This support should extend to efforts to ensure that new laws are fully and effectively implemented.

Expanding and Strengthening the Protected Areas Network

Further steps should immediately be taken to expand and strengthen the network of pro-

tected areas. These steps should include adoption of the proposed new protected areas act; full authorization of the new National Nature Protection Service, definition of its responsibilities, and support for efforts to coordinate its functions with those of other government agencies; appointment of a task force to review the mission and goals of the protected areas network and the effectiveness of the existing system of protected areas; identification of areas of special interest and concern for inclusion in the network; regional meetings, open to public participation, leading to a national meeting to develop detailed plans for revising and expanding the network; delineation of research needs; and a review of the status of Bulgaria's 17 Biosphere Reserves and their management needs. Support should be given for improvements in managing the protected areas, including development of public education, information, and interpretation programs; strengthening of enforcement capabilities; assessments of staffing requirements; development of effective management plans; and increased opportunities for professional training.

Environmental Education and Cooperative Extension

Much more time and energy need to be devoted to environmental education at all levels. This is a long-term undertaking, but immediate steps can be taken to begin the process. These steps include developing a national strategy for environmental education; appointing an advisory group of scientists, educators, and conservationists to provide guidance and advice in the design of curricula involving biological diversity and its conservation; developing teacher training programs; and supporting opportunities for Bulgarians to interact with environmental educators in other countries. Educational programs should not be limited to students or to schools. This is especially important to the land restitution process. Extension services should be organized on the national level to disseminate information about biological diversity to new (as well as current) landholders, and to communicate landholder concerns back to the scientists and policy makers.

Developing and Implementing an Ecotourism Policy

Support should be given to Bulgarian conservation and regional planning agencies to develop and implement a clear, workable national policy on ecotourism. This policy should involve support for a number of practical activities, including the publication of tourism-related literature on protected areas; establishment by the Ministry of Environment of tourism management guidelines for protected areas; definition of conservation design guidelines for essential construction activities; establishment of an incentive system for conservation projects; and the dissemination of business development and marketing advice for craft industries.

Stimulating Conservation in the Black Sea Basin

The Black Sea requires both national and international measures to recover and conserve its biological diversity and economic resources. At the national level, support is needed for efforts to identify biologically important areas for inclusion in the protected areas network; to implement nationwide integrated coastal zone planning; to undertake restoration and pollution mitigation measures; and to strengthen the enforcement of environmental regulations. At the international level, support is needed for cooperative efforts to address the problems of transboundary pollution, overexploitation, and inappropriate development; for biodiversity monitoring and conservation planning; for the restoration of marine biodiversity; for ecosystem-level scientific research on the Black Sea and its biological diversity; and for the implementation of the Convention on the Protection of the Black Sea from Pollution and further development of the Black Sea Action Plan.

Stimulating Conservation in the Balkan Peninsula

The conservation of biological diversity within Bulgaria requires cooperation and coordination with neighboring countries. Conversely, actions taken within Bulgaria have ramifications for conservation beyond its borders. Support should be given to efforts to explore shared concerns, exchange information, and coordinate biodiversity conservation plans with the other countries of the Balkan Peninsula. Short-term actions that can be taken to strengthen existing ties and to build the foundation for cooperative conservation projects include investigations of biodiversity conservation issues in important transboundary areas; sponsoring of a region-wide conference on the biological diversity of the Balkan Peninsula and its conservation; establishment of advisory councils in each of the Balkan countries; collaborative scientific research on the biogeography and biological diversity of the Balkan Peninsula; the preparation of Balkan-wide red data books; and landscape-level conservation planning in border areas. Although such actions are difficult to initiate given the current levels of political and economic instability in the region, cooperative conservation projects can provide a positive focus for the region's peoples and contribute to the realization of a more secure and peaceful future for the Balkan Peninsula as a whole.

INTRODUCTION

SAND LIZARD (*LACERTA AGILIS*), ONE OF 36 SPECIES OF REPTILES FOUND IN BULGARIA. PHOTO: © 1994, GEORGI TSONEV.

Over the last several years, the country of Bulgaria has experienced profound social, economic, and political changes. These changes have had, and will continue to have, far-reaching implications for the protection and sustainable use of biological diversity. Bulgarian officials, scientists, and conservationists have been working to respond to these changes and to initiate reforms. At the same time, foreign environmental assessment teams have visited Bulgaria and reported the need for a national biodiversity conservation strategy.

The National Biological Diversity Conservation Strategy (NBDCS) is the culmination of a 3-year process. This process was funded by the Bureau for Europe and the New Independent States of the U.S. Agency for International Development (USAID/ENI) and was carried out as technical assistance to the government of Bulgaria's Ministry of Environment (MOE). The NBDCS was coordinated through the U.S.-based Biodiversity Support Program, a consortium of World Wildlife Fund, The Nature Conservancy, and World Resources Institute. The Biodiversity Support Program promotes efforts to protect biological diversity while enhancing human livelihoods in developing countries through improved conservation and use of biological resources.

This strategy has been developed in accordance with the requirement for national-level conservation planning outlined in the 1992 Convention on Biological Diversity, to which Bulgaria is a signatory. It also reflects recommendations contained in the World Bank's 1992 *Bulgaria Environment Strategy Study*. The NBDCS represents the first national-level strategic plan for conserving biological diversity to be developed in Central and Eastern Europe.

The centerpiece of the planning process was the National Biological Diversity Conservation Strategy workshop, held at Sveti Vrach, outside Sandanski, Bulgaria, on March 12-20, 1993. The workshop, and the documents prepared for it, were designed to develop consensus for this national strategy and to provide a framework for future foreign assistance on conservation and development projects. The objectives of the workshop were the following:

- Assemble and evaluate available information leading to an understanding of the biological basis for conservation planning in Bulgaria.

- Identify goals for the conservation of biological resources and biological diversity in Bulgaria, including the identification of biologically important areas and priorities for conservation action.

- Clarify the legal and social framework for conserving biological resources and for generating revenues to support conservation.

- Identify and rank mechanism(s) for attaining conservation goals.

- Draft recommendations.

- Recommend further steps to resolve outstanding issues.

The 75 workshop participants included a broad range of Bulgarian scientists, government officials, and nongovernmental organization (NGO) representatives, as well as several non-Bulgarian advisers. Prior to the workshop, in mid-1992, five teams were formed to provide input to the process, prepare background reports, and develop recommendations.

A *biological diversity team*, composed of specialists in the biological sciences, prepared reports on Bulgaria's vertebrates, invertebrates, vascular and nonvascular plants, fungi, forests and other plant communities, and freshwater and Black Sea biota. Using geographic information system (GIS) technology, the members of this team prepared maps to synthesize information on the distribution and status of biological diversity.

An *applied biological diversity team* provided information on applied aspects of resource use and conservation, focusing on traditional and modern uses of medicinal plants and fungi, plant and animal genetic resources, soils, forests, and other biological resources.

A *social science team*, composed of foreign and Bulgarian specialists, provided expertise on legal aspects of biodiversity conservation, protected areas planning and management, natural resource economics, and regional planning.

A *nongovernmental organization (NGO) team* worked to define the key social, economic, and political issues related to the environment and conservation in Bulgaria. To this end, the five participating NGOs held discussions among their members and prepared reports based on analyses of their meetings and on specially commissioned surveys of landowners and other interested citizens.

An *information team*, composed of geographic information specialists from Bulgarian institutions and the U.S.-based Environmental Systems Research Institute (ESRI), worked with the other teams to prepare maps for the workshop and for the national strategy documents. These maps have played a critical role in developing the national strategy, providing new tools for land use planning and for sustainable management of biological diversity both within and outside Bulgaria's protected areas. The GIS component of the strategy process has been supported by USAID, the U.S. Environmental Protection Agency, and the European Community Poland and Hungary Action for Restructuring the Economy (PHARE) program.

The workshop brought together these five teams, as well as the deputy minister of the environment, the environmental adviser to the president, and representatives from the Commission on the Environment of the Bulgarian Parliament; the Ministry of Environment's Office of Biodiversity, Protected Areas and Forests; the Bulgarian Academy of Sciences; the Ministry of Agriculture; the Ministry of Regional Development and Construction; the Committee of Forests; and the Committee on Tourism. Over the course of the 8-day workshop, participants listened to one another's reports, engaged in extensive discussions of the findings, and debated conservation recommendations and priorities. With the aid of the newly generated maps, participants were able to display, compare, and

synthesize data in support of their discussions.

This report summarizes the findings and recommendations of the workshop. While it contains information and recommendations of broad relevance to all who are interested in conservation and sustainable development, it is directed specifically to several audiences:

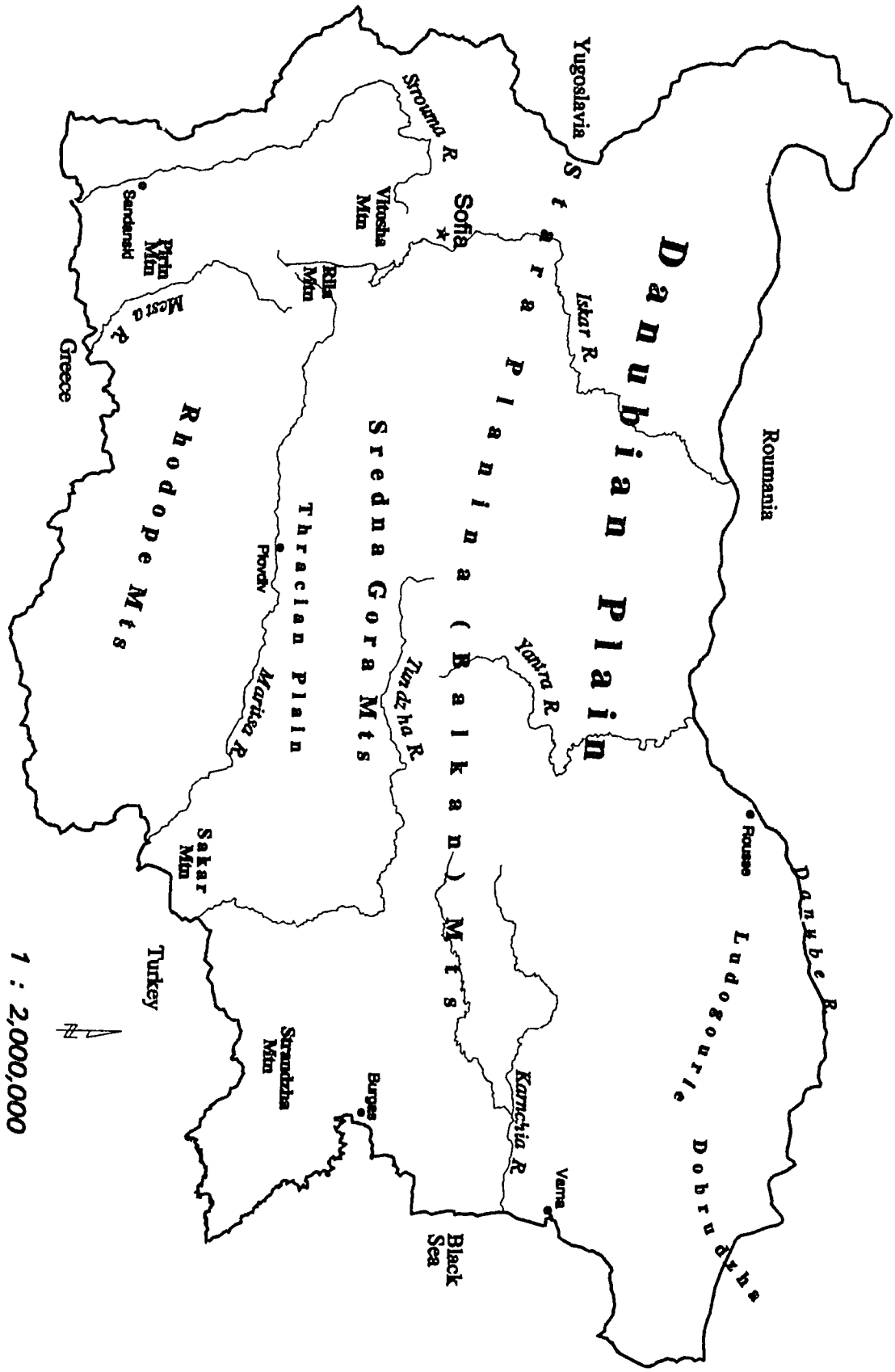
- The NBDCS workshop participants, whose hard work, in partnership with their many colleagues and on behalf of their fellow citizens, provided the foundation on which this strategy is built. The full text of each of the workshop reports, with corresponding maps, are being published separately by the Biodiversity Support Program.

- Bulgaria's citizens, scientists, NGOs, and government officials, on whom depends the future development and successful implementation of the strategy.

- Conservationists in other countries, especially in Central and Eastern Europe and the former Soviet Union, who are confronting many of the same challenges as Bulgaria, and many of whom are involved in developing their own national strategies.

- International conservation, development, and funding organizations, whose support will be critical in achieving the long-term goals of this strategy.

The protection of biological diversity, the strengthening of democratic traditions, and the building of a sustainable economy are interwoven challenges that will demand the attention and commitment of all of Bulgaria's 9 million citizens and their elected representatives for many years to come. It is the hope of all those who have worked to prepare this strategy that it will be useful in stimulating actions to safeguard Bulgaria's biological diversity at the community and national levels, while generating social and economic benefits for current and future generations.



MAP 1. SELECTED FEATURES OF BULGARIA

THE CONSERVATION CHALLENGE

HIGH MOUNTAIN FORESTS AND MEADOWS IN THE RILA MOUNTAINS. PHOTO: © 1994, CHRISTO DELTSHEV

History and geography have combined to present Bulgaria with tremendous challenges as well as special opportunities in its efforts to conserve biological diversity. Its natural ecosystems, like those of other Mediterranean and Balkan countries, have been extensively altered by millennia of intensive human land use. In recent decades Bulgaria has -- along with the industrialized world, in general, and the other nations of Central and Eastern Europe and the former Soviet Union in particular -- burdened itself with profound pollution problems and other forms of degradation of its air, water, and land resources. These forces continue to take a heavy toll on biological diversity and on ecological processes within the Bulgarian landscape.

Despite these circumstances, there is much room for optimism as the people of Bulgaria work to protect and restore environmental quality. The nation's landscape has retained, even through its long history of human settlement, a high degree of biological diversity, wildness, and beauty. In addition, Bulgaria does not face many of the pressing problems associated with rapid population growth (from 1980 to 1990, its population remained stable at just under 8.9 million). Bulgaria also possesses a wealth of scientific expertise and a strong historical commitment to conservation. The Bulgarian flora and fauna are well studied. Although important gaps in scientific knowledge do exist, many of the most urgent actions needed to conserve biological diversity can be taken based on existing information. Finally, Bulgaria has a dedicated body of conservation advocates, scientists, and administrators in nongovernmental organizations (NGOs), universities, and government agencies, and in the citizenry at large.

The obstacles, however, should not be un-

Box 1. Bulgaria's Conservation Agencies

The conservation of biological diversity and management of natural resources are overseen and affected by several agencies of the Bulgarian government. The administrative functions of the Bulgarian government are carried out through 15 ministries, the heads of which are elected by the Parliament and constitute the Council of Ministers. Committees have more restricted functions; their heads are appointed by the Prime Minister and do not sit on the Council of Ministers. All agency responsibilities are defined through special decrees of the council.

The Ministry of Environment (MOE) is the primary agency responsible for implementing national environmental policy. Under the Environmental Protection Act (1991, amended 1992) and Decree No. 14 (1992) the duties of the MOE are

- "[define] the government strategy for environmental protection in cooperation with the ministers concerned with the problem" (Art. 24, para. 1-1);
- "control the quality of the environment in the territory and territorial waters of the Republic of Bulgaria, [and] prohibit or stop activities that damage the environment" (Art. 24, para. 1-3);
- "coordinate the control functions discharged by other ministries and departments with respect to the environment" (Art. 24, para. 1-4);
- "endorse in consultation with the Minister of Health, the Minister of Agricultural Development, Land Use and Restoration of Land Ownership, the Minister of Regional Development and Construction and other state bodies, fee schedules for the use of natural resources and for admissible pollution" (Art. 24, para. 1-7d and Dec. No. 14, art 2-8-8); and
- "guide and control the preservation of biological diversity and natural ecosystems, [and] designate protected species and territories" (Art. 24, para. 1-8).

The MOE executes governmental policy regarding environmental protection and nature conservation, as well as the ecologically-based use of natural resources (Dec. No. 14, art. 1 and 3-1). In consultation with other governmental agencies and public organizations, it develops management plans for regions with threatened natural features and protected areas (Dec. No. 14, art. 2-4). The MOE has authority to control and manage protected areas, protect biological diversity and natural ecosystems, as well as designate protected species and areas.

In March 1994, the MOE created the National Nature Protection Service (NNPS), "a specialized body [within the MOE] for the management, control, and protection of biological diversity, protected natural sites and natural ecosystems." It incorporates the former Office of Biodiversity, Protected Areas, and Forests. Though the structure and functions of this new service are still evolving, it is expected to be the lead unit for biodiversity conservation in the MOE.

The Committee of Forests (COF) is the administrative body under the Council of Ministers responsible for carrying out state policy involving the management, protection, and use of the country's forests, game, and noncommercial fisheries. Under Decree No. 35 (1991), the COF

(CONTINUED ON PAGE 3)

derestimated. Scientific understanding of Bulgaria's biological diversity, though relatively advanced, still has significant gaps. Moreover, the need for environmental reform comes at a

Box 1. Bulgaria's Conservation Agencies (CONTINUED FROM PAGE 2)

- "organizes the maintenance and patrolling of protected areas in the forest fund and participates in their establishment and expansion" (Art. 3-1);
- "organizes the preservation of protected flora and fauna and controls the ecologically-based use of other forest species" (Art. 3-2);
- "controls and coordinates the use and restoration of game and noncommercial fishery resources" (Art. 4-1); and
- "controls and coordinates the economic use of secondary forest [products]" (Art. 6-3).

Under Bulgarian law, forests are classified into two groups. "Forests of commercial purpose" are managed primarily for producing timber. "Forests of special purpose" are managed primarily for their environmental, recreational, and scientific values; harvesting of timber and other raw materials in these areas is limited and occurs only according to strict environmental standards. Over the last three decades, the proportion of "special purpose" forests has increased from 10.2 percent to 30.4 percent of the total forestland under the COF's jurisdiction.

The Ministry of Regional Development and Construction is responsible for coordinating planning and development at the regional level. In collaboration with other agencies, it provides conditions for the effective use of land, energy, and other resources, and for sustainable regional and community development.

The Ministry of Agriculture administers programs that involve soil conservation, environmentally sound agriculture, and the restoration of damaged and polluted soils. The State Fisheries Inspectorate, which oversees the use and management of aquatic biological resources, is also located within the Ministry of Agriculture.

The Bulgarian Academy of Agriculture administers research institutes and experimental stations that explore, protect, and develop local germplasm resources for breeding programs and for direct use. The Academy also administers the Institute for Plant Genetic Resources at Sodovo, which is the nation's primary seed storage facility.

The National Water Council is responsible for the allocation and use of water resources.

The Committee of Geology and Mineral Resources directs activities related to the exploration and extraction of mineral resources.

The Committee on Tourism oversees the development and promotion of tourism.

The Bulgarian Academy of Sciences (BAS) consists of some 30 separate research institutes. Environmental research and monitoring takes place mainly through its Institutes of Botany, Ecology, Water Problems, and Zoology, the Forest Research Institute, and the National Center of Hydrology and Meteorology. The National Natural History Museum, associated with the Institute of Zoology, serves as the nation's main repository of natural history collections. In the past, the Institute of Ecology has often taken the lead in proposing new protected areas.

Municipal councils and local government bodies are also involved in environmental protection and management. These local entities develop more specific environmental programs, report environmental offenses, administer municipal services, work with the national government in setting environmental pollution standards, and contribute to the regional planning process. They also administer some protected areas (part of Vitosha National Park, for example, falls under the jurisdiction of the city of Sofia).

time when social, economic, and political conditions inside Bulgaria, and in the Balkan Peninsula more widely, are unstable. As in the other fledgling democracies of the former Soviet bloc,

the political processes within Bulgaria are evolving rapidly. This has important consequences for the governmental agencies that administer environmental laws and regulations (see Box 1). The lack of political continuity creates special difficulties not only for environmental advocates and decision makers within the country, but for international assistance agencies as well. In-country financial resources for conservation are limited. The financial resources that do exist are devoted to more immediate social, economic, and environmental needs, while foreign investments are directed primarily toward establishing private business ventures and opening new markets for Western goods and services.

But the new path that Bulgaria is charting must involve extensive environmental reform. The consequences of past environmental abuse can no longer be neglected. Reforms are needed to ensure that the social and economic changes now taking place contribute to, and benefit from, long-term improvements in environmental quality. Support for environmental reform reflects both the nation's heritage of conservation commitment and the democratic changes now occurring within Bulgarian society. Environmental NGOs have long played an important role in advancing conservation and were at the forefront of the events that brought democracy to Bulgaria in November 1989 (see Box 2). Even under the difficult economic conditions that have followed, the community of NGOs has remained strong and active in promoting sustainable management of natural resources, protection and restoration of natural areas, and conservation-related research, policy reform, and educational activities. At the same time, changes taking place within the government agencies hold great promise for implementing stronger and broader environmental protection policies.

There is a strong desire for a more secure environmental future among the people of Bulgaria. This high level of interest has already focused attention on the problems of air, water, and soil quality, and will continue to play an essential role in the nation's efforts to develop in a sustainable manner. With the development of this strategy, greater attention will now be given as well to a cherished goal of Bulgarians: the conservation of the nation's biological diversity. This document provides a framework by which progress toward this goal can be achieved through a concerted and coordinated program of actions.

The need for such a program is evident. Bulgaria's biota was historically, and remains, among the richest in Europe. Now a variety of anthropogenic factors threaten the survival of many members of that biota. Over the last 50 years, as degradation of Bulgaria's natural environment has accelerated, habitat conditions throughout the country have suffered. Large portions of some habitat types, such as wetlands, steppes, and lowland forests, have been lost. Other biotic communities, such as mid-elevation hardwood forests, have been greatly altered by human exploitation. Pollution, overexploitation, changing patterns of land use, and other threats compound the problem of habitat loss and degradation.

If the trends of the last several decades are allowed to continue, Bulgaria stands to lose over the next several decades a substantial portion of its biological diversity. Especially vulnerable are its vascular plants, mature forests, rare cultivars and domestic breeds, important edible fungi and medicinal plants, and a number of vertebrate species (including freshwater and Black Sea fish). For some groups of organisms facing specific threats, the situation may be even more perilous. It is possible, for example, that illegal harvesting will, within the next 10 years, endanger or even drive to extinction many of Bulgaria's medicinal plants. Such losses would have far-reaching environmental and economic consequences -- consequences that are even more significant in view of the nation's efforts to rebuild its economy and restore environmental quality.

Bulgaria's biological diversity confers direct and indirect economic benefits in the form of commercially valuable species, traditional and

Box 2. Environmental Nongovernmental Organizations

Nongovernmental organizations (NGOs) have played a critical role in the recent environmental and political reform movements in Bulgaria. Their efforts, however, rest on a century-long foundation of citizen involvement in environmental issues. The first citizen groups devoted to environmental activities, which appeared in the late nineteenth century, focused mainly on education. The first national conservation organization [illegible] Council for the Protection of the Countryside, a "union for nature protection" formed in 19?? [illegible] he support of scientists as well as the general public. This organization worked successfully for the establishment of the nation's first protected areas.

The formation of legitimate NGOs was difficult during the communist era. A Popular Committee for Nature Protection was officially established as a public organization, but information about conservation, environmental issues, and health hazards was often suppressed. Citizens had no mechanisms through which they could influence environmental policy or protest abuses. Despite political constraints, Bulgaria's first environmental NGO -- the Civil Committee for the Ecological Defense of Ruse -- was founded in March 1988. Although harassed by governmental authorities, the committee opened the way for other NGOs. The first NGO to be formally registered was the Bulgarian Society for the Protection of Birds, founded in June 1988.

The most prominent environmental NGO prior to, and in the course of, the fall of the communist regime in Bulgaria was Ecoglasnost, founded in April 1989. One of Ecoglasnost's main tasks was to collect information about the health and environmental effects of pollution, including the contamination of water and soil with arsenic and mercury and the release of radiation during the Chernobyl accident. Ecoglasnost provided many of the founders and leaders of the United Democratic Forces (UDF), which is now a major political force within Bulgaria.

With the coming of democracy to Bulgaria, many new environmental NGOs have been established at the national, regional, and local levels. These groups work toward varied goals, including the protection of natural areas, more effective pollution control, stronger environmental education programs, and the conservation of specific areas. Among these newly created groups are the Union for Nature Protection, the Wilderness Fund, the Bulgarian Society for Protection of the Rhodope Mountains, the Green Balkans Movement, the Ecomonitoring Club, the Green Society Foundation, the Ecoforum for Peace, the Ecos Foundation, and the Green Patrols. Some of these groups have begun to work on local projects with the support of international organizations.

While environmental NGOs remain strong in Bulgaria, current economic conditions limit their effectiveness. To function normally, these organizations require assistance in a number of areas:

- Adequate funding to develop their programs;
- Consultation on scientific, legal, and socioeconomic aspects of environmental issues;
- Knowledge of the structure and activities of similar organizations in other countries;
- Training in methods of working with local people and communities; and
- Access to information.

In connection with the last of these, a national conference of Bulgaria's environmental NGOs was held in 1993 to discuss, among other needs, the development of an effective information clearinghouse -- the Environmental NGO Information Center. This center is in the process of being established.

rare plant cultivars and animal breeds, primitive relatives of domesticated species, and opportunities for ecotourism and other recreational activities. The long-term economic benefits of these biological resources need to be secured by managing them on a more sustainable basis. This pertains not only to economically important resources such as timber trees and commercial fish species that have long been intensively managed, but also to species harvested from the wild, semiwild and domesticated species, and unique genetic resources.

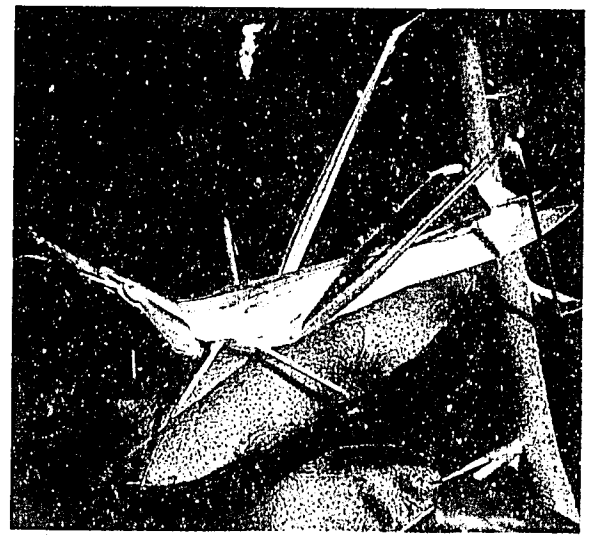
Even as many biological resources have declined, their real and potential value has been overlooked. For example, species of fungi, medicinal plants, and other plants and animals that occur in the wild may, with improved methods of cultivation and commercial production, offer important opportunities to integrate conservation and economic development at the local level. Similarly, when distinctive semiwild plant relatives, local cultivars, and animal breeds are lost, so are options for their future use. The genetic diversity of these cultivars and breeds has endowed them with resistance to disease, tolerance of climatic extremes, and special adaptations to local environmental conditions. These qualities may prove critical in ensuring the viability of modern domestic forms under changing economic and environmental conditions.

Biodiversity also plays a fundamental role in the functioning of Bulgaria's terrestrial and aquatic ecosystems, and thus in the restoration and maintenance of ecosystem health. Biological diversity serves to protect soils, recycle nutrients, maintain fertility, control pests, remove wastes, and regulate hydrologic cycles. By conserving biological diversity, society conserves these critical environmental services and the foundations on which sustainable development rests.

In addition to these tangible economic and environmental benefits, biological diversity also provides the means through which unique cultural, aesthetic, and spiritual values are expressed. Although these values elude measurement, they are pervasive in Bulgaria's art, history, music, literature, cuisine, and language. The plants, animals, and landscapes of Bulgaria serve as subjects and symbols in sculpture, painting, songs, and fables, in festivals and celebrations, and in the imagery and artistry of Bulgaria's religious traditions. Biological diversity is in this sense the fundamental source of much of the country's distinctive culture.

For all of these reasons, Bulgaria's future well-being -- social, economic, cultural, and environmental -- depends on the conservation of its biological diversity. To prevent the loss of biodiversity and to secure its tangible and intangible benefits for future generations, a broadly conceived national strategy must begin now to address the many, varied, and interrelated factors that threaten it.

BULGARIA'S BIOLOGICAL DIVERSITY



BULGARIA'S EXCEPTIONALLY RICH INSECT FAUNA INCLUDES THIS *ACRIDA UNGARICA*. PHOTO © 1994, GEORGI TSONEV.

Although Bulgaria is a relatively small country, it is rich in biological diversity due to its highly varied climate, geology, topography, and hydrology. Bulgaria covers an area of 110,912 km^2. This land base can be divided into five general regions. The Danubian plain straddles the Danube River along the northern border with Romania. The Stara Planina (also known as the Balkan Mountains) stretches across the country from the western border to the Black Sea coast. South of the Stara Planina Mountains are the central plains and valley of the Maritsa River. The southwestern quarter of Bulgaria consists of the high mountains of the Rila, Pirin, and Rhodope chains. The Black Sea coast forms the eastern border of the country.

Bulgaria sits at the crossroads of three broad bioclimatic regions -- the mid-European continental, Eurasian steppe, and Mediterranean -- that overlap and create a range of transitional climate conditions. The complex topography of mountain massifs, foothills, lowlands, and plains provides a high degree of variation in microhabitats and determines the vertical distribution of life zones, from the alpine forest belts of the high mountain peaks to the dune communities along the Black Sea coast. Diverse rock and soil substrates, hydrological conditions, and aquatic systems (including the Black Sea and Danube River) contribute to the wide range of habitat conditions. In addition, the effects of the Tertiary and Quaternary periods are evident in the presence of many relict and endemic plant and animal species. This variation in habitat types and biogeographic influences has given Bulgaria a level of floral and faunal diversity that ranks among the highest in Europe.

Most of Bulgaria's land has been extensively altered by human use. As of 1990, about 62 percent of the land base (and almost all of the lowlands) was in agricultural production (see Box 8). Most of the rest consists of forested land. Forestlands total about 3.9 million hectares (35 percent of the country's total land base). The forests are dominated by oaks (*Quercus* spp.) up to 1,000 m, beech (*Fagus* spp.) and other broad-leaved trees between 1,000 and 1,500 m, and conifers (primarily *Picea abies, Abies alba,* and *Pinus* spp.) in the higher elevations up to

about 2,200 m. Coniferous forests cover about 1.1 million hectares and broad-leaved forest about 2.2 million hectares. About 60 percent of the forested area (2.3 million hectares) consists of forests of natural origin, the balance being stands of artificial origin. The remainder consists of other vegetation types, such as coastal marshes, brackish and freshwater wetlands, grasslands, and shrub communities, as well as inland waters and developed areas.

An Overview of Biological Diversity

The National Biological Diversity Conservation Strategy (NBDCS) workshop brought together a broad spectrum of specialists in the natural and applied biological sciences to present and discuss the state of knowledge of biological diversity within their areas of expertise. These scientists and their collaborators were asked to summarize, with the aid of maps generated through geographical information system technology, information under the categories of species richness; rare species; endemism; ecosystems, habitats, and unique communities; ecological services; fragility under specific human activities; known threats; sites containing representative samples of Bulgaria's biological diversity; species of proven or potential economic importance; and areas requiring further study.

Some of these categories were more appropriate for some taxonomic groups than for others. In a number of cases, the available information allowed only tentative estimates and was inadequate to generate meaningful maps. Despite such gaps, the workshop provided a comprehensive overview of Bulgaria's biological diversity and its status. The findings are reviewed in this section. Table 1 at the end of this chapter summarizes species-level data (and, where appropriate, data pertaining to other taxonomic levels) in four categories: number of described species, rare species, endemic spec' , and known extinctions. The data are derived from the expert assessments presented at the NBDCS workshop as well as from other published sources. It should be noted that data for many of these categories are preliminary, and require further research.

Species Richness

Bulgaria's biota ranks among the most species-rich in Europe, especially relative to the country's size.

The Bulgarian flora is known to contain between 3,550 and 3,750 species of vascular plants, some 3,000 algae, 668 mosses, and 58 ferns and fern allies, as well as more than 700 species of lichens. About 2,100 taxa of macromycetes fungi have been described for Bulgaria (as compared with a total of 5,500 species for the world).

More than 20,000 invertebrates have been described for Bulgaria. This total includes more than 1,800 taxa of protozoans and more than 2,500 arachnids, mollusks, nematodes, and other noninsect invertebrates. About 85 percent of the known invertebrates are insects. Almost 17,500 insect species and subspecies have been described, and the total number has been estimated at 27,000. Within several insect orders (e.g., the Ephemeroptera, Heteroptera, and Orthoptera), more species are known to occur in Bulgaria than in all of Central Europe. Of special note is Bulgaria's unusually diverse invertebrate cave fauna.

The vertebrate fauna has been studied most extensively and is known to include some 730 species: 94 species of mammals, 383 birds, 36 reptiles, 16 amphibians, and 207 Black Sea and freshwater fish. Within these groups, Bulgaria can claim several special distinctions. Only Spain and Greece have as rich a herpetofauna. With 29 species of bats, Bulgaria is home to virtually all the extant species in Europe. The large mammal fauna, with 23 extant species, is among the richest in Europe, and includes the wolf (*Canis lupus lupus*), brown bear (*Ursus arctos*), badger (*Meles meles*), two species of marten (*Martes martes* and *M. foina*), three species of polecat (*Mustela eversmanni, M. putorius,* and *Vormela peregusna peregusna*), three species of deer (*Dama dama, Cervus elaphus,* and *Capreolus*

MAP 2. SPECIES RICHNESS

Categories of importance for species richness reflect composite rankings based on assessments of the known or estimated numbers of species present, or of the value of an area in terms of species richness

capreolus), and three marine mammals (*Dolphinus delphis, Phocaena phocaena relicta,* and *Tursiops truncatus ponticus*). A fourth marine mammal -- the Black Sea monk seal, a distinct form of the Mediterranean monk seal (*Monachus monachus*) -- is presumed to be extinct.

Current data on the numbers of described species are summarized in Table 1. The number of described species is not, of course, equivalent to species richness. Only in the "higher" taxonomic groups (i.e., vascular plants and vertebrates) can the number of described species be considered more or less equivalent to total species richness. Among insect orders, the number of described species may represent anywhere from 28 percent (Diptera, 2,800 described species out of an estimated total of 10,000) to 100 percent (Isoptera, 2 described species out of a total of 2) of total species richness. Among less studied groups -- algae, protozoans, and aquatic invertebrates -- knowledge of species richness is still far from complete and will be more difficult to ascertain. Even within well-studied groups, the classifications of species and subspecies are subject to revision. Despite these difficulties, the state of knowledge about diversity within these groups is more advanced in Bulgaria than in most countries.

Available information on the levels of species richness in the Bulgarian landscape has been synthesized in Map 2. The map incorporates available data on fungi; algae; vascular plants; all invertebrates; aquatic organisms of the Danube River, Black Sea, and Aegean Sea basins; freshwater fish of the Danube and selected rivers; amphibians; reptiles; birds; and mammals. The map also incorporates data on plant communities dominated by Bulgarian and Balkan endemics due to the significance of centers of endemism as indicators of species richness. Based on these data, the areas of highest species richness for all taxonomic groups include the Stara Planina Mountains, Pirin Mountains, Rhodope Mountains (especially the eastern portions), Strandzha Mountain, Maritsa and Lom River basins, and Black Sea coast.

Endemism

Bulgaria's biota includes significant numbers of endemic species and subspecies. Among the protozoa, fungi, and nonvascular plants, endemism is difficult to establish. For the vascular plants, insects, other invertebrates, and vertebrates, endemism is easier to confirm and an important criterion in setting conservation priorities. (For these latter groups, it is also useful to identify both Bulgarian and Balkan endemic organisms.)

The Bulgarian vascular plant flora contains 170 Bulgarian endemic species and 100 subspecies, and 200 Balkan endemic species and subspecies. Bulgarian endemic organisms constitute about 5 percent of the total flora, a high proportion compared with other, larger European countries. If subspecies are taken into consideration, the percentage becomes even greater (8 percent). Furthermore, many Balkan endemic organisms are believed to have originally occurred in, and subsequently spread from, Bulgaria (primarily the mountain regions). If these species are also taken into account, the degree of plant endemism in Bulgaria rises significantly.

Endemism for both the Balkan Peninsula and Bulgaria has been established for 387 noninsect invertebrate species (8.8 percent of all species, including protozoans) and for 744 insects (4.3 percent of all insect species). Among the noninsect invertebrates, the degree of endemism is highest for the Crustacea (50.5 percent of known species) and Myriapoda (48.4 percent). Among the insects, endemism is highest for the Orthoptera (28 percent) and Plecoptera (25 percent). As more research is conducted on invertebrates, both the absolute number and the percentage of endemic species are likely to rise.

Known endemic vertebrates include 12 freshwater fishes, 1 amphibian subspecies, and 4 reptile subspecies. Recognition of endemism among mammals depends highly on the currently accepted status of the taxa. For example, three subspecies of bats were once considered endemic to Bulgaria, but their taxonomic distinction is no longer recognized. Two small

MAP 3. ENDEMIC TAXA

Categories of importance for endemic taxa reflect composite rankings based on assessments of the known or estimated number of endemic taxa present, or of the value of an area in terms of endemic taxa. Note: unshaded areas were not ranked by any contributors as having importance for endemic taxa.

mammals that occur primarily in Bulgaria -- the Bulgarian golden hamster (*Mesocricetus newtoni*) and a dormouse (*Myomimus roachi*) -- can be considered regional endemics. Among large mammals, at least 4 endemic subspecies -- the bottle-nosed dolphin (*Tursiops truncatus ponticus*), the harbor porpoise (*Phocaena phocaena relicta*), the chamois (*Rupicapra rupicapra balcanica*), and the European marbled polecat (*Vormela peregusna peregusna*) -- are widely accepted. Some experts also consider the local populations of the brown bear (*Ursus arctos*) and least weasel (*Mustela nivalis*) to be Balkan endemics.

Data on the number of endemic species and subspecies are summarized in Table 1. Available information on the spatial distribution of endemic taxa has been synthesized in Map 3. The map incorporates data on the endemic Bulgarian and Balkan algae, medicinal plants and other vascular plants, and invertebrates; the endemic Balkan mammals; and the endemic Bulgarian fishes, amphibians, and reptiles. The map also incorporates data on plant communities characterized by a high level of endemism. The most important regions in terms of the presence of endemic species are the Stara Planina, Rhodope, Pirin, Vitosha, Rila, and Strandzha mountains and the Strouma River valley. By definition, of course, many endemic taxa are highly localized in their distributions. This is reflected in the outlier areas of high endemism within the map. More detailed descriptions of these areas can be found in the papers presented at the NBDCS workshop.

Rarity

The incidence of rarity varies significantly among the different taxonomic groups. The particular biological characteristics of some groups, such as algae and fungi, make it exceedingly difficult to identify rare species with any certainty. For other groups, such as the bats and herpetofauna, there are few rare species; most species in these groups are relatively widely distributed and are common or abundant in other parts of their ranges.

Based on available information, some 69 species of algae, moss, and other nonvascular plants and 25 forms of lichen can be considered rare. More than 700 vascular plants, many of which are high mountain endemic species, are considered rare. The 1984 *Red Data Book of the People's Republic of Bulgaria (Volume 1, Plants)* listed 574 species "of special scientific interest," 330 species protected by the Law for the Protection of Nature, and 150 species threatened with extinction.

Among invertebrates, rare species are relatively numerous due to their restricted populations and limited ranges. Based on current assessments, 23 percent of noninsect invertebrates (567 species) are considered rare, a high figure relative to other taxa. (The degree of rarity is highest among the protozoa, nematodes, and arachnids.) More than 1,500 insect species are considered rare. Among insect orders represented by more than 50 species, those with the highest percentage of rare species are the Plecoptera (29 percent), Neuroptera (27.4 percent), Odonata (26.6 percent), Ephemeroptera (18.6 percent), and Trichoptera (18.0 percent).

Rare vertebrates include 29 species of Black Sea and freshwater fish and 2 snakes (*Coluber rubriceps* and *Vipera aspis balcanica*). Seventy-eight birds (including 16 globally threatened species and 61 species listed in the 1985 *Red Data Book of the People's Republic of Bulgaria (Volume 2, Animals)*) are considered rare. Many of these are raptors. Nineteen mammal species (including 2 extinct species) were listed in the *Red Data Book*. There are few rare small mammals. Several species exist in relatively high numbers, but they are confined to limited ranges; others occur as scattered populations in a limited number of locations. Seven bat species exist in limited numbers in Bulgaria, but are relatively abundant in other countries. For the purposes of this strategy, 10 large mammals are considered rare: the four endemic subspecies noted previously, the brown bear (*Ursus arctos*), wolf (*Canis lupus*), steppe polecat (*Mustela eversmanni*), pine marten (*Martes martes*), otter (*Lutra lutra*), and wild cat (*Felis sylvestris*).

MAP 4. RARE TAXA

Categories of importance for rare taxa reflect composite rankings based on assessments of the known or estimated number of rare taxa or the value of an area in terms of rare taxa.

Data on the number of rare taxa are summarized in Table 1. Available information on the spatial distribution of rare taxa has been synthesized in Map 4. The map incorporates data on rare fungi, plants, invertebrates, fish, amphibians, reptiles, birds, and mammals. The map also incorporates data on rare plant communities dominated by relict species. Distribution patterns, it should be noted, vary widely among the different taxa. For example, the Strouma River valley and the southern Black Sea coast support the highest number of known rare insect species. The highest concentration of rare bird species is found in the Atanasovsko Lake region along the Black Sea coast. Rare plants, primarily endemic angiosperms, are found most frequently in the higher mountains. Especially important areas for the presence of rare species in general are the Rhodope, Rila, Strandzha, and central and western Stara Planina mountains; the Black Sea coast; the Strouma River valley; and the eastern and central Danubian plain.

Extinctions

Numerous species are known to have become extinct in Bulgaria in recent years as a result of anthropogenic pressures (see Table 1). They include at least 2 Black Sea algae species and 4 additional nonvascular plants. According to the *Red Data Book* of Bulgarian plants, 31 vascular plant species have become extinct since the 1930s. Five of these were endemic to Bulgaria.

Extinctions are difficult to document for invertebrates due to the lack of information on their current and historic occurrence and the problems associated with studying and monitoring their populations. Despite these difficulties, seven extinctions have been recorded among invertebrates (all in the Ephemeroptera).

Among vertebrates, two snakes (*Vipera aspis* and *Vipera ursinii*), the European mink (*Mustela lutreola*), and the lynx (*Lynx lynx*) are listed in the *Red Data Book* as extinct in Bulgaria. Three species of native fish -- *Lampetra planeri* and *Eudontomyzon danfordi* (in the Petromyzonidae family) and *Knipowitschia longocuadata* (Gobiidae) -- are no longer found in Bulgaria. Nine bird species have been extirpated and are listed in the *Red Data Book* as extinct. Six of these -- the white pelican (*Pelecanus onocrotalus*), black vulture (*Aegypius monachus*), black grouse (*Tetrao tetrix*), Eurasian crane (*Grus grus*), snipe (*Gallinago gallinago*), and pygmy owl (*Glaucidium passerinum*) -- no longer breed in the country but do occur during migration. The other three species -- the lammergeier (or bearded vulture) (*Gypaetus barbatus*), demoiselle crane (*Anthropoides virgo*), and little bustard (*Tetrax tetrax*) -- no longer breed in or migrate through Bulgaria. The Black Sea monk seal is now thought to be extinct, although individuals have been sighted as recently as 1991. In recent years, the endemic subspecies of harbor porpoise and bottle-nosed dolphin have become seriously endangered and may also be nearing extinction.

In addition to these wild species, six indigenous domestic animal breeds -- the Rila Monastery Sheep, the Local Klepoucha Pig, the Local Pravoucha Pig, the Deliorman Horse, the Kamchia Horse, and the Rila Planina Horse -- have disappeared in recent decades.

Unique and Representative Communities and Ecosystems

Bulgaria is characterized by a wide variety of plant and animal communities, and contains almost all of the main habitat types found in Europe. Among them are a number of unique and representative communities and ecosystems that are especially valuable in terms of biological diversity. Many are well represented within the existing system of protected areas (see Box 4). Others, such as native steppes and riparian forests, are underrepresented, often because they were largely displaced before a network existed to protect them. Bulgaria's unique and representative communities include the following:

- Alpine and subalpine coniferous forests, meadows, wetlands, peat bogs, and lakes in the high mountains -- the Rila, Pirin, Stara Planina, Vitosha, and Rhodope mountains, as well as the Belasitsa, Maleshevska, and Slavyanka mountains.

- Mature coniferous and beech forests in the mountain regions. Especially important are the primary forests of fir (*Abies alba*), spruce (*Picea abies*), and pine (mainly *Pinus peuce, P. sylvestris,* and *P. nigra*) in the Rila, Pirin, Rhodope, and central Stara Planina mountains; the Mugho pine (*P. mugo*) scrub forests in the Rila and Pirin mountains; and the unique beech (*Fagus orientalis*) forests of Strandzha Mountain.

- Oak (*Quercus* spp.) woodlands and forests, primarily in the lower elevation mountains and adjacent foothills and plains.

- Karst regions, especially in the Rhodope Mountains, the central Stara Planina, the Pirin Mountains, and Slavyanka Mountain. These regions are notable for their high diversity of endemic plants, birds of prey, and bats. These regions contain most of Bulgaria's 5,000 caves, with their rich cave-dwelling fauna.

- Gorges throughout the main mountain ranges, many of which serve as refuge or outlier habitats for rare and nontypical flora and fauna.

- Mediterranean and sub-Mediterranean communities in the Strouma River valley (especially the Kresna gorge and the Sandanski-Petrich plain), the Maritsa and Mesta River valleys, the eastern Rhodope Mountains, the Sakhar hilly region, Strandzha Mountain, and along the southern Black Sea coast.

- Mesophytic grasslands of the lowland plains, remnants of native steppe communities, and natural lowland forests (especially of *Quercus pedunculiflora*).

BULGARIA'S NUMEROUS CAVES ARE HOME TO A RICH ARRAY OF ENDEMIC SPECIES. PHOTO: © 1994, CHRISTO DELTSHEV

- Riparian shrub and forest vegetation (primarily *Salix, Populus,* and *Alnus* spp.) along the Danube and smaller rivers (especially the Batova, Kamchia, Ropotamo, Tundzha, and Veleka).

- Wetlands along the interior rivers, and at major complexes near Belene Island, Srebarna Lake, Shabla (the northern Black Sea coast), the mouth of the Kamchia River, the Bourgas lakes, the mouth of the Ropotamo River, and other portions of the southern Black Sea coast.

- Vardim Island, Belene Island, and other seasonally flooded islands in the Danube River, which are especially important breeding habitats for birds.

Box 3. Nontimber Forest Products

Bulgaria's forests have traditionally been managed to provide mainly timber and watershed protection. As efforts to protect and restore biological diversity on forestlands proceed, much greater attention will need to be devoted to nontimber forest resources and products. These resources include most of the species of medicinal plants; many of the edible fungi, fruit trees, and berry-producing shrubs; and plants used for teas, oils, dyes, and other products. Forest fungi and plants are widely (and increasingly) exploited for both domestic use and export. Many of these species are suitable for cultivation and can, if developed properly, benefit local economies while relieving some of the pressure on wild populations. Forests also provide habitat for game animals, nongame fish, birds, and mammals, as well as other less conspicuous components of the ecosystem. Bulgaria's mature montane forests, which are among the oldest and most extensive in Europe, are the stronghold for many forest species (including large predators) that have disappeared from other parts of the continent. These forests also provide significant recreation and tourism opportunities for hikers, bird watchers, and other outdoor enthusiasts. Finally, the forests serve as important areas for environmental education and research.

While many of these nontimber forest values have been recognized and promoted in the past, they will require even greater emphasis in the future. These resources, if carefully managed, can provide direct economic benefits at the local level for forest conservation activities. However, great care must be taken to assure that use does not lead to overexploitation, which is a threat especially for edible fungi and medicinal plants. For these species, the potential for cultivation needs to be explored and promoted as efforts to protect native genetic resources and the habitats in which they occur proceed.

- Black Sea coastal communities and habitats, including the Black Sea lakes; sand dunes, wetlands, and coastal limestone communities; and staging areas and other lands along the western Black Sea migratory bird route (also known as the Via Pontica), which passes through Bulgaria and is one of the two most important European bird migration routes.

- The pelagic, littoral, sublittoral, and benthic communities of the Black Sea itself.

Important Biological Resources

Bulgaria's biological diversity includes species and genetic resources that are widely used for both commercial and noncommercial purposes, and others that have the potential to provide important economic benefits. Biological diversity provides additional economic benefits by performing various environmental services, although the value of these services is not fully recognized or reflected in the market. These biological resources can be grouped into several categories.

Economically Valuable Species

Many of Bulgaria's native species provide products for local consumption, domestic trade, and export. In the past, these resources have been developed and exploited to varying degrees. Some, such as timber trees, game animals, and food fish, have long been important economically, and have been intensively exploited and managed. Others, such as edible fungi and medicinal plants, have traditionally been collected from the wild but have recently become subject to heavier exploitation, especially for commercial export.

The economically valuable biological resources of Bulgaria include the following

- More than 200 species of edible fungi;

- About 750 traditional medicinal plants (some 250 of which are considered economically important);

- Timber trees, especially oaks (*Quercus* spp.), beech (*Fagus orientalis* and *Fagus sylvatica*), Scotch pine (*Pinus sylvestris*), Austrian pine (*P. nigra*), Norway spruce (*Picea abies*), and fir (primarily *Abies alba*);

- A wide variety of nontimber forest species (see Box 3);

- Wild and domesticated native plants that provide fruits, berries, oils, and chemical compounds; are used as ornamentals; and are used in farm and forestry operations as livestock forage and fodder, cover crops, green manures, and tree stock for reforestation and erosion control;

- Two species of snails (*Helix pomade* and *H. lucorum*), the exotic Rapana sea snail (*Rapana tomasiana*), and the marsh frog (*Rana ridibunda*), all of which are edible;

- Large and small game animals, including 16 mammalian species (several of which are introduced or invasive) and 24 bird species (both waterfowl and upland species); and

- More than 20 Black Sea and freshwater fish species important for both commercial and recreational fishing.

Local Plant Varieties and Animal Breeds

Bulgaria's plant and animal genetic resources are of immense economic, cultural, and biological importance. Over the centuries, the environmental conditions and selection pressures in the Bulgarian system of agriculture allowed an enormous diversity of both native and introduced crops to develop. Bulgaria is a primary center of diversity for many field, vegetable, and orchard crops, especially cereals, legumes, fruit trees, and forage species. As a result of its geographical, climatic, and edaphic variability, and the hybridizing of local varieties with foreign strains, it is also a secondary center of diversity for many of the cultivated plants introduced from other centers of origin. The domesticated plant resources include distinctive local varieties of durum and other bread wheats; other grains, including rye, oats, barley, sorghum, and maize; garden and field legumes, seed legumes, and annual and perennial forage legumes; and a wide range of vegetables (including tomatoes, peppers, onions, cabbage, cucumbers, pumpkins, watermelons, and other melons). Tobacco, spices, seed and stone fruit trees, grapevines, and nut-bearing species are also represented by local varieties.

Bulgaria possesses a similarly diverse stable of indigenous domesticated animals. A survey of these indigenous forms prepared for the NBDCS workshop noted a total of 37 domestic mammals with distinctive Bulgarian breeds: 3 cattle, 1 ox, 20 sheep, 1 goat, 3 pigs, 6 horses, and 3 dogs.

In Bulgaria, as in other parts of the world, the diversity of local varieties and breeds has eroded in recent decades as a result of socioeconomic pressures (especially farm collectivization), other structural changes in agriculture, and the accelerated adoption of new crop varieties suited to large-scale processing. Now, as the economic, cultural, and environmental value of these neglected forms has become more evident, attention has again turned to opportunities for incorporating them into more sustainable land use systems.

Wild and Primitive Relatives of Cultivated Plants and Domestic Animal Breeds

The Bulgarian flora also contains wild and semiwild relatives of many cultivated plants. Many are endemic to Bulgaria. Virtually all the cultivated cereal grains and leguminous forage species have wild relatives in the Bulgarian flora. Among shrubs and fruit and nut trees -- raspberries, strawberries, apricots, pears, apples, plums, cherries, morellos, and walnuts -- the diversity of wild and semiwild relatives is great. Over the centuries, crossbreeding has produced a wide variety of local adaptations, including differences in the size, taste, and structure of the fruits; in maturity rates and disease resistance; and in

growth forms and other characteristics. As is the case with local varieties of cultivated plants, many of these primitive relatives have been neglected in recent decades as fruit production in Bulgaria was collectivized and organized into large orchards growing only a few varieties of a given species.

Many of the rare domestic animal breeds, such as the Rhodope Shorthorn Cattle, Bulgarian Mediterranean Buffalo, and Karakachan Sheep, are closely related to their wild forebears and retain ancestral features. These breeds, too, diminished under collectivized agriculture. Many survive only as small populations within state-owned livestock breeding facilities.

Ecological Services

In addition to species and genetic resources whose market value can be gauged through traditional economic methodologies, Bulgaria's biota also includes organisms that provide important ecological services, the benefits of which are not reflected in the market and, consequently, are more difficult to measure. Microbes, fungi, plants, invertebrates, and other animals all serve important functions in a wide range of processes that profoundly affect human economic activities, including decomposition and nutrient cycling, pest and pathogen control, pollination, soil enrichment, soil and water conservation, flood control, and the removal and recycling of industrial and organic wastes. Although artificial products and processes have been developed to serve some of these ecological functions, they are often prohibitively expensive. Biological diversity also plays a critical role in the regulation of climatic, hydrological, and biogeochemical cycles -- regional- and global-scale phenomena that both influence and are increasingly influenced by human economic activities.

Gaps in Scientific Knowledge

The solid foundation of scientific information on Bulgaria's biological diversity, as previously illustrated, is one of the nation's most significant strengths as it implements new conservation measures. Nevertheless, this scientific foundation has several weaknesses and gaps. These deficiencies range from those that are common to many areas of research on biological diversity and its conservation to those that are specific to certain regions, taxa, habitats, and threats. Many specific knowledge gaps are described in the papers presented and discussed at the NBDCS workshop. Three gaps were most widely identified:

- *Insufficient information on species richness, distribution, current populations, and population trends for many taxonomic groups.* This was most significant for the fungi, algae and other nonvascular plants, invertebrates, and aquatic organisms.

- *Insufficient information on species composition for various taxa and other aspects of biological diversity in specific geographic areas.* Map 5 provides a synthesized view of the areas identified by workshop participants and their collaborators as in need of further study. The map incorporates data regarding fungi, algae, all invertebrates, fish, amphibians, reptiles, and mammals. The map also incorporates data regarding plant communities. Although different taxonomic groups have been studied to varying degrees in different parts of the country, several regions stand out as needing further study. These include the Rhodope Mountains (especially the eastern portions), the Pirin Mountains, the southwestern border mountains, hill lands between the Danubian plain and the Stara Planina Mountains; and the Black Sea coast. Other areas recognized as in need of further study include Sredna Gora and the central Stara Planina; portions of the Arda, Kamchia, Maritsa, Mesta, Strouma, and Tundzha rivers; the Sakhar hilly region; Dobrudzha; and the Kraishte-Konyovo region.

- *Insufficient information on the impact of various anthropogenic threats to biological*

MAP 5. AREAS NEEDING FURTHER STUDY

Categories of importance for areas needing further study reflect compoiste rankings based on assessments provided by NBDSC participants.

diversity, methods for mitigating these impacts, and restoration procedures. There has been, for example, little research of the biological impacts of the construction of railroads, factories, highways, resorts, and dams, or of mines, quarries, and other forms of industrial and urban development. This is especially a concern in biologically fragile areas where development has proceeded without expert environmental assessment.

Other gaps in knowledge that have been widely identified include the following:

- Lack of knowledge concerning the functioning of Bulgaria's aquatic and terrestrial ecosystems and methods of managing their resources on a sustainable basis (especially for edible fungi, other nontimber forest products, and inland and Black Sea fish populations);
- Lack of basic up-to-date information on the presence of rare and endangered species;
- Lack of long-term biological monitoring and ecological studies, especially of species listed within the Bulgarian *Red Data Books*;
- Outdated red data book information, and lack of coverage for fungi, invertebrates, and nonvascular plants in the existing *Red Data Books*;
- Incomplete or outdated inventories of the biological diversity in the protected areas network, and the lack of a comprehensive data base to manage information about the biological diversity within the network;
- Lack of long-term studies of environmental change, especially within the protected areas;
- Lack of coordination and clear criteria in planning research projects on biological diversity and its conservation;
- Inadequate exposure to emerging concepts in conservation biology and applied ecology (e.g., landscape ecology and restoration ecology); and
- Inadequate procedures for organizing and publishing scientific information and for communicating and incorporating biological principles in the policy process.

Box 4. Bulgaria's Protected Areas Network

The core of Bulgaria's efforts to conserve biological diversity, both in the past and in the future, is its network of protected areas. The network's origins can be traced to 1933, when the first nature reserves, at Silecsia and Parangalitsa, were declared. In the following year, protected areas at Baiovi dupki and Vitosha National Park were established at a time when only a few countries in Europe had created national parks. New protected areas were established intermittently over the next four decades. By 1977, about 100,000 hectares were included within protected areas. In 1978, the Committee on Environmental Protection (now the Ministry of Environment) assumed primary oversight responsibility for the protected areas, and the network as a whole entered a period of rapid expansion. As of 1993, the total area had increased to more than 380,000 hectares, or about 3.5 percent of Bulgaria's total land base. (The distribution of existing protected areas of 100 or more hectares is shown in Map 6 in Chapter 4).

The 1967 Law on Nature Protection, under which the current system of protected areas was established and is now administered, defined five categories of protected areas and described their use and status.

Nature Reserves are strictly protected areas containing representative natural ecosystems and habitats of rare species. They correspond to protected areas in Category I (Strict Nature Reserve/Wilderness Area -- a protected area managed mainly for science or wilderness protection) as designated by the World Conservation Union (IUCN). At present, 89 reserves, comprising 77,000 hectares (20 percent of the total area in the network), have been established. Most are situated in Bulgaria's forest ecosystems, and some are included within the national parks.

National Parks (or *People's Parks*) are large protected areas established to conserve lands where natural conditions and ecosystems predominate. The 11 existing parks contain about 293,000 hectares (including 30,000 hectares designated as nature reserves), or 76 percent of the total land area within the network. The characteristics of the parks vary. Some correspond to those included in IUCN Category II (National Park -- a protected area managed mainly for ecosystem protection and recreation). Others are more similar to those in IUCN Category IV (Habitat and Species Management Area -- an area protected mainly for conservation through management intervention) and Category V (Protected Landscape/Seascape -- a protected area managed mainly for landscape and seascape protection and recreation). National parks in the latter categories contain both agricultural lands and nature reserves, as well as hotels, ski resorts, and other recreational developments.

Natural Landmarks (or *Nature Sanctuaries*) and *Protected Sites* are smaller areas of 1 to 500 hectares that provide protection for special landscape features, such as waterfalls and caves, and for communities of rare and endangered species. They correspond largely to those in IUCN Category III (Natural Monument/Natural Landmark -- a protected area managed mainly for conserving a specific natural feature). More than 500 such sites have been established.

Bulgaria's 972 *Historic Sites* serve to protect lands surrounding historical and archeological monuments. Their value in terms of biodiversity conservation is limited, although many sites do contain important natural features.

Many of the protected areas in Bulgaria are of international importance. Two sites (Pirin National Park and the Srebarna Reserve) are recognized as World Natural Heritage Sites under the 1972 Convention for the Protection of the World Cultural and Natural Heritage. Seventeen areas are listed as biosphere reserves under the Man and the Biosphere Program of the United Nations Educational, Scientific, and Cultural Organization. Four sites are designated as important wetland areas under the Convention on Wetlands of International Importance (known as the RAMSAR Convention). In addition, 22 sites (some of which are not currently protected) have been designated by BirdLife International as Important Bird Areas in Europe. (See Appendix A for listings of these areas.)

Box 5. GIS and the National Biological Diversity Conservation Strategy

The maps used in this document have been produced using geographic information system (GIS) technology, which offers important tools for conserving biological diversity. This technology has already played a vital role in preparing this national strategy by allowing scientists from a wide variety of fields, as well as NGO representatives and agency officials, to work together and to see the results of their collaboration in graphic form. While GIS cannot and should not replace established cartographic and planning techniques designed to perform specific tasks, it can serve to coordinate data from many sources and to facilitate applications of this data to conservation problems.

The flexibility of GIS technology is evident in the many roles it can play in implementing various aspects of this national strategy:

- GIS can be used to establish baseline ecological condition maps against which changes in habitats can be measured spatially.
- It can model the influence and spread of both point and non-point source pollution, as well as other human impacts, and show the potential effect of these impacts on areas of high biological value.
- It can be used to gain an overview of the changing status of land tenure and patterns of land ownership and management.
- This technology can be used to monitor and manage the resources within national parks and other protected areas.
- It can be used by local and regional planning officials to resolve and rectify conflicting demands on private lands and other unprotected areas.
- It provides an important means of synthesizing biological and ecological data in restoration projects, and in monitoring the success of restoration and reintroduction programs.
- GIS, because of its integrative nature, allows for collaborative interdisciplinary research on environmental issues, including their social causes and impacts.
- It simplifies the publication of maps and related materials. This capability has many relevant applications to conservation. To cite only a few examples, GIS maps can be used to update and create red data books, to support environmental education projects, and to generate attractive ecotourism-related materials.

Conservation scientists and planners in Bulgaria have only recently begun to use GIS technology. As GIS is adapted to meet the country's conservation needs, it will be called on to perform many services. In the short term, emphasis should be placed on expanding training opportunities, coordinating GIS with existing geographic and cartographic information technologies, and providing computer hardware and software where it will be most useful. As specific elements of the National Biological Diversity Conservation Strategy are implemented, opportunities to incorporate the products of GIS, and to familiarize both professionals and the general public with its capabilities, should be sought.

TABLE 1. NUMBER OF DESCRIBED, ENDEMIC, RARE AND EXTINCT SPECIES (AND OTHER TAXA) FOR SELECTED GROUPS IN BULGARIA.

Kingdom and Subdivision	Described Species	Endemic Species	Rare Species	Known Extinctions
Protozoa	1,800 (est.)	na	422	na
Fungi	3,500 (est.)	na	na	na
Macromycetes[1]	2,100 (est.)	na	65 [2]	na
Plants				
Nonvascular plants				
Algae	2,998	na [3]	22 [4]	2 [5]
Mosses	668	0	19	na
Others[6]	187	0	38 [7]	4
Lichens	709	14 (est.)	25 (est.)	na
Vascular plants	3,550 - 3,750 [8]	na	728 [9]	31 [10]
Pteridophytes	58	0	15	0
Gymnosperms	16	0	2	0
Angiosperms	3,460	170 [11]	711	31
Animals[12]				
Invertebrates				
Noninsects[13]	2,577	387 [14]	567	na
Nematodes	517	24 (est.)	157	na
Oligochaetes	54	10 [15]	8	na
Mollusks	432	116 [16]	60 [17]	na
Crustaceans	1,200 (est.)	47 [18]	4 [19]	na
Arachnids	1,266	79	322	na
Myriapods	215	104	16	na
Insects[20]	19,500 [21] (est.)	744 [22]	1,558	7 [23]
Vertebrates	700 [24] (est.)			
Fish (total/Black Sea)	207/126 [25]	12 [26] /na	29/12	3 [27] /0
Amphibians	16	1 [28]	0	0
Reptiles	36	4 [29]	2	[30] 2
Birds	383 [31]	0	78 [32]	9 [33]
Mammals	94 [34]			
Bats	29	0 [35]	0 [36]	0
Small mammals[37]	42	2 [38]	0 [39]	0
Large mammals[40]	23	4 [41]	10 [42]	2

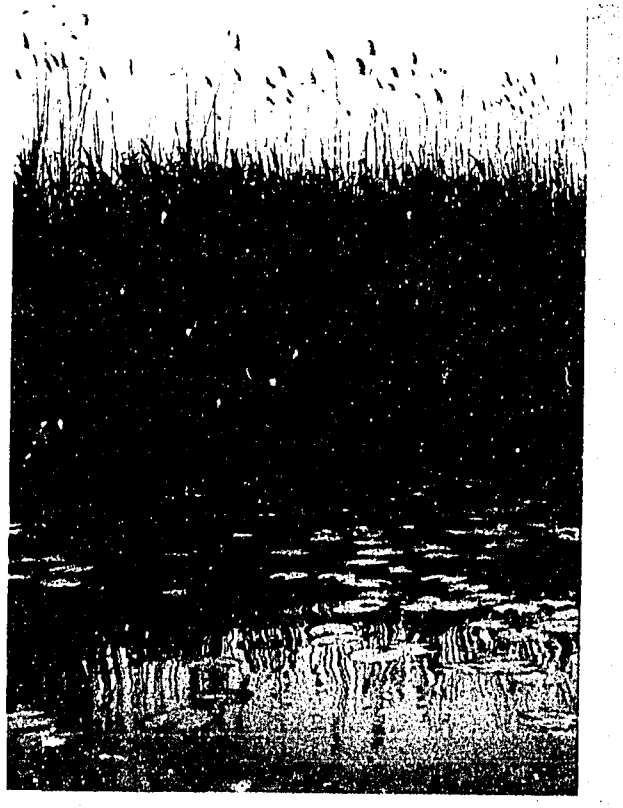
NOTE: The information in this table is derived from the papers prepared for the National Biological Diversity Conservation Strategy workshop. Participants in the workshop were asked to provide information (including but not limited to information from the two volumes of the *Red Data Book of the People's Republic of Bulgaria*) within their area of taxonomic expertise. Key: est., estimated, na, not available.

NOTES FOR TABLE 1.

1. Includes species, subspecies, varieties, and forms from the classes Mymomycetes, Ascomycetes, and Basidiomycetes.
2. Proposed based on research undertaken for the NBDCS workshop.
3. There are four Black Sea macrophytes that are considered endemics.
4. These are all Black Sea species that are classified as rare or endangered.
5. Both are Black Sea species. Other extinctions are likely, but unconfirmed.
6. Hydatophytes, neustophytes, helophytes, and hydatoneustophytes.
7. Listed as endangered, rare, or extinct in the 1984 *Red Data Book of the People's Republic of Bulgaria. Vol. 1. Plants.*
8. The Bulgarian flora also contains approximately 847 subspecies and 2,000 varieties.
9. Threatened and rare species listed in appendixes of Peev et al., "Biodiversity of Higher Plants of Bulgaria," presented at the NBDCS workshop.
10. Extinctions occurring in the "last 50 years" according to the 1984 *Red Data Book of the People's Republic of Bulgaria. Vol. 1. Plants.*
11. Bulgarian endemics. An additional 100 subspecies are considered Bulgarian endemics. The Bulgarian higher flora contains 200 Balkan endemic species and subspecies.
12. The 1985 *Red Data Book of the People's Republic of Bulgaria. Vol. 2. Animals* assumes a total of "about 35,000 animal species within the country's limits, of which nearly 18,000 have been described."
13. Does not include protozoa.
14. Includes 68 species that are considered Balkan endemics.
15. Species and subspecies.
16. Includes taxa other than species.
17. Includes taxa other than species.
18. Refers only to isopods.
19. Refers only to isopods.
20. Includes the following orders: Odonata, Ephemeroptera, Plecoptera, Homoptera (Auchenorrhyncha), Heteroptera, Coleoptera, Blattodea, Mantodea, Isoptera, Orthoptera, Dermaptera, Embioptera, Raphidioptera, Neuroptera, Mecoptera, Hymenoptera, Trichoptera, Lepidoptera, and Diptera.
21. The total number of insect species in Bulgaria is estimated at 29,500.
22. Species and subspecies, including 166 that are also considered Balkan endemics.
23. All from the order Ephemeroptera.
24. Includes both indigenous and introduced species.
25. Both numbers include species and subspecies.
26. Freshwater fish endemic to the Balkan Peninsula.
27. Known extinctions among all taxa in Bulgarian fish fauna.
28. Subspecies.
29. Subspecies.
30. Nearly all herpetofauna that are classified as rare in Bulgaria are common or numerous through their entire ranges. The two snake species noted here -- *Coluber rubriceps* and *Vipera aspis balcanica* -- are extremely rare within Bulgaria.
31. Includes resident, migratory, and wintering birds.
32. Includes 16 globally threatened species as well as 61 that were listed as rare or threatened in the 1985 *Red Data Book of the People's Republic of Bulgaria. Vol. 2. Animals.*
33. Includes six species extirpated from the Bulgarian avifauna but which occur in Bulgaria during migrations.
34. Includes introduced species. The 1985 *Red Data Book of the People's Republic of Bulgaria. Vol. 2. Animals* noted 88 mammal species.
35. There are seven bat species that occur rarely in Bulgaria, but which are common or abundant in other areas.
36. Three bat subspecies that were first described as Bulgarian endemics in 1936 are no longer recognized.
37. Includes Insectivora, Lagomorpha, and Rodentia.

38. The ranges of these two species -- the hamster *Mesocricetus newtoni* and the dormouse *Myomimus roachi* -- are restricted; they occur mainly within Bulgarian territory.
39. Although no small mammal species are noted here as rare, a number of species can be considered rare depending on the definition of rarity. These include species with populations that are small and discontinuously distributed, limited in their distribution, or represented by small scattered populations at a limited number of locations.
40. Includes Carnivora, Pinnipedia, Cetacea, and Artiodactyla.
41. Refers to the two endemic subspecies of dolphin and the endemic subspecies of chamois and European marbled polecat.
42. Includes species, subspecies, and populations considered rare, vulnerable, or endangered within Bulgaria.

THREATS TO BIOLOGICAL DIVERSITY IN BULGARIA



WETLANDS ALONG THE BLACK SEA COAST. PHOTO: © 1994 CHRISTO DELIASHEV

Bulgaria's biological diversity faces a broad spectrum of anthropogenic threats. The varied threats affect different taxa and regions to different degrees. In some cases -- the damage to commercial fish breeding areas in the Black Sea littoral zone as a result of trawling, for example -- the threats are discrete, readily identifiable, and of short-term economic consequence. In any given ecosystem, however, a combination of interrelated threats is usually present, affecting the general health of the system in often subtle ways. Poor pasture management and overgrazing in the mid-elevation hills, for example, has led not only to a loss of floral and soil biotic diversity in the pastures themselves, but also to soil erosion, siltation, and eutrophication in downstream waters and wetlands.

The threats to biological diversity fall into several general categories: habitat loss and degradation, pollution, overexploitation (of ecosystems, habitats, and species), exotic and hybrid species, changing land tenure, global change, and lack of knowledge and effective policy.

HABITAT LOSS AND DEGRADATION

The degradation and outright destruction of both aquatic and terrestrial habitats are the most significant threats to biological diversity in Bulgaria. The deterioration of habitats affects all ecosystems, from the high mountain forests and lakes to the open waters of the Black Sea. In some cases the threats are site-specific and the effects acute. In other cases, the threats issue from general patterns of land use, and the effects are widespread across the landscape.

Bulgaria's aquatic systems -- the Black Sea; the seaside lakes (Bourgas, Varna, Beloslav, Mandra); the Danube and other major rivers, inland lakes and streams; groundwater; and wetlands associated with the Black Sea coast, the Danube, and other inland waters -- are subject to many forms of habitat loss and degradation:

- Pollution from household, agricultural, industrial, and nuclear wastes;

- Eutrophication as a result of intensified land uses, sedimentation, wastewater influx, and overloading with other organic inputs;

- Illegal bottom trawling in the Black Sea, which damages fish breeding areas;

- Channelization of riverbeds, affecting both the biota of the streams and rates of water and sediment flow into the Black Sea;

- Other alterations of stream hydrology, habitats, and processes, including diking, embankment, diversion for irrigation, and damming; and

- Drainage of wetlands along the Black Sea coast, in the Danubian plain, and in inland basins.

These factors have led to substantial alterations and, in some cases, the complete disappearance of fish populations and other fauna in many aquatic environments.

Bulgaria's terrestrial ecosystems face a different set of threats:

- Clearing of the few remaining natural lowland forests for agricultural purposes and of older forests in the higher elevations for timber. Timber harvesting not only degrades habitats directly, but requires the construction of roads and other support structures, further degrading and fragmenting forest ecosystems.

- Widespread alterations of mid-elevation forests due to clearing, fires, heavy pressure from livestock grazing, and artificial planting and afforestation (especially the replacement of broad-leaved forests with conifer plantations).

- Problems associated with agricultural land uses: plowing of meadows, including formerly uncultivated lands; overgrazing in high mountain meadows, pasturelands, and foothills; expansion of monocultures and input-intensive agriculture, especially the intensified use of fertilizers and pesticides; loss of the genetic diversity of crop plants, orchard trees, wild and primitive relatives of domesticated crops, and domestic animal breeds; and soil erosion and siltation of lakes, wetlands, and waterways.

- Poorly planned construction and development projects, including tourist resorts and facilities, highways and other transportation projects, dams, mines, and quarries, as well as urban expansion in general. Especially vulnerable are those areas, often biologically fragile, that are developed for increased tourism -- the Black Sea coastal dunes and beaches, caves, and high mountain forests and meadows. Such projects have not been undertaken with expert evaluation of their environmental impacts.

- Genetic isolation as a result of habitat fragmentation. This is known to affect the chamois and brown bear populations in the Stara Planina Mountains, which are separated from those in the Rhodope, Rila, and Pirin mountains. Other plant and animal species, not only in the montane forests but in remnant lowland communities, may also be affected.

Pollution

Bulgaria's biological diversity is threatened to varying degrees by virtually all forms of point and non-point source pollution, including household, industrial, agricultural, petroleum and petrochemical, and nuclear. Several forms are of particular concern:

- Household wastewater (especially in the high mountains) and other toxic and organic household wastes;
- Runoff of agricultural organic wastes and chemicals (pesticides and fertilizers)
- Contamination of agricultural lands with heavy metals;
- Localized air pollution in parks near large urban or industrial areas (especially Vitosha National Park);
- Localized pollution of soil (especially agricultural lands) and water with heavy metals, chlorine compounds, and other industrial wastes;
- Oil pollution from drilling and shipment on the Black Sea;
- Thermal pollution of the Danube River, other inland waters, and (more sporadically) the Black Sea waters (this has not been well studied in Bulgaria, but should be considered a threat based on studies performed in other areas);
- Transboundary air pollution from other European countries; and
- Transboundary water pollution of the Danube River and Black Sea.

Environmental reforms in Bulgaria, and throughout Central and Eastern Europe, have been driven largely by concerns over the severity and extent of industrial pollution and its associated effects on human health (see Box 6). This remains an overriding concern, but greater consideration should be given to other types of pollutants, and to their effects on biological diversity.

PYGMY CORMORANT, (*HALIETOR PYGMEUS*).
PHOTO: © 1994, TANIEU MICHEV

OVEREXPLOITATION

Direct exploitation and especially the overexploitation of economically valuable species affect many different ecosystems, habitats, and taxa. Included in this category are such threats as

- Illegal gathering, sale, and export of medicinal plants, edible fungi, the two commercial species of snail, vipers, and protected reptiles, especially reptile species from the Mediterranean zones.
- Overharvesting of commercial fish species in the Black Sea coastal and open waters. Overexploitation of the Bulgarian Black Sea fisheries was most intensive in the period from 1960 to 1980. Despite the adoption of

Box 6. Addressing Pollution Problems

Although the human health and environmental effects of pollution are not the primary focus of this strategy, the issues of biodiversity conservation and pollution control are inseparable. Pollution of the air, soil, groundwater, freshwater, and coastal waters in Bulgaria has intensified over the last five decades and constitutes a major threat to both biological diversity and human health.

Air quality suffers from high levels of particulate matter, sulfur dioxide, and nitrous oxides. Most are emitted from automobiles; coal-burning power plants; and chemical, cement, and other industrial plants. The effects of these pollutants are evident in the occurrence of regional concentrations of human respiratory problems and incidence of acid precipitation. Air pollution is also cited as a contributing factor in the reduced resistance of forest stands to disease and insect infestations.

Of Bulgaria's 13 major rivers, only one (the Mesta) now meets recreational quality standards along its full length. Most are polluted in their lower stretches. Two (the Danube and Beli Lom) fail to meet pollution standards at any point and 10 are seriously polluted along more than half their length. These rivers receive inputs of barely or untreated sewage, feedlot effluent, fertilizer runoff, and unregulated industrial wastewater containing chemicals and heavy metals. The consequences for biological diversity have been profound. A 1987 evaluation of the major rivers revealed significant declines in species diversity. Rivers with the poorest river bottom communities are the Arda, Iskar, Yantra, Russensky Lom, and Maritsa. Stretches of the Vit, Osam, and Ogosta have also been seriously degraded.

Although pollution of the Black Sea is a problem that transcends national boundaries, Bulgaria contributes a significant portion of the wastes. At present, pollution constitutes the main threat to marine resources, and marine biodiversity in general, along the Black Sea coast. Oil and petrochemical industrial wastes comprise nearly half of the discharge into Bourgas Bay. Adjacent Bourgas Lake is the most heavily polluted of the seaside lakes. Concentrations of untreated sewage and industrial wastewater have also caused advanced eutrophication in Varna Bay.

Soil and groundwater pollution are significant problems. Rapid, large-scale industrialization over the last several decades has left a legacy of high concentrations of heavy metals, fly ash, organic chemicals, and acids. Mining and smelting operations, coal-burning power plants, and oil processing and chemical production facilities were (and in many cases remain) the main sources. Wastes from these

(CONTINUED ON PAGE 31)

fishing regulations and prohibitions in Bulgaria over the last decade, stocks of most commercial species within Bulgaria's waters have continued to decline, in some cases dramatically. Species affected include the sprat (*Sprattus sprattus phalericus*), mullets (Mugilidae), turbot (*Psetta maxima moeotica*), sand smelt (*Atherina boyeri*), gobies (Gobiidae), European flounder (*Platichtys flesus luscus*), Black Sea mackerel (*Scomber scombrus*), bonito (*Sarda sarda*), bluefish (*Pomatomus saltator*), and anchovy (*Engraulis encrasicolus*).

- Poaching and sport hunting pressures on large mammals, birds (especially waterfowl and birds of prey), and other groups. Among the species affected are several regionally and globally threatened species, including the brown bear (*Ursus arctos*), chamois (*Rupicapra rupicapra balcanica*), capercaillie (*Tetrao urogallus*), rock partridge (*Alectoris graeca*), red-breasted goose (*Branta ruficollis*), white-headed duck (*Oxyura leucocephala*), pygmy cormorant (*Halietor pygmeus*), and pheasant (*Phasianus colchicus colchicus*).

- Control of predators, especially those (such as the wolf and cormorant) that subsist on game animals and commercially valuable fish species. In the past, strychnine, barbi-

Box 6. Addressing Pollution Problems (continued from page 30)

sources were dispersed through the air, through irrigation with wastewater, and through direct dumping. Although pollution control laws were enacted, they went largely unenforced. At the same time, advanced pollution control technologies were unavailable due to political constraints. The pollution of soils with heavy metals -- primarily copper, zinc, lead, and cadmium -- remains an especially serious concern. Some 456,000 hectares that were to be returned to private ownership under Bulgaria's land restitution laws cannot legally be turned over until they have been cleaned up. Although these pollution problems have received greater attention in the last few years, scientific information on the extent of the environmental impacts remains limited. Groundwater pollution, for example, has rarely been monitored.

The political reforms now occurring have begun to address these long-neglected problems. Nongovernmental organizations (NGOs), in particular, have provided the stimulus and many detailed analyses and recommendations for improved national environmental policies. However, the lack of effective laws, financial resources, and incentives remain serious obstacles. New legislation to bolster the authority of regulatory bodies and to encourage the adoption of "greener" technologies is being formulated. International interest has also aided the effort. Shortly after the change in Bulgaria's government, the World Bank, the U.S. Environmental Protection Agency, and the U.S. Agency for International Development (USAID), in cooperation with the Bulgarian Ministry of Environment, undertook a comprehensive study of the country's environmental problems. This was a critical step in communicating to the world the pollution problems facing Bulgaria and in setting priorities for responding to them.

Such analyses have begun to provide guidance to private investors and assistance agencies interested in environmental cleanup and restoration projects. Although these projects are often expensive and still in the experimental phase, several have already been initiated. For example, Battelle Laboratories (with the assistance of the USAID) has helped to support a new NGO that will promote energy efficiency through policy reform, joint venture development, training, and education. Inefficient energy use, particularly in the industrial sector, has been a key contributor to Bulgaria's air pollution problems. The Bulgarian Energy Efficiency Foundation was established in August 1993, staffed with in-country experts able to provide advice and assistance for improving efficiency.

turates, and other substances have been used against wolves, affecting not only the wolf population, but populations of vultures and other scavengers that feed on the carcasses. Similarly, the control of rodents and other pest species through mass poisoning has had indirect effects on their natural predators. This has been a contributing factor behind recent declines in the population of several steppe species, including the marbled polecat (*Vormela peregusna peregusna*), steppe polecat (*Mustela eversmanni*), golden hamster (*Mesocricetus newtoni*), and several species of waterfowl and birds of prey.

Invasive and Introduced Species

As a European country long occupied by human beings and their domesticated plants and animals, Bulgaria is not as vulnerable as other biogeographic areas to the problems associated with invasions by exotic species. However, it is not invulnerable. For example, the raccoon dog (*Nyctereutes procyonoides*) and the muskrat (*Ondatra zibethica*) have spread successfully through Bulgaria following their artificial introduction into other parts of Eastern Europe. Bulgaria's aquatic ecosystems in particular are susceptible to disruptive invasions. In the last

few years, the ctenophore *Mnemia maccradyi* has significantly affected the stability and diversity of the Black Sea coastal plankton community.

The intentional introduction of nonnative species and subspecies has also had negative impacts on biological diversity. Nonnative timber trees have been widely used in forest plantations, appropriating and altering natural habitats and narrowing the genetic base of forest trees. Exotic stocks of fish and game animals have been introduced, sometimes to the detriment of native species and subspecies. The Mongolian pheasant (*Phasianus colchicus mongolicus)* has interbred with the local indigenous form (*Phasianus colchicus colchicus*). Similarly, browns bears (*Ursus arctos)* from the Russian-Carpathian population were introduced in 1983-1984 into the Bulgarian range of the Balkan brown bear, which is morphologically and behaviorally distinct from its northern relative.

Agricultural Intensification

As noted previously, Bulgaria's unique genetic resources -- local crop varieties, wild relatives of domesticated plants, and local and primitive domestic animal breeds -- have been diminishing as a result of changes in land use and the agricultural economy. Local crop varieties began to be lost with the advent of intensive agriculture and the development of new crop varieties. Land consolidation and the collectivization of agricultural production accelerated the process. Now, the greater availability and productivity of foreign forms may result in further pressure on local varieties. The same forces have also led to the loss or decline of local animal breeds. Of the 37 domestic animal breeds indigenous to Bulgaria, all face some degree of threat; 6 are already extinct, 12 are nearly extinct, 16 are threatened, and 3 are potentially threatened. Potentially important genetic resources of wild plant and animals, including rare species and Bulgarian endemics, are also decreasing. Habitat loss, illegal gathering, hybridization between wild and domestic species, and a lack of incentives and other measures to assure propagation and preservation are the main factors behind their decline.

Changing Land Tenure

Land restitution -- the return of state-controlled lands to private or municipal ownership -- is a complex process now unfolding in Bulgaria and other countries of Central and Eastern Europe (see Box 7). In Bulgaria, it is expected to affect about 4.6 million hectares, or 40 percent of the nation's land base. Most of these lands are situated in the lowlands and submontane foothills (as opposed to high mountain regions).

Restitution does not, in and of itself, constitute a threat to biological diversity. In fact, in areas of the country where extensive monocultural regimes have been in place, it may have significant positive impacts by encouraging new land use patterns favorable to biological diversity. In all cases it holds great potential for involving citizens more directly in conservation activities.

However, there is real concern that, as the restitution process accelerates, and as citizens and communities regain control over lands, they will not be fully informed or encouraged -- through education, local planning, or economic incentives -- to adopt conservative or restorative land use practices. Many who are coming into land ownership are still uncertain about their options. In a recent survey of people living in small towns and villages near protected areas, 25 percent had not decided what they will do with their lands. Restitution, therefore, entails a number of *potential* threats to biological diversity:

- Impaired ability to protect the public interest in private lands, especially lands in or near protected areas;
- Increased difficulty (and possibly expense) in adding to the system of protected areas;

Box 7. Land Restitution and Conservation

Land restitution presents both important opportunities and potential problems for conservation. The long-term effects depend on the degree to which conservation provisions are built into the restitution process. That process is complicated due to the diversity of historic land tenure patterns. Land in Bulgaria has traditionally been owned or managed by private individuals, cooperatives, municipalities, and the church, and holdings have usually been situated in close proximity to one another. Sorting out these patterns is a time-consuming task, often involving extensive research and conflicting claims. It also has broad implications for future conservation planning, especially planning at the landscape scale.

Bulgaria's Law on Restitution is clear on the fate of farmlands within the nation's protected areas: no lands will be returned that are now within protected areas of national and international importance (primarily the national parks and natural reserves). The government will compensate former or potential owners of these lands with other lands. In other types of protected areas -- natural landmarks, protected sites, and historic sites -- landowners will be required to use their lands in a manner defined by law.

Land restitution, however, will have its greatest impact on agricultural lands outside protected areas. These lands form the matrix within which protected areas exist, and themselves support (or can support with restoration) important populations, habitats, and communities. It is on these lands that conservation -- of soil and water resources, forests, wetlands, other wildlife habitats, plant genetic resources, and aesthetic values -- will be most in need of commitment on the part of individual and municipal landholders. More perhaps than any other one factor, the actions of these landholders over the next few years, acting singly and cooperatively, will determine the character of the Bulgarian landscape and the fate of its biological diversity.

The restitution of forestlands presents even greater complications. Naturally, in a recessionary period the economic expectations that accompany forest ownership are great. The Ministry of Environment, other government entities, and nongovernmental organizations are now assessing carefully all projects in an effort to guarantee the sustainable use, maintenance, and enrichment of the biological resources and diversity within private forest lands. At present, however, there are no legal or policy provisions that offer guidance or incentives for biodiversity conservation on restituted forestlands, nor is there a coherent program to inform landowners of conservation issues and techniques.

Providing a stronger legal basis for conservation on all restituted lands, not just those within existing protected areas, is absolutely necessary. However, such legal provisions will automatically solve neither the economic problems of the people in these areas nor the environmental problems of the affected lands. As a sobering case in point, the restitution of heavily polluted agricultural lands has been delayed until they are adequately restored (see Box 8). Furthermore, the ability of the government to stimulate the adoption of sustainable agriculture and forestry methods by local farmers and other landowners is limited under existing economic conditions. Successful conservation will require that landowners possess the desire, the ability, and the knowledge to manage their lands in a manner that combines their own interests and the public interest. Toward this end, an effective program of incentives and dissemination of information about sustainable agriculture methods and systems will be critical in supporting any new laws.

- Direct destruction of economic resources and rare or unique habitats on returned lands through logging, agricultural expansion, draining of wetlands, and other activities;
- Increased susceptibility to indiscriminate urbanization and tourism-related development;
- Exacerbation of the illegal gathering and export of medicinal plants, fungi, and other commercially valuable species subject to exploitation in the wild;
- Increased need to compensate for wildlife damage;

Box 8. Sustainable Agriculture in Bulgaria

As the dominant land use in Bulgaria, agriculture has a critical influence on the fate of biological diversity within the country. Agriculture, like all areas of Bulgarian life, is in a state of profound transition as a result of the political and economic changes that have occurred in the last several years. As these changes continue, conservationists, agricultural experts, officials, farmers, and other landowners will need to work together in moving toward a system of agriculture that is socially, economically, and environmentally sustainable.

Of Bulgaria's land base, 62 percent -- about 6.85 million hectares -- is devoted to agricultural production. The 4.6 million hectares of cultivated land are divided among grains, vegetables, and other crops (3.85 million hectares); grasslands (.49 million hectares); vineyards and orchards (.3 million hectares). Pastures account for 1.5 million hectares, and other agricultural uses account for the remainder. Although most food is produced for domestic use, Bulgaria does export grains, fresh fruits, and vegetables. Agriculture accounted for 25 percent of the nation's income in 1989. Agricultural output and income have since declined due to unstable political and economic conditions.

Agriculture in Bulgaria dates back, of course, several millennia. Plant geneticists believe that Bulgaria may in fact have provided important genetic source material for many important crops, including many cereal grains and fruit trees. Traditional agriculture in Bulgaria was based on small private landholdings. In 1946, prior to the forced collectivization of farmlands, these small parcels numbered about 12.2 million, averaging about .3 to .5 hectares in size. The 1946 Law on Land Property initiated the process of land collectivization and effectively abolished private ownership of land. By 1958, virtually all farmland had been incorporated into large collective farms or lost to industrial expansion, mining operations, and other forms of development.

As collectivization changed the nature of farming, many of the localized pest and nutrient management practices, crop and livestock genetic strains, and seed sources were abandoned. Larger-scale agriculture required increased dependence on purchased inputs of machinery, artificial fertilizers, pesticides, and seeds. The heavy emphasis on productivity resulted in increased outputs, but incurred widespread social and environmental costs. Of the latter, soil erosion is perhaps the most severe. As a result of deforestation, overgrazing, and other factors, 68 percent of Bulgaria's arable land is either seriously eroded or at risk of erosion. Other environmental problems associated with agricultural land use include chemical pollution of soil, pollution of surface waters from livestock operations, toxic contamination of soils with heavy metals, and the loss of genetic diversity. Little research, however, has been undertaken to ascertain the full extent of these effects. Groundwater pollution, for example, has rarely been monitored in Bulgaria.

Since passage of the Law on Ownership and Use of Farmland in October 1991, additional laws have been enacted to move the process of land restitution forward, and others are now being drafted. While several of these new laws contain provisions related to environmental protection, they place no explicit emphasis on protecting sensitive habitats and species. Furthermore, they address only peripherally the need to encourage adoption of environmentally sound agricultural practices.

As the restitution process continues, lawmakers need to be more aware of the important connections between sustainable agriculture and biodiversity conservation. Agricultural land use will have far-reaching consequences for soil and water quality, habitat protection and restoration, the management of protected areas and buffer zones, protection of plant and animal genetic resources, landscape- and watershed-level planning, and other critical aspects of biodiversity conservation. But conservation is only one of many important reasons for moving toward sustainable agriculture in Bulgaria. Perhaps most important, work at this interface can serve to bring together agricultural, environmental, and natural scientists, as well as farmers, landowners, educators, food wholesalers and retailers, consumers, and representatives from nongovernmental organizations.

- Increased difficulty in conducting research on private lands;
- Increased use of agricultural chemicals and other pollutants;
- Decreased incentives for long-term investments in forestry, sustainable agriculture, and other conservative land use practices; and
- Lack of adequate legislation or education to support zoning and the adoption of appropriate land management practices.

Global Change

Accelerated rates of global change could significantly affect Bulgaria's biological diversity. Bulgaria, like all countries, faces overarching threats related to the depletion of the Earth's ozone layer and the accumulation of greenhouse gases in the atmosphere. As a mid-latitude country, Bulgaria will likely be less affected by the most immediate effects of ozone depletion. If current predictions of global warming hold true, the effects on Bulgaria's transitional climatic conditions could be far-reaching. Because Bulgaria is situated at the point where three major bioclimatic regions meet, even slight shifts in climatic conditions could have substantial effects on temperature, precipitation distribution and timing, and weather patterns, and thus on biological diversity. If a general warming trend emerges, the survival of the many rare and endemic populations and species in Bulgaria's alpine habitats (especially those populations that have become isolated as a result of habitat fragmentation) could be threatened. If global warming should result in a rise in sea levels, the effects along the Black Sea coast would also be substantial.

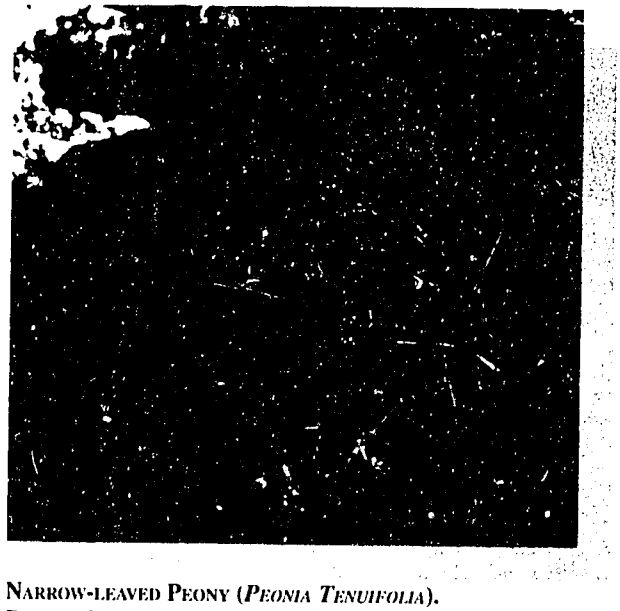
It will be several years before current global warming scenarios can be evaluated with greater certainty, and the potential effects on biological diversity better understood. In the meantime, some sense of the possible impacts can be gained by assessing the effects of the drought conditions that have prevailed in Bulgaria and other parts of Central and Eastern Europe over the last 10 years. During this period, average temperatures in Bulgaria have risen, while rainfall levels have fallen 43 percent below that which is considered normal. The most direct impacts have been felt on wetlands, streams (especially those that provide water for irrigation), and reservoirs (many of which are at or near record low levels). These regional impacts should be fully considered in discussions of the effects of global change on biological diversity in the Balkan Peninsula.

Lack of Knowledge and Effective Policy

The lack of knowledge and effective public policy is a less direct but no less critical threat to biological diversity. This complex category of threats includes several general areas of special concern:

- Insufficient scientific information on the status of and threats to biological diversity (see "Gaps in Scientific Knowledge" in the previous chapter).
- Inadequate management and administration of protected areas.
- Uncoordinated and poorly enforced conservation laws and environmental regulations.
- Ineffective or nonexistent penalties and sanctions.
- Insufficient registration and monitoring of harvested biological resources.
- Lack of public understanding of biological diversity and the threats to it, and a lack of information available to the public to achieve a higher level of awareness.

DEVELOPING A COMPREHENSIVE CONSERVATION PROGRAM



NARROW-LEAVED PEONY (*PEONIA TENUIFOLIA*).
PHOTO: © 1994, IVA APOSTOLOVA.

None of the threats to Bulgaria's biological diversity can be easily addressed. Complex socioeconomic and environmental forces lie behind them; complex effects issue from them. Neither, in most cases, do the threats act in isolation. In most ecosystems, various threats interact and diminish the ability of species and communities to perpetuate themselves. No single action, it follows, will be able to prevent future losses of biological diversity. To address the many threats to biodiversity in a coordinated and mutually reinforcing manner, a comprehensive conservation program, entailing a wide variety of activities, is needed.

Such a program will need to include many components, from legislative reform and environmental education to biodiversity research and ecosystem restoration. It must encourage and build on actions undertaken at the local level, and involve all those who have a stake in the future of Bulgaria's biological diversity -- farmers and students, land managers and agency officials, recreationists and educators, scientists, advocates, and decision makers. People from many backgrounds, with a wide range of talents, will need to contribute to this program if it is to succeed.

In laying out this new conservation program, recognition should be given to past efforts to protect biological diversity and manage biological resources. Over the last 100 years forest management has allowed Bulgaria to retain and restore a high proportion of its forest cover (especially when compared with other European countries). The existing network of protected areas has succeeded in preserving critically important lands. These previous accomplishments provide a solid foundation on which to build integrated resource management programs that conserve specific biological resources while protecting and restoring biological diversity more generally.

In each of the areas discussed in this chapter, recommendations are offered that emerged in discussions at the National Biological Diversity Conservation Strategy workshop. (Many more specific recommendations were offered by the participants, and are included in the papers from the workshop.) In formulating these recommendations, workshop participants agreed to employ two overriding criteria: these actions are both *urgently needed* and largely *achievable*

with existing institutions, financial resources, and personnel. International support will be needed to carry out fully some of these recommended actions, but most can be initiated, developed, and implemented domestically.

Land and Resource Management

The key to conserving biological diversity in Bulgaria is the adoption of an approach to land and resource management that recognizes the value of retaining and restoring diversity at all scales, on both reserved and nonreserved lands, and under various management regimes. Protected areas are, of course, special repositories of biological diversity and other unique natural features, and strengthening the national system of protected areas is essential. Protected areas exist, however, as components within a broader landscape. The recommendations offered under this category stress the need to better integrate the management of all land, water, and biological resources in order to protect and renew the ecological processes on which biological diversity depends (see Box 9).

Protected Areas

Historically, protected areas have been established to safeguard areas of special biological, aesthetic, and cultural value. The network of protected areas remains the foundation of the nation's biodiversity conservation strategy, but it has many biological gaps and administrative shortcomings. At the NBDCS workshop, participants frequently mentioned several overarching concerns.

- Administrative and jurisdictional responsibilities for managing the protected areas need to be clarified and better coordinated, and management requirements for the different categories of protected areas need to be defined.

- A number of biologically critical areas are not included within the existing system, while several typical ecosystems are inadequately represented. Secondary plant communities are underrepresented. In addition, the network contains many small or isolated reserves that require more effective management to protect their biological diversity.

- Administration of the nature reserves, national parks, and important natural landmarks and protected sites needs to be strengthened, especially as regards law enforcement and land management. Meaningful management plans have been developed for only a few of these protected areas, and enforcement of restrictions within the reserves is inadequate. Many reserves are not staffed at all. Management experience and professional training opportunities are lacking within the system as a whole.

- Scientific information and research programs (especially inventory and monitoring programs) for the protected areas are inadequate.

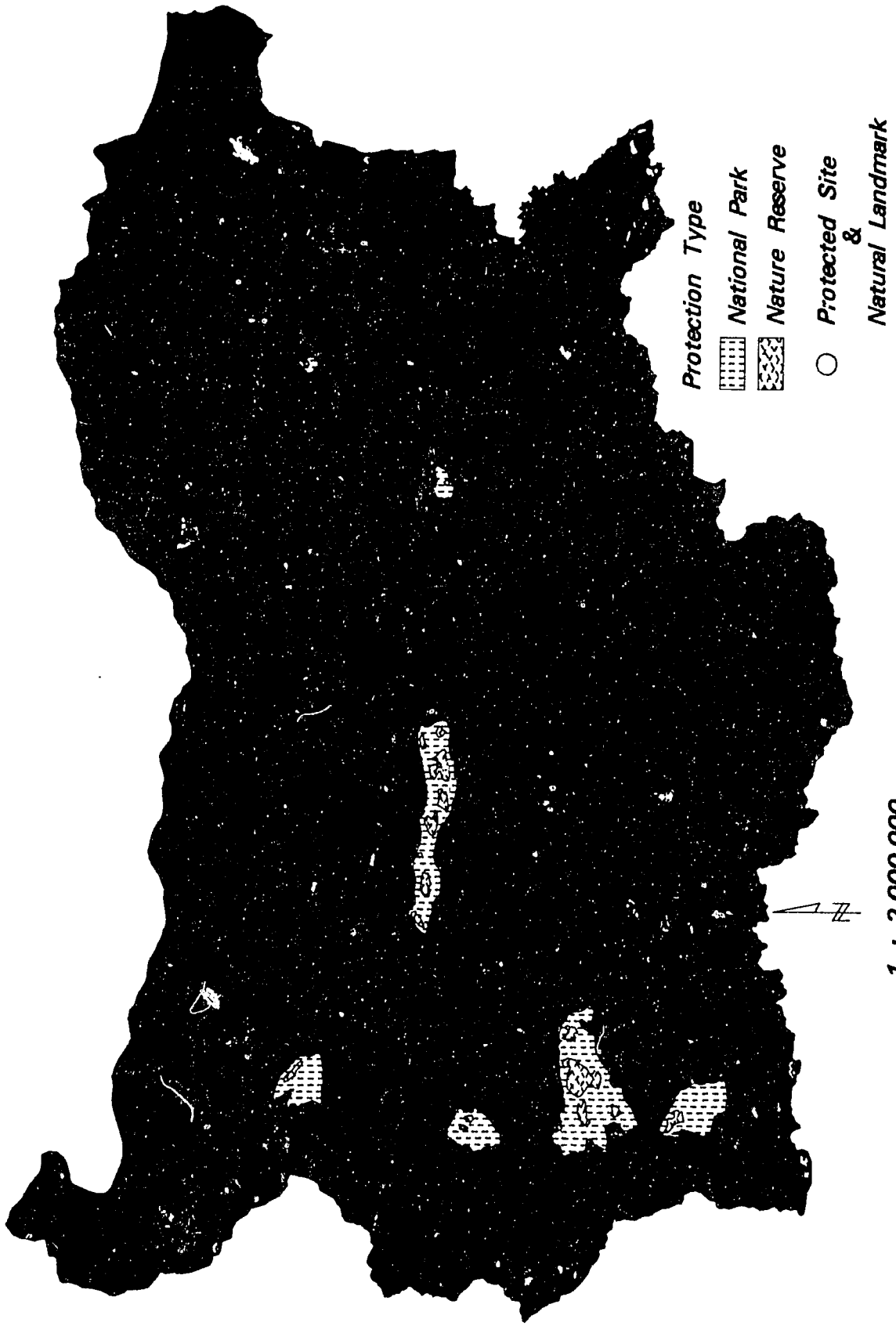
- Public interest in the protected areas as repositories of biological diversity is lacking, as is strong legislative support for the needed reforms.

- Information about the existing protected areas network needs to be made more available, and public education and interpretation programs need to be improved.

- Funds to strengthen the protected areas network have been lacking.

Despite these problems, the system of protected areas has succeeded in safeguarding many important sites and representative areas. The reform and improvement of the network will be one of the most critical components of the NBDCS in the years ahead.

Plans to expand the system of protected areas are advancing. The MOE, for example, has established a goal of designating 7.5 percent to 8.0 percent of the nation's territory in protected areas by the year 2000. Several NGOs have



MAP 6. EXISTING PROTECTED AREAS (100 OR MORE HECTARES)

developed detailed proposals for improving the network. The participants in the NBDCS workshop offered over a hundred recommendations for additional protected areas. These varied from general suggestions (to create, for example, a new national park in the Rhodope Mountains) to highly detailed proposals for new protected sites important for various taxonomic groups. Many other specific proposals for expanding and strengthening the network were offered, while the gap analysis procedure using geographic information system technology has provided an initial filter by which to identify "missing pieces" in the network (see Map 7). Map 7 synthesizes data from the species richness, endemic and rare species assessments, uses this data to rank areas according to their importance (low, medium, high), and overlays the map of existing protected areas of 100 or more hectares. (See Appendix D for a graphic representation of this process.) This procedure identifies areas of high importance for future protection efforts. At the same time, Map 7 should be considered preliminary; refinement of the gap analysis should proceed along with further discussions for strengthening the protected areas network.

The NBDCS workshop was not designed to reach consensus on specific boundaries for new protected areas, but it did lay the foundation for further discussion and agreement. High-priority regions for considering future protected areas include

- the Rhodope Mountains;
- the eastern Stara Planina Mountains;
- the Black Sea coast;
- Strandzha Mountain;
- the Strouma River valley; and
- smaller areas surrounding and connecting the existing national parks of the Rila, Pirin, Vitosha, and Stara Planina mountains.

Plans for improving the administration of the protected areas network are also advancing. A new protected areas act is being developed that will include general provisions for improving the system as well as specific requirements for managing the different categories of protected areas. As of April 1994, this act has been approved by the Council of Ministers and is awaiting further action in the Commission on the Environment of the Parliament. The creation of the new National Nature Protection Service also provides opportunities to strengthen protected areas administration within the MOE, and to better coordinate interagency management activities. New funding sources are being tapped to support expanded opportunities for planning and enforcement, training of personnel, scientific research, and public education. Finally, Bulgaria is participating in the development of the *Action Plan for Protected Areas in Europe*, which provides guidance on protected area management for policy makers and administrators under the auspices of the World Conservation Union.

Immediate steps should be taken to advance these efforts, and further discussions held to consider in greater detail the many proposals for expanding the network of protected areas and for improving administration (see "Priorities for Immediate Action and Support" later). In this process, actions should be taken to address the following specific recommendations.

Recommendations

- Evaluate the effectiveness of the existing network of protected areas and establish new areas as needed to protect key habitats across the country.
- Employ emerging principles of conservation biology and landscape ecology to redesign reserves where necessary, to designate effective buffer zones, and to connect and coordinate reserves at the broader landscape scale.

MAP 7. INITIAL GAP ANALYSIS

"Map synthesizes data from the species richness, endemic and rare species assessments, uses this data to rank areas acccording to their importance (low, medium, high), and overlays existing protected areas of 100 or more hectares to reveal those areas of importance not under any type of protection."

- Adopt standardized habitat description and classification systems that are in harmony with those used in other European countries.

- Institute a program of long-term biodiversity research and monitoring within the protected areas. Studies undertaken under this program should provide information on issues related to reserve management and biodiversity protection, and should be coordinated to build a comprehensive, accessible data base.

- Strengthen the management and enforcement capability in protected areas and national parks to ensure protection of important species and communities. In particular, opportunities for training reserve personnel are needed.

- Finance improvements in managing protected areas by establishing a Nature Protection Fund. The fund should serve to reinvest revenues from new sources (e.g., user and visitor fees, debt-for-nature agreements, and ecotourism facilities) in conservation activities.

- Develop innovative partnership programs to improve the administration of parks and other protected areas.

- Provide the public and government officials with more information about the protected areas network as a whole -- the existing reserves, their role in conserving the nation's biodiversity, management guidelines and regulations, and opportunities for public involvement. Specifically, a directory of protected areas should be published and distributed to all government agencies.

- Provide opportunities for better public understanding of the individual protected areas through expanded education and interpretation programs.

Nonreserved Lands

Protected areas will be able to safeguard only a small fraction of Bulgaria's land base. Even if the goal of including 7.5 percent of the country's land base in protected areas is met, the network will still be able to protect only a small portion of the nation's biological diversity. Furthermore, the fate of protected areas and of the biological diversity they support is influenced to a great degree by their geographical context -- the broader landscape in which they exist. Retention and restoration of biodiversity are also important to the sustainable management of croplands, pastures, commercial forests, and other lands devoted primarily to economic uses, as well as aquatic ecosystems and the fisheries they support. Finally, even lands whose biological diversity has been depleted or displaced retain value for conservation purposes, including habitat restoration, watershed protection, and buffer zone management. For these reasons, greater attention must be paid to the management of lands beyond the protected areas, especially those that are soon to be returned to private or municipal ownership. To promote conservation on nonreserved lands, the following actions are recommended.

Recommendations

- Establish incentive programs to involve individual citizens and private landowners in conserving important remaining resources and habitats and restoring degraded habitats.

- Develop, as a high priority, a coordinated program of incentives, information, technology dissemination, and management guidelines to address the need for rehabilitation of contaminated agricultural lands.

- Encourage closer collaboration between agricultural programs and biodiversity conservation programs, especially to promote the preservation of rare breeds, local varieties,

Box 9. Integrating Resource Management in Bulgaria

In Bulgaria, as in other countries, the management of natural resources has traditionally been divided along well-defined disciplinary and departmental lines. Training, research, and administration in agriculture, forestry, game and fisheries management, natural areas management, tourism and recreational development, civil engineering, resource policy and economics, education, urban and regional planning, and other fields have tended to obscure the fact that all of these are interrelated and exist within a unified spatial context (be it a municipality, watershed, landscape, or other geographic unit). As a result, conservation activities have usually focused on particular resources, projects, or reforms in isolation, and overlooked the need for coordination.

Because biological diversity serves as a common denominator for many different fields, and because many professions affect the status and fate of biological diversity within the landscape, conservation efforts must begin to bring specialists together and to build connections between them. The NBDCS workshop itself was designed to incorporate expertise from diverse fields and to include a broad range of scientists, officials, and NGO representatives. This openness will continue to be a vital part of the strategy process. To protect and manage biological diversity, biologists, educators, administrators, foresters, farmers, other land managers, NGO representatives, and other citizens will need to share their own expertise and draw on the expertise of others. Because such collaboration often runs counter to prevailing administrative procedures, new modes of collaboration will need to emerge.

Bulgaria is well positioned to take such steps. Because it is a relatively small country and its institutions are accustomed to working with one another, the foundations for such integration already exist The Bulgarian Academy of Sciences has long served as an important unifying force in the sciences, especially as they relate to environmental issues. Furthermore, as political reforms have taken hold, they have opened up the organizational structure of the government and presented new opportunities to coordinate conservation planning. As reforms continue, all sectors should seek opportunities for cooperation and integration.

and wild relatives of domestic crops and fruit trees.

- To protect the biological diversity of aquatic systems, which will only rarely be included in protected areas: take steps to regulate fishing methods and catch levels; control pollution, especially through international agreements; encourage adoption of sustainable agriculture methods; control urban runoff; protect stream corridors; and limit construction in and near waterways.

- To protect the natural and cultural features of the Bulgarian Black Sea coast, state agencies, municipalities, private businesses, and nongovernmental organizations should be involved in, and support, efforts to develop and implement an integrated coastal zone management program.

- Require modified benefit-cost analyses and environmental impact assessments for dams, highways, and other major land use and construction projects.

- Adjust national economic policies, including tax rates, subsidies, incentives, and fees, to discourage destruction of habitats, and to promote sustainable land use practices.

Sustainable Resource Management

The management of economically important species, habitat types, and soil and water resources has far-reaching effects not only on the resources in question, but also on other members of the biotic communities in which they occur. In Bulgaria, these economically important resources include timber trees, edible fungi, medicinal plants, game animals, Black Sea and

freshwater fish, and crop and pasturelands. To ensure that these biophysical and biological resources are managed in a more sustainable manner, the following steps should be taken.

Recommendations

- Develop new laws to regulate the use of species for domestic trade and export, and establish new regulations, based on the most current knowledge and concepts in resource management, to adjust the level at which species are taken for commercial or recreational use.

- Improve the state of Bulgaria's fisheries through ecologically based management practices. Unilateral actions should be taken to protect the Black Sea's pelagic, littoral, and coastal communities from pollution, overexploitation, development, and oil and gas exploration. These actions should include the establishment of protected zones, restrictions on detrimental construction projects, enforcement of existing prohibitions on bottom trawling, improved monitoring of pollution, controls on introducing nonindigenous fish species, and the restoration of degraded areas. The development, improvement, and adaptation of mariculture and aquaculture facilities should be considered as an option for recovering stocks of indigenous commercial species such as mussels (*Mytilus galloprovincialis*), mullets (Mugilidae), and turbot (*Psetta maxima moeotica*), but such measures should be based on an integrated understanding of the genetic diversity, population ecology, and ecological needs and roles of these species. In addition to these unilateral actions, region-wide efforts to regulate commercial fishing, monitor and control pollution, and improve land use practices in the Black Sea watershed should be intensified.

- Review the status of biological diversity in Bulgaria's forests and the effect of historic and current forest management practices -- including silvicultural treatments, reforestation planning procedures, pest control, and harvesting methods -- on species composition and ecosystem functions. This review should involve a wide range of forest experts, including ecologists, other biologists, economists, and administrators. It should cover both protected and unprotected forestlands, and should explicitly consider the externalized costs of current management practices and the status of biological diversity within a landscape context (i.e., at scales larger than the individual forest stand). This review should make recommendations to place forest management on a sustainable basis, with full consideration given to the role of biological diversity in the healthy functioning of forest ecosystems. Finally, the review process should analyze the effects of current economic policies on the forests and explore alternative policies that enhance forest conservation, taking into account the value of nontimber forest products and the ecological services that forests provide.

- Promote a balanced system of wildlife management that protects, restores, and maintains populations of indigenous species and subspecies; serves to conserve nongame as well as game species (including invertebrate animals and plants); and integrates wildlife management practices with other resource management methods to maintain healthy ecosystems and communities.

- Stimulate the adoption of sustainable agricultural systems and practices -- including integrated pest and nutrient management, crop diversification, crop rotations, soil conservation techniques, improved pasture management practices, wildlife habitat restoration, and the cultivation of rare crop varieties and landraces -- through educational programs, economic incentives, and the removal of perverse policy incentives (see

Box 10. Economic Incentives for Conservation

Bulgaria's shift from a centralized command economy to a market economy holds great potential for improving environmental conditions. Under the former regime, the state-run monopolies did not encourage innovation or efficiency, and public access to information and technologies was limited. These conditions are now changing rapidly and could have positive effects on conservation. However, there is no guarantee that efforts to conserve biological diversity will be rewarded under a free market system. To protect and promote the public interest in biodiversity conservation, market reforms must be coordinated with other institutional changes, and government policies must reflect these needs.

One method of accomplishing this is to establish a system of incentives to conserve biological diversity and disincentives to discourage its degradation. In addition, perverse government incentives that encourage overexploitation of natural resources should be removed. Under socialism, prices for natural resources were kept artificially low to boost industrialization, leading to high depletion rates and inefficient use of resources. Energy-intensive heavy industries were also promoted under socialism, with little regard for the high levels of pollution they produced. By liberalizing most prices, Bulgaria has removed some of these perverse incentives.

Incentives and disincentives are not exclusively economic in nature. Some incentives may take advantage of social needs and values. To conserve a natural area rich in biological diversity, local people need to be convinced that wise stewardship of the area is in their best interest. In Bulgaria this is especially important, since financial resources for park maintenance and protection are scarce. In this case, incentives for the local people may not only include revenues from tourism, but employment opportunities in or near the parks and easy access to important natural features. It is important, in such circumstances, that local people be closely involved in the planning and decision-making process.

Other examples of conservation incentives include tax credits for private owners who conserve biological diversity or endangered species; access to credit for industries that use pollution control devices and sponsor conservation activities; credit for farmers who adopt sustainable agriculture practices; tax allowances for companies that invest in environmentally friendly technologies; and tax exemptions for private landowners who work with or through NGOs in advancing conservation on their lands. International incentives can play an important role through, for example, encouraging energy conservation and improvements in public transportation systems. Debt-for-nature swaps (see Box 12) can also be considered a form of international incentive. They also illustrate the point that incentives can be initiated not only by the government, but also by private organizations. Fines for destroying or harming endangered species are a form of disincentive. More effective use of these and other types of incentives and disincentives should be considered as part of a national effort to encourage more efficient use of resources.

Boxes 8 and 10). This effort should also include diversification of seeds and seedling materials, protection of soil-improving pasture species, restoration of damaged agricultural lands, and appropriate controls on the use of fertilizers and pesticides.

- Include, in all efforts to strengthen controls on pollution sources, explicit reference to the need to prevent further degradation of biological resources. Similarly, all efforts to mitigate the effects of past pollution should entail, as an explicit goal, the restoration of biological diversity and productivity.

Habitat Restoration

Extensive areas of Bulgaria -- especially wetlands, forests, lands supporting intensive crop agriculture, pastures, riparian zones, and industrial zones -- have been degraded or even destroyed in the past by unwise management prac-

tices. To restore biological diversity, vitality, and productivity to these lands, greater investments of time, labor, skill, and knowledge are required. This emphasis is in keeping with the provisions of the Convention on Biological Diversity, which directs signatory countries to take measures to rehabilitate and restore ecosystems and to promote the recovery of threatened species. The convention further stipulates that such measures must involve assistance to, and the participation of, local citizens.

The science and practice of restoration ecology is still quite new in Bulgaria. The government has undertaken several specific reintroduction and restoration projects (for example, the reintroduction of *Lynx lynx*, which was extirpated from Bulgaria). Other conservation activities, such as measures to reverse eutrophication of water bodies and to reforest deforested lands, also entail restoration. These projects, however, have not had as their overriding goal the restoration of biological diversity and ecosystem processes, nor have they been undertaken in a coordinated fashion with coherent and consistent goals, or with objectives and methods tailored to local circumstances. There is, for example, no national plan for protecting and restoring the remnants of the Danube floodplain forests, native steppes, or other especially rare plant communities in agricultural zones. There are signs, however, of growing interest in restoration. For example, the MOE, with the assistance of the French government and the RAMSAR Convention Bureau, has recently developed a national wetlands restoration plan, *Plan National D'actions Prioritaires de Conservation des Zones Humides les Plus Importantes de Bulgarie.*

As restoration becomes a more important component of conservation in Bulgaria, scientists, agency officials, and resource managers can benefit from the recent surge of interest and research in restoration ecology in other countries. At the same time, restoration in Bulgaria will need to reflect the country's inherent possibilities and limitations. Human settlement has altered the landscape of Bulgaria over the course of several millennia; hence, restoration will have different aims than in other, more recently developed nations. It may not be possible, for example, to restore certain elements of the native biota, or to recreate whole natural communities. Nonetheless, restoration can ameliorate past environmental abuses, improve the condition of common as well as critical habitats, open new avenues of research, provide important educational opportunities, and stimulate individual and community involvement in conservation.

The following recommendations are intended to provide the basis for more active restoration work in the future.

Recommendations

- Conduct a national-level workshop to explore current concepts in restoration ecology and to clarify their application in the Bulgarian context.

- Provide support and encouragement for nongovernmental organizations that assume a greater role in developing and implementing restoration projects at the community or municipal level.

- Establish economic incentives to provide local benefits for restoration projects.

- Promote scientific research on restoration methods appropriate to different types of degraded lands and aquatic systems.

- Develop new and existing seed banks, nurseries, and other genetic sources (both *in situ* and *ex situ*) to ensure that necessary amounts of seeds and seedling materials are available for restoration.

- Work with neighboring countries to restore ecological processes within trans-boundary habitats and ecosystems, including the Danube River and the Black Sea.

- Develop partnerships with restoration ecologists in other nations outside the region to take advantage of existing information and knowledge on restoration concepts, methods, and goals. Opportunities for exposure to and dissemination of research results, management techniques, and concepts of restoration from other ecological settings should be sought.

Ex Situ Conservation

This strategy focuses primarily on *in situ* conservation measures -- that is, the protection, restoration, and management of biological diversity within natural habitats and communities. However, measures should also be taken to create, expand, and strengthen *ex situ* conservation activities in Bulgaria. *Ex situ* facilities, such as seed banks, experimental farms, aquacultural structures, captive propagation centers, and other types of breeding, research, and educational facilities (including herbaria, arboreta, aquaria, botanical gardens, zoos, and museums), are needed to bolster and complement *in situ* conservation programs. Attention should focus initially on the need to protect threatened taxa unique to Bulgaria or potentially important as germplasm sources. These latter resources include fruit trees, forest trees, medicinal plants, edible fungi, grape varieties, pasture grasses and legumes, cereal crops, and rare livestock breeds. At the same time, the facilities for basic research -- especially herbaria, museums, and the national seed bank at the National Institute for Plant Genetic Resources at Sodovo -- need to be assessed and their long-term needs defined.

Activities undertaken through *ex situ* programs should not be limited to protection, storage, and propagation. They should be integrated into the broader conservation strategy and support appropriate commercial development (of, for example, medicinal plants), sustainable agriculture and fisheries management, public education, and reintroduction and ecological restoration projects. This may entail redefining the goals of existing *ex situ* institutions and programs, such as those administered by the National Institute for Plant Genetic Resources and the Committee of Forests. While a fuller examination and assessment of *ex situ* conservation needs is required, the following recommendations can be made based on information provided at the NBDCS workshop.

Recommendations

- Develop *ex situ* programs and facilities for the propagation of medicinal plants and other wild plants and animals that are currently threatened or overexploited in their natural habitats. The initial step in this process should be an assessment of the priorities for *ex situ* management and of the potential for reintroduction and reestablishment of wild populations.

- Strengthen the national program for conservation of local plant varieties (including their wild progenitors), and for the protection of plant materials, building on the existing repository at the National Institute for Plant Genetic Resources.

- Develop a program to encourage farmers, gardeners, and conservationists to protect and to cultivate in *ex situ* settings typical local plant varieties. This should include, if necessary, economic incentives, including subsidies or tax exemptions, for farmers who wish to grow local crop varieties.

- Expand opportunities for Bulgarian biologists to participate in existing international, regional, and bilateral *ex situ* conservation programs (including, for example, those of the International Agricultural Research Centers, the European Cooperative Program for Plant Genetic Resources, and the United Nations Food and Agriculture Organization's [FAO] Committee for Plant Genetic Resources).

Box 11. International Treaties and Agreements

Bulgaria is, or is likely to become, a signatory to many international treaties and agreements that affect biodiversity conservation within the country. The special significance of international agreements in Bulgaria derives from Article 5(4) of the 1991 constitution, which states that "[a]ny international instruments which have been ratified by the constitutionally established procedure, promulgated and come into force with respect to the country of Bulgaria, shall be considered part of the domestic legislation of the country. They shall supersede any domestic legislation stipulating otherwise." Recent court rulings in Bulgaria have held that this provision applies only to treaties ratified after the 1991 constitution, and have stipulated that treaties must be ratified *and* published in the *State Gazette* before they acquire the status of domestic law. Nonbinding agreements, in contrast to binding treaties, do not fall under this provision, although they can have, and in practice have had, considerable influence on domestic legislation. Among the most significant agreements, including their current status in Bulgaria, are

- The Convention on Biological Diversity: signed but not yet ratified or published.
- The Framework Convention on Climate Change: signed, ratification pending.
- The Nonlegally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation, and Sustainable Development of All Types of Forests (Rio Forest Principles): signed, nonbinding agreement.
- The Convention on Wetlands of International Importance (RAMSAR), Especially Waterfowl Habitat: signed, ratified, and published.
- The Convention on International Trade in Endangered Species (CITES): signed, ratified, and published.
- The Convention for the Protection of the World Cultural and Natural Heritage (World Heritage Convention): signed and ratified, with one reservation, not yet published.

(CONTINUED ON PAGE 49)

Legislative Initiatives and International Agreements

Law is an essential tool for ensuring that public policy and governmental actions accurately and consistently reflect scientific information, public opinion, and social values. New laws, revisions to existing laws, and the ratification and implementation of international agreements will be needed to attain the goals of the NBDCS.

International agreements provide important and useful tools for protecting biological resources and diversity within Bulgaria. Although they often lack firm enforcement provisions, these agreements define and advance international standards, encourage the exchange of information, and offer opportunities for international collaboration and financial assistance. Under the Bulgarian Constitution of 1991, international treaty obligations become domestic law upon ratification and publication in the *State Gazette*. Moreover, international treaties supersede existing domestic legislation when they conflict (see Box 11). International agreements thus provide important support and direction for the national strategy. However, because most international environmental agreements are writ-

Box 11. International Treaties and Agreements (continued from page 48)

- The Man and the Biosphere Program (MAB) of the United Nations Educational, Scientific, and Cultural Organization: Bulgaria is a participating nation, but has been less active since 1985 due to lack of funds.

- The Convention Concerning Fishing in the Waters of the Danube of 1958: signed, ratified, and published.

- The Convention Concerning Fishing in the Black Sea of 1959: signed, ratified, and published. A new fisheries convention on the Black Sea, applying a basin-wide common fisheries policy, is being prepared.

- The Convention on the Protection of the Black Sea from Pollution: signed in 1992, ratified by Bulgaria in 1993, published. Six countries (Bulgaria, Romania, Russia, Ukraine, Georgia, and Turkey) signed the convention; of these six, only the Ukraine has not yet ratified it.

The most important European-level agreement involving the conservation of biological diversity to which Bulgaria is a signatory is the 1979 Berne Convention on the Conservation of European Wildlife and Natural Habitats. The Berne Convention obligates parties to maintain wildlife populations at levels that meet ecological and cultural needs and to promote *in situ* conservation of wildlife and habitats. It has been ratified but not yet published in Bulgaria. Other European-level accords, including the European Community's 1992 Habitat and Wildlife Directive (which implements many of the provisions of the Berne Convention) and the European Community's "Birds Directive" of 1979, are not technically in force in Bulgaria, but are important in determining the context for developing new domestic law.

Bulgaria has implemented many of these agreements, at least in part, through domestic legislation. However, many of their provisions lack supporting legislation. Moreover, the existing laws are often ineffective due to an indefinite division of enforcement responsibilities, confusion between new and older laws, weak penalty provisions, lack of clear criteria to guide decision making, failure to provide for public participation, and other defects. (More detailed discussion of the provisions, general status, and status in Bulgaria of these agreements can be found in several of the published papers from the NBDCS workshop.)

ten in general terms, more detailed domestic laws are required to implement them fully.

Regional agreements and treaties also are important to the future of biological diversity in Bulgaria and the Balkan Peninsula. Cooperative conservation measures are necessary to protect the region's many endemic species, many of which are threatened with extinction. Moreover, many of the threats to biological diversity in Bulgaria and neighboring states are transboundary in their origins and impacts. Regional cooperation has become even more critical in light of the conflicts in and among the former Yugoslavian states. Cooperative conservation programs may serve as building blocks in the restoration not only of the region's ecosystems, but also of its social and political stability.

The most critical legislative reforms, however, must take place domestically. Bulgaria, along with the other emerging democracies of Central and Eastern Europe, has already begun shifting toward a legal system that is more responsive to the will of the people. This includes the creation of more effective environmental laws and the strengthening of the institutions that enforce them. Meanwhile, existing environmental laws require reevaluation in light of new sci-

entific information, changing conservation priorities, and evolving social attitudes.

Recommendations

Successful implementation of the strategy will require action on many specific legislative items. Bulgarian legal experts have already initiated this process, with the assistance of non-Bulgarian legal advisers. In this dynamic period, it is important to recognize and emphasize several general legal principles that should be incorporated into all laws as they are formulated. As lawmakers move forward, they should

- Clarify which governmental authority has control over which territories and activities, delegating exclusive control of specific areas to specific government departments and levels of government (i.e., national, regional, or municipal);
- Clarify the relationship of old and new environmental laws, explicitly repealing the provisions of older laws where necessary to resolve inconsistencies;
- Establish clear criteria for making decisions that affect biological diversity;
- Include mechanisms for periodically reevaluating standards and rules as scientific knowledge advances;
- Provide (through reference to administrative law or otherwise) procedures for independent, impartial review of government decisions affecting biological diversity;
- Provide procedures for public participation in policy formation as well as specific project and management decisions; and
- Strengthen enforcement of standards and rules by giving specific government agencies clear authority, granting citizens the right to file suit over violations, and ensuring that proper procedures are followed in the courts.

These are basic principles that are fundamental to human rights, democracy, and sustainable development, as reflected in trends in international law and the laws of an increasing number of countries around the world. At the same time, they can and must be adapted to the unique cultural, socioeconomic, and environmental conditions in each country and region. In Bulgaria, they form the conceptual framework for the legislative reforms that must be undertaken to conserve biological diversity.

As specific legislation to protect and manage biological diversity is drafted, lawmakers should create laws that are well coordinated, consistent, and enforceable, and that anticipate advances in scientific knowledge and changing social conditions. The involvement of NGOs in the lawmaking process is especially useful and important in ensuring that scientific expertise and the full range of viewpoints among conservationists and the public at large are reflected accurately. In the near future, lawmakers should

- Develop an integrated framework law to protect biological diversity, plus a package of related laws and regulations pertaining to the management of biological resources. These laws should include provisions to

  protect all elements of Bulgaria's native biological diversity, restore lost elements, and prevent degradation of unique, threatened, and critical habitats (e.g., riparian zones and caves);

  control overexploitation of economically important biological resources, including edible fungi, medicinal plants, timber trees, Black Sea and freshwater fish, game, and other forms of exploited wildlife;

  promote new means of sustainable management of these biological resources;

- strengthen existing regulations, prohibitions, enforcement provisions, and penalties relating to habitat degradation, especially in protected areas; and

- ensure public participation in government actions affecting the management of protected areas as well as conservation on nonreserved lands.

- Incorporate and integrate biodiversity conservation provisions into other legal initiatives (i.e., laws other than environmental laws) as they are developed, especially laws relating to infrastructure development and the restitution of private lands.

Many of these recommendations are already being implemented. New laws are being drafted, including a framework biodiversity law; a protected areas act; laws on forestry, fisheries, game, and medicinal plants; and legislation implementing the Convention on International Trade in Endangered Species (CITES). As this work continues, it should incorporate and reflect the findings and recommendations in other parts of the strategy, and should also aim to:

- Develop the expertise and resources to carry out the environmental impact assessment provisions of the 1991 Bulgarian Environmental Protection Act.

- Provide for disseminating, through a public information service, information on relevant conservation and environmental protection laws and the texts of international agreements.

- Bring Bulgarian law into concordance with European and other international agreements regarding the conservation of biological diversity (this should specifically include publication of the Berne Convention and adoption of implementing legislation).

- Intensify efforts to reach international agreements on pollution control and fisheries management within the Black Sea basin and the Danube River watershed.

Conservation Administration and Policy

The formulation of effective conservation policies and the execution of laws affecting biological diversity require a solid administrative structure. As new and revised laws are enacted, the existing administrative structure will evolve to reflect new needs and responsibilities. This is a complex process, and could not be fully addressed or resolved within the context of the NBDCS workshop. Nonetheless, participants agreed that a critical goal of any national strategy must be to secure a stronger administrative structure to conserve biodiversity *both within and beyond protected areas.*

The government's role in conserving biological diversity entails many activities, including: development, management, and oversight of the network of protected areas; research, monitoring, and restoration programs; public education and information dissemination; development of legislation and policy affecting biodiversity; international negotiations and agreements related to biological diversity; and coordination and communications between agencies and with NGOs. These functions are shared among many government entities (see Box 1), which is not surprising, given the wide range of government actions that affect biological diversity. The key question is whether these responsibilities can be more effectively coordinated, and the capacities of the respective agencies strengthened, to advance toward common goals.

As steps are taken to develop and implement the conservation strategy, changes in the existing administrative structure will need to occur. Although the specific nature of these changes cannot be prescribed here, several principles and goals can be identified:

- Agency jurisdictions, responsibilities, and relationships should be clarified, and clear authority over interagency functions established;

- Resource management activities of the different agencies should be coordinated and integrated to ensure the protection of biological diversity;

- Conflicting policies should be avoided to the greatest degree possible, and clear mechanisms established for resolving conflicts when they do occur;

- Protection and management of resources should be refocused and decentralized to place greater responsibility at the regional and municipal levels; and

- The role of local governments, nongovernmental organizations, and the general public should be increased, and the functions of state agencies more fully integrated with local communities.

The many questions surrounding the administration of the protected areas deserve special attention. Ineffective management and administration of the protected areas is one of the principal threats to Bulgaria's biological diversity. While the MOE, COF, and local municipalities currently administer the protected areas, there are discrepancies between their functions as established by law and the available resources and personnel for carrying out these functions. High priority must be given to strengthening all aspects of protected area administration, including research and monitoring, training of personnel, land management, law enforcement, education, buffer zone management, and tourism and recreation planning.

A number of workshop participants recommended that a new independent agency be created that would be solely responsible for managing biological diversity in Bulgaria, including the administration of the protected areas. Some suggested that this agency be associated with, but placed outside, the MOE; others proposed that it be a strengthened administrative body within the MOE. Proponents argued that the creation of such an agency would unify the authority over protected areas; improve local coordination of conservation policies and activities; ensure a more prominent role for conservation within the Council of Ministers; clearly distinguish the governmental responsibilities for biodiversity protection and economic development of resources; provide increased funding support; and allow better oversight provisions. Opponents argued that such an agency would be beyond the control of the ministries; that similar structures already exist within the MOE and as departments within the COF; and that existing conservation programs within the COF are self-financing through its economic activities.

With the creation of the new National Nature Protection Service in the MOE, many of these issues are moving toward resolution. The NNPS has been established to lead the MOE's activities in the management, control, and protection of biological diversity, protected natural sites, and natural ecosystems (see Box 1). As the structure and functions of the NNPS become more fully defined, it is especially important that the protected areas be seen within a landscape context, and managed accordingly. This implies that administrative actions should be based on sound scientific knowledge of biodiversity and ecological processes, interagency cooperation, and the involvement of local land owners, municipalities, and NGOs in the planning and implementation process.

A variety of models exist on which the Bulgarian Ministry of Environment, the Committee of Forests, other government agencies, and NGOs can base the management of Bulgaria's protected areas, including areas not within forests. These include, for example, interagency management programs, public-private partnerships, involving local citizens and NGOs, and ecosystem-level planning. *As a high priority, the agencies should examine different modes of collaboration to determine which fits existing needs and emerging mandates. Further discussion of the benefits and drawbacks of various administrative arrangements should be encouraged and supported.* At present, it is most important that all parties examine candidly their

scientific and administrative needs and come to some working agreement that protects the lands at issue.

Administrative Recommendations

As agency functions evolve to reflect greater attention to the conservation of biological diversity, the following recommendations should serve as general guidelines for reform:

- Encourage better interagency and interdisciplinary cooperation on all resource management and ecosystem protection activities.
- Require the development and implementation of effective management plans for all parks and other protected areas (especially the smaller protected areas), and for selected habitats and species, with the aim of conserving their biological diversity.
- Strengthen the ability of agencies to enforce biodiversity legislation, especially the authority to penalize violators.
- Strengthen, through enabling legislation and other means, agency capacities for research, establishment of data banks, educational programs, and partnerships.
- Develop and maintain a highly professional work force of land and resource managers. In particular, the administration of protected areas should be strengthened by developing training courses for both professional managers and volunteers.
- Build strong, constructive, cooperative relationships with local citizens and nongovernmental organizations, especially through involvement in the planning process.
- Support biodiversity protection, management, and education projects through the establishment of a nature protection fund.

Policy Recommendations

As part of the general effort to better coordinate and implement conservation policy at the national level, especially as reorganization plans are discussed, opportunities to introduce broader policy reforms should be sought. Important policy initiatives relevant to biodiversity conservation have already been undertaken. For example, the Ministerial Declaration on the Protection of the Black Sea was issued in 1993. Such measures, it should be noted, are not limited to the conservation agencies, but involve related changes in economic, social, and development policy. As new policies are defined and implemented, they should

- Promote, as a general principle, the science-based management of resources and ecosystems, in part through establishment of an independent scientific advisory board.
- Require consideration of biodiversity conservation within regional and municipal planning processes.
- Analyze the current incentive structure within Bulgaria and remove incentives that encourage activities harmful to biological diversity.
- Provide positive incentives (e.g., low-interest loans and other credit mechanisms, taxes, compensation, and subsidies) to individuals, new landowners, and municipalities to promote the conservation of biological diversity and environmental protection.
- Employ disincentives to discourage construction activities, agricultural practices, and other land uses that harm important habitats and ecological processes.
- Revise and strengthen the enforcement provisions of resource use policies (including harvesting regulations, take limits, export

restrictions, licensing provisions, and fines) to encourage the protection and sustainable management of economically important timber, game, freshwater and Black Sea fish, edible fungi, and medicinal plant species.

- Adopt modified economic analyses that attempt to internalize the costs of biodiversity loss and the benefits of conservation.

Research and Technical Support

Scientific information on Bulgaria's biological diversity and its conservation is the foundation on which this strategy is built. Fortunately, the body of existing knowledge about Bulgaria's biodiversity is relatively extensive and detailed. This reflects a rich heritage of research in the natural sciences, dating to the 1800s. Bulgarian scientists have been able to maintain strong national institutions, intellectual traditions, and academic programs despite political and economic circumstances that have often constrained both their work within Bulgaria and their ability to communicate with foreign experts and other colleagues.

As noted previously, biodiversity conservation is hindered by gaps in knowledge and technical constraints. The following recommendations are intended to provide a stronger scientific and technical basis for conservation policy and action.

Recommendations

- Encourage and support collaborative interdisciplinary studies of biological diversity and its conservation within state agencies, universities, the Higher Institute of Forestry, the Bulgarian Academy of Agriculture, and the institutes of the Bulgarian Academy of Sciences.

- Establish goals and standards for a national program of biodiversity data collection, storage, and analysis.

- Support additional taxonomic research to close existing gaps.

- Expand research on species composition, distribution, status, and population trends for all taxa, but especially for rare and threatened species and for invertebrates, fungi, and other less-studied taxa.

- Update the *Red Data Books*, create new ones as needed, and bring their categories of conservation status into accordance with international categories.

- Evaluate natural areas for potential inclusion in an expanded national network of protected areas.

- Establish a biomonitoring program for the protected areas network.

- Support cooperative research on maps, red book development, and conservation biology with other Balkan and European scientists.

- Undertake long-term ecological research projects, with special attention to the changing distribution and populations of species and changing habitat conditions.

- Initiate research on restoration ecology in several key degraded ecosystems.

- Expand research on the cultivation of medicinal plants and other species currently collected from the wild.

- Develop a coordinated plan for conserving national plant genetic resources that involves, among other measures, establishment of a national council; strengthening of the national seed repository at Sodovo; support for further studies of *in situ* genetic resources; and a program to involve farmers, nongovernmental organizations, and conservationists in the propagation of local plant varieties.

- Expand training opportunities for using and applying geographical information system technology in conservation planning and implementation (see Box 5).

Environmental Education

Education involving the values, status, and conservation of biological diversity is a fundamental part of the national conservation strategy. Simply put, this strategy will not succeed without strong public understanding and support. These, in turn, can only be fostered by communicating information about biological diversity throughout the public school curriculum, in universities, in professional training and development programs, and in various public forums (including museums, zoos, national parks, information and visitors' centers, and the mass media).

Bulgaria lacks a unified plan for biodiversity education, or even a process for designing such a plan. As a result, teachers have little experience in or exposure to current concepts in conservation, and little access to programs or materials useful in the Bulgarian context. The legal basis for improving education on biological diversity does exist. Article 11 of the Bulgarian Environmental Protection Act of 1991 requires authorities to publicize information on the environment through the mass media and other means, although it does not specifically mention biological diversity. The Convention on Biological Diversity obligates countries to promote and encourage understanding of biodiversity through the media and through public education. In effect, the development of this strategy has served as a first step in following through on these directives.

In moving forward on this component of the strategy, scientists, conservationists, officials, and educators need to maintain a broad approach. As a general guiding principle, education on biological diversity should not be seen as a discrete, "one-time" effort, but as a long-term, continuing process through which critical thinking about conservation issues and values can be introduced and encouraged. The aims of a fully developed conservation education program should be to increase public awareness of biodiversity issues, to stimulate pride in and enjoyment of the country's unique biota, to communicate existing and emerging scientific information, to convey new concepts in conservation, to foster constructive debate over conservation strategies, and to meet changing conservation needs. Finally, development of the educational component of the biodiversity conservation strategy should not be undertaken in isolation, but as part of a yet broader national environmental education program that will address additional environmental concerns.

Recommendations

- As the national conservation strategy process continues, a parallel national environmental education initiative should be developed. This comprehensive plan for improved environmental education should provide guidance and support for educators at all levels. It should be developed by the Ministry of Environment in partnership with the Ministry of Education, the Bulgarian Academy of Sciences, conservation groups and nongovernmental organizations, and other organizations and agencies.

- Public education programs and information campaigns should be instituted to disseminate information on conservation and biodiversity values, the principles of sustainable economics and development, current laws, and legislative initiatives. As part of this effort, information about this strategy and its findings should be made available in an appropriate popular form.

- Biodiversity education projects should, as a fundamental principle, draw on diverse approaches and ideas based on local educational opportunities outside the classroom, including both natural settings as well as zoos, botanical gardens, and other facilities.

Programs should build on and reflect these local resources. Creative activities (e.g., photography or poetry contests), direct contact, and hands-on projects (e.g., planting trees and stream-sampling) should be encouraged at every opportunity.

- Nongovernmental organizations can and should play an active role in designing and supporting biodiversity education programs at the local level.

- The Ministry of Environment, the Ministry of Education, the Bulgarian Academy of Sciences, universities, and other organizations should work together to offer teacher training courses and workshops and to develop teaching materials for classroom and extracurricular use. Formal training in environmental education should be made available through the universities.

- Special attention should be devoted to developing educational programs, projects, and materials for landowners who are acquiring land through the process of restitution. The objective should be to equip landholders with information on biodiversity values, conservation techniques, and environmentally sensitive agricultural practices. Specific activities that should be considered include

  Easily readable publications on land restitution laws;

  Nongovernmental-organization-assisted educational projects at the local level, including preparation of handouts, arrangement of meetings, and organization of cooperative programs;

  A national system of extension services to offer comprehensive land use information and to provide communication between landowners and researchers;

  Interim efforts to explain and promote conservation, the environmental impacts of land use practices, and sustainable agriculture techniques through the mass media;

  Conservation-related short courses and workshops for farmers and other landholders through existing educational facilities, agricultural and biological research stations, and other institutions;

  Open visitor and demonstration days in agricultural institutes and on farms employing sustainable agriculture practices; and

  A national speakers' bureau to provide expert information on biodiversity conservation and land use.

Ecotourism

Ecotourism opportunities, if developed in an appropriate manner, can make important contributions to biodiversity conservation. Hiking, climbing, touring, bird watching, and other activities depend on a high-quality environment and thus encourage broad interest in protecting and restoring biological diversity. They can also provide economic returns for conservation at the local level.

Bulgaria, with its many mountain ranges, national parks and other protected areas, Black Sea coast, wine-producing regions, monasteries, and other cultural and historical sites, presents abundant ecotourism opportunities. In addition, the country's central location, the high level of education among its people, and the affordability of its goods and services place it in an advantageous position. At the same time, Bulgaria has weaknesses, such as poor safety and hygiene standards and inferior infrastructure, that impede its ability to benefit from these advantages.

Ecotourism is not an entirely new idea in Bulgaria. Bulgarian ornithologists and the Royal English Society for the Protection of Birds have

been cooperating since 1983, when the first bird-watching tours, led by Bulgarian specialists, were established. The contacts nurtured on these tours turned out to be fruitful on both ends. The Bulgarian Society for Bird Protection has assisted in organizing bird-watching trips for visitors from throughout Europe. Groups follow a basic route through the Rhodope Mountains to the Black Sea coast, the Srebarna Lake Reserve, and part of the Danube River basin. The rich variety of breeding and migratory birds, the competent ornithologist guides, and the good hotel accommodations have allowed this form of ecotourism to succeed, and it can serve as a useful model in identifying and developing additional opportunities. In the future, it is likely that bird-watching tours will be expanded to include other parts of the country.

With the democratization of Bulgaria and the opening of the country to visitors, conditions now exist for the fuller development of ecotourism sites. At the same time, Bulgarians recognize the need to proceed with caution and sound planning. To help ensure that such development occurs in a sensitive and conservative manner, a Sustainable Tourism Workshop was held in October 1992 at Bansko, following a request by the Bulgarian Ministry of Environment for support under the British Environment Know-How Fund. The *Tourism Development Strategy for Bulgaria* was prepared based on the many discussions and suggestions from the workshop. This document recommended medium-term measures for improvement in several key areas: transportation and communications, pollution control and treatment, land use planning, and the quality of the natural and built environment. Follow-up projects have begun to develop more specific ecotourism plans for the Black Sea coast and for the Rila, Pirin, Central Balkan, and Vitosha National Parks and surrounding areas. Steps are now being taken by the MOE, the COF, the Committee on Tourism, several NGOs, and local municipalities to implement these plans.

To take greater advantage of the potential benefits of ecotourism, government agencies, scientists, municipal and local officials, and NGOs should focus on the following needs.

Recommendations

- Develop a clear national policy on ecotourism and an action plan for its implementation.
- Assess existing environmental and cultural resources in terms of ecotourism opportunities.
- Identify key sensitive areas, including national parks, buffer zones, and areas of high aesthetic value.
- Identify the potential "pressure areas" within Bulgaria and consider the environmental impacts, including pollution, of varying degrees of tourism activity.
- Analyze existing methods of land conservation and municipal planning.
- Integrate ecotourism plans and projects into the regional planning process.
- Link private tour operators with other key parties, including conservation groups and educators.
- Include environmental education as a primary goal in developing ecotourism sites and programs.

Collaborative Partnerships

Experience in many countries has shown that collaborative partnerships can contribute significantly to the long-term success of biodiversity conservation projects. Such partnerships may involve a wide range of individuals and organizations, including the municipal and national government agencies; visitors and tourists; private landowners, volunteers, and benefactors; professional organizations; corporations and local businesses; schools and uni-

versities; conservation groups, historical societies, and other NGOs; and park "friends" groups. Partnerships can be formed to support a wide range of necessary activities, including park and trail maintenance, education and interpretation programs, biological inventory and monitoring, and fund raising. While many partnerships have focused on maintaining protected areas, they have potential application in conservation work on other lands as well.

Successful partnerships confer many benefits. They can reduce the costs of maintenance and management while increasing the cultural and economic value of rare and otherwise special biological and historical features. Such partnerships are especially important when economic resources are limited, and when conservation projects require the presence of a strong and committed local community. At the same time, partnerships can provide economic returns to communities through employment and training opportunities and through increased tourism and business investments. By involving citizens at the local level, partnerships encourage pride, expertise, and environmental stewardship where it most counts, and give local people a greater stake in areas of national and even international importance. Partnerships almost invariably offer opportunities for education, both formal and informal. In this way, partnerships contribute to broader public understanding of conservation issues and to the building of a national environmental ethic.

In Bulgaria, innovative conservation partnerships of the kind described here are still relatively uncommon. In the past, such groups as the Union of Hunters and Fishermen and the Hiker's Union have volunteered in outdoor education and resource management. Until 1990, however, most volunteer work was organized by the centralized management agencies and through officially supported conservation groups. With the emergence of the new conservation-oriented NGOs in the late 1980s and early 1990s, the potential for creative partnerships has increased greatly. Many of these groups (including all of those attending the NBDCS workshop) are already active in environmental education, habitat protection and monitoring, and other activities. These groups should be supported as they seek to expand their involvement.

It is not always easy to establish and maintain effective partnerships. They often require commitment among parties that have rarely cooperated in the past, and that in fact may have been in conflict with one another. Furthermore, partnerships are often hindered by a lack of legal authority and administrative support. Despite these deterrents, partnerships have proved successful under many different circumstances. A wide range of models can be adapted to local needs and opportunities in Bulgaria. As a country rich in human skills, knowledge, and commitment, Bulgaria has the ingredients most essential in building successful partnerships.

Recommendations

- Adopt the principle of partnerships in order to enlist the widest possible support for conservation programs.
- Take advantage of the experience and traditions of local people by working with them at the outset in the development of conservation plans.
- Seek enabling legislation as necessary to eliminate roadblocks and to support the formation of partnerships.
- Require all proposals for protected area designation and management, as well as for other conservation and environmental protection projects, to have a strong educational component with partnerships involving local schools.

Implementing the Conservation Program

The conservation program outlined above provides a framework of actions needed to ad-

vance the safeguarding of biological diversity in Bulgaria. It describes several key areas in which Bulgarian citizens, scientists, and officials need to act, and in which they *can* act under existing social and economic circumstances. The measure of this plan's success will be the degree to which it motivates and enables the citizens and elected officials of Bulgaria to take action.

As such, this plan should be seen as only the initial attempt to define what must be a continually evolving conservation program. The framework needs to be filled in. The various components must be developed in greater detail, and other relevant areas not touched upon here need to be included. Each of the components will require constant public involvement and feedback; all will need to evolve as they are implemented and as new opportunities and constraints arise. Successful implementation will require many different actions at the international, regional (European and Balkan), national, municipal, and local levels. None of these levels can be neglected. If properly coordinated, activities at all levels can reinforce one another.

Ultimately, however, the fate of the National Biological Diversity Conservation Strategy will depend on the degree of public support it gains within Bulgaria. It has evolved to this point due to the participation and dedication of hundreds of Bulgarian citizens. That process must not only continue, but expand. Putting the strategy into practice -- through policy reform, education, research, community development, and a wide range of on-the-ground conservation practices -- will require broad-based commitment to the common good, to Bulgaria's biotic inheritance, and to future generations.

Box 12. Debt-for-Nature Agreements: The Potential in Bulgaria

The recommendations in this conservation strategy emphasize actions that can be undertaken with existing resources, including financial resources. As these recommendations are implemented, and as further conservation needs arise, innovative methods to support them will be needed. Bulgaria, like many countries, faces significant economic difficulties and a large burden of foreign debt, even as it tries to address its urgent environmental needs. Under similar circumstances, other heavily indebted countries -- Costa Rica, Mexico, Madagascar, and the Philippines, to name a few -- have initiated successful debt-for-nature programs.

Debt-for-nature swaps are financial agreements through which portions of a country's foreign debt can be traded for investments in conservation. Debts are purchased on the international debt market, at a discount and with hard currency, by an intermediary. In practice, this role has usually been assumed by private conservation groups. The intermediary then presents the debt to the central bank of the indebted country for cancellation. In return, the indebted country agrees to provide funds for in-country conservation projects.

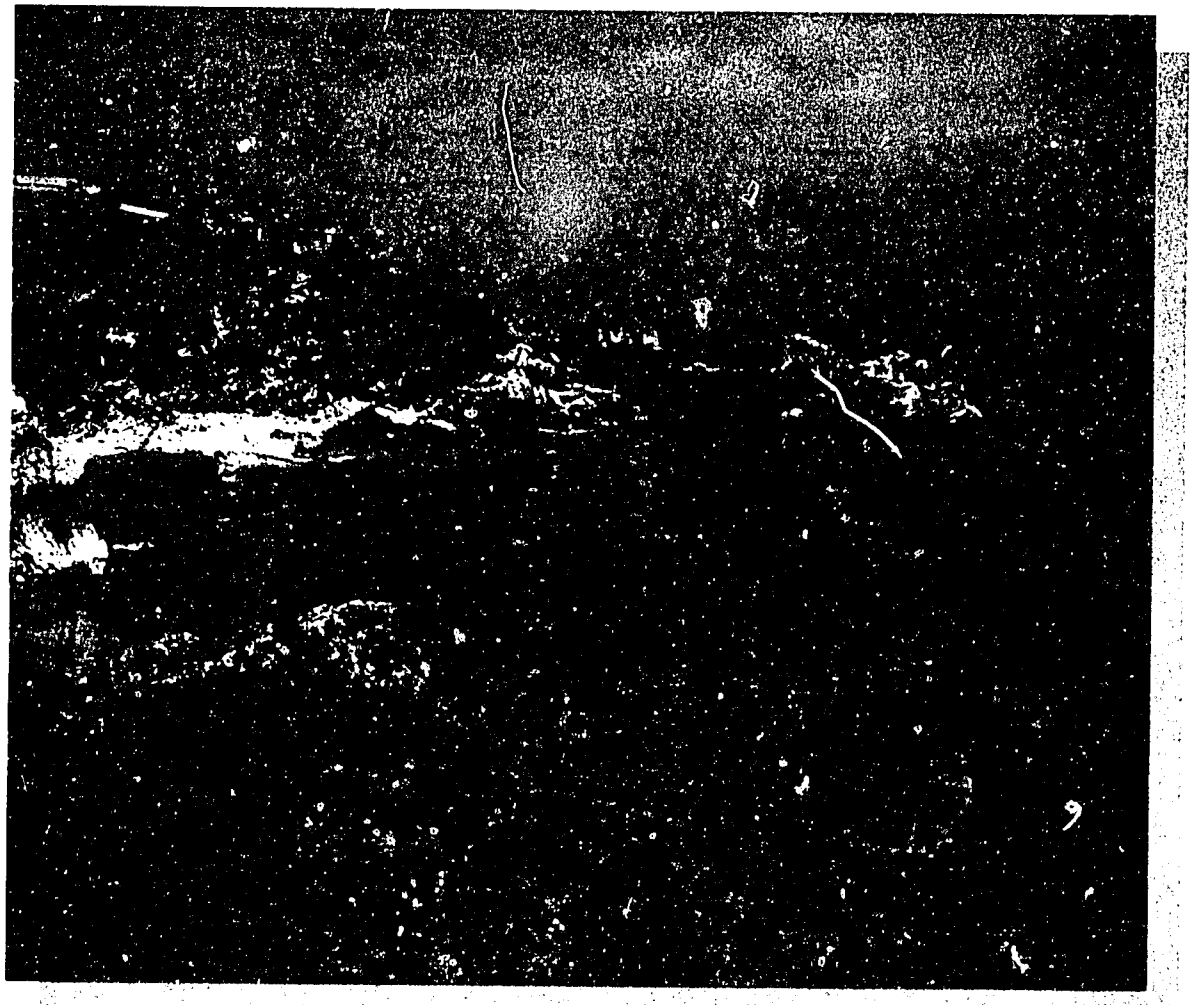
Such agreements do not seek to transfer ownership of lands or to redirect capital to foreign investors, but to provide support for conservation activities (most often improvements in park and reserve management and infrastructure). Debt-for-nature swaps cannot by themselves relieve either the participating country's foreign debt problems or the pressures on biological diversity. However, they can serve to reduce debt, leverage additional investments, stimulate local economic development, generate foreign exchange, support needed conservation projects, promote public interest in biological diversity, and assist participating government agencies and NGOS.

As yet, only a few debt-for-nature swaps have been proposed or implemented in the countries of Central and Eastern Europe and the former Soviet Union. Poland entered into two such agreements in 1990.

Many opportunities exist for debt-for-nature agreements in Bulgaria. Bulgaria faces a combined foreign debt of $12.3 billion, more than half of which is owed to banks in Germany, Japan, and Austria. It is currently negotiating with its commercial creditors in an effort to restructure its debt load and to design a realistic repayment schedule in light of its weak domestic economy and foreign exchange situation. As part of this general restructuring, debt-for-nature swaps could be included to the advantage of all parties. The government of Bulgaria, through the MOE, has already expressed interest in the potential of debt-for-nature swaps, and has taken initial steps in consideration of such agreements.

Several obstacles must be overcome before debt-for-nature agreements can be arranged and made to work in Bulgaria. Some of these obstacles are addressed in other portions of this strategy: ambiguity surrounding the jurisdiction and administrative responsibilities of the different government agencies; inadequate cooperation among different government departments and between the government and the NGOs; and lack of experience in building successful partnerships. As efforts to surmount these obstacles progress, debt-for-nature agreements hold great potential as one method of meeting the goals of the NBDCS. (For further information, see *Bulgaria: Debt-for-Nature Swaps -- Potential and Opportunity*, a report of the Biodiversity Support Program.)

PRIORITIES FOR IMMEDIATE ACTION AND SUPPORT



RED LIMESTONE ROCKS ALONG THE NORTHERN BULGARIAN BLACK SEA COAST. PHOTO: © 1994, LUBOMIR KLISSAROV.

The success of the National Biological Diversity Conservation Strategy (NBDCS) will require that actions be taken and steady progress made in many areas. There are, however, several key elements of the strategy that deserve immediate support within Bulgaria and from the international community. The areas recommended for support are discussed in this chapter. They are of urgent importance, offer both immediate and long-term benefits, and provide much of the foundation on which the full conservation strategy can be built.

STRENGTHENING THE SCIENTIFIC BASIS FOR CONSERVATION

A sound scientific foundation is essential to the long-term effectiveness of conservation actions. Improved land and resource management, the formulation of more effective legislation and policy, the design of relevant extension services and environmental education programs, and the appropriate development of ecotourism opportunities all require accurate, up-to-date information about biological diversity. Applying basic

scientific knowledge to conservation problems also requires interdisciplinary, and often international, communication and collaboration. This is especially important as concepts in conservation biology advance. Bolstering the scientific foundation of the NBDCS will promote progress in all these areas and will allow Bulgarian scientists to apply and extend their existing knowledge in important new directions.

Efforts to strengthen the scientific understanding of biological diversity in Bulgaria should focus on the gaps identified elsewhere in the strategy, especially the need for basic information on specific taxonomic groups, geographic areas, anthropogenic threats and impacts, and mitigation and restoration methods. Other high-priority areas include

- *Equipment and supply needs.* In many cases, the most important scientific needs are the most basic: office equipment, computer supplies, copy machines, field and laboratory supplies, and so forth. Progress in other areas will often require assistance first in meeting these basic needs.

- *Revision of the Bulgarian* Red Data Books *and the creation of new ones for missing taxonomic categories.* The books synthesize basic information on rare and endangered species for use in many aspects of conservation planning and environmental impact assessment. Their data are outdated, and some groups, such as fungi, have not yet been covered. The categories of conservation status used in Bulgaria need to be brought into agreement with the internationally accepted categories of the World Conservation Union (IUCN), which are now being revised. Much of the information to improve or compile new books already exists. In some cases, additional research will be needed.

- *Additional species- and community-level information.* The basic information provided in the existing *Red Data Books* needs to be supplemented with additional information about biological diversity at the species and community levels. At the species level, atlases of breeding area distribution (especially of plants, birds, and other vertebrates) need to be prepared. At the community level, standardized habitat descriptions need to be adopted, and the classification system coordinated with that used in other European countries. Consideration should also be given to preparing red data lists for threatened habitats and community types.

- *Encouragement of interdisciplinary research.* The fostering of interdisciplinary research is especially important to the future of conservation in Bulgaria. The study of Bulgaria's soils, waters, fungi, plants (including its forests), animals, agricultural systems, fish resources, genetic resources, and other aspects of biological diversity has, as in other countries, followed traditional disciplinary lines. The interdisciplinary approaches needed to address conservation problems have been relatively neglected. Support is needed for research projects and training opportunities that encourage the integration of scientific knowledge.

- *Greater access to existing scientific information.* In the last several years, Bulgarian biologists have been able to interact more regularly with colleagues from outside Bulgaria. However, opportunities to stay abreast of scientific information and concepts developed in other countries and regions are still quite limited. Especially in the emerging, integrative disciplines of conservation biology, landscape ecology, and restoration ecology, Bulgarian scientists have much to learn from, and contribute to, colleagues from other countries. Support should be given to Bulgarian scientists and institutions for the purchase of books and reports, subscriptions to journals and computer net-

works, and attendance at conferences and scientific meetings.

- *Dissemination of scientific information.* To make existing and newly gathered information about biological diversity more available to citizens, students, other scientists, and decision makers, improved methods of dissemination need to be devised. These include not only reports and other publications, but the development of computer data bases, classes and seminars, policy-related briefings, mass media programs, and other communication opportunities.

Legislative Initiatives

Legal reforms and initiatives related to biodiversity conservation in Bulgaria have reached a critical stage. New laws, and revisions of existing laws, will be needed to implement many aspects of the national biodiversity conservation strategy. Stronger enforcement provisions will be needed to ensure that these laws are effective. In addition to a framework biodiversity law, new laws involving land restitution, the administration and management of protected areas, management of forest, fish, game, and medicinal plant resources, and CITES implementation are being drafted and introduced.

These laws should be based on the most complete technical and scientific information and reflect the broadest possible public input and NGO support. To achieve this goal support should be given to the in-country legal experts and non-Bulgarian advisers who have been working with scientists, NGO representatives, and government officials to draft these laws. Such support will ensure that these initiatives provide a strong framework of national legislation related to biodiversity conservation and bring national laws into accordance with European and international environmental agreements. In addition, continued assistance is needed to ensure that new laws are not merely passed, but that they are fully and effectively implemented. As laws are adopted, they will require shifts in institutional functions and priorities. Facilitating and monitoring these changes will be as essential a task as the initial passage of legislation.

Finally, it should be noted that the ongoing consultations in support of legislative initiatives are also serving to equip in-country legal experts with knowledge, tools, and experience that will provide continuing benefits. Moreover, the process of public participation in drafting biodiversity-related legislation has further benefits that extend beyond the conservation context. It conveys basic principles of democracy and justice, and thus is valuable in and of itself as Bulgaria develops the legal procedures and institutions essential to stable democratic government.

Expanding and Strengthening the Protected Areas Network

The central aim of the NBDCS workshop was to identify and coordinate a broad range of actions that will conserve biological diversity across the whole landscape, that is, in both aquatic and terrestrial ecosystems, and on both reserved and nonreserved lands. As such, it could only begin the process of identifying in detail those areas requiring protected status and those actions needed to strengthen the network as a whole. A follow-up process should begin immediately to focus exclusively on expanding and strengthening the network of protected areas. This process should include

- Clarification of the jurisdictional issues affecting the protected areas and full authorization of the overseeing agency to provide effective protection and management of designated areas. (These goals are expected to be met through the adoption of the new protected areas act and the creation of the new NNPS within the Ministry of Environment);

- Appointment of a task force of scientists, agency officials, nongovernmental organization representatives, and others to determine the percentage of the land base needed in meeting the goals of the protected areas network and to define the methods to be followed in improving the network;

- A review of the existing protected areas and identification of areas of special interest and concern (including corridors and buffer zones) that are outside the protected areas network, in part through gap analysis using geographic information systems;

- Identification and ranking of the management needs of the protected areas network, including the development of public education, information, and interpretation programs; strengthening of enforcement capabilities; assessments of staffing requirements; development of effective management plans and sustainable land use programs; and increased opportunities for professional training;

- Regional meetings, open to public participation, leading to a national meeting that will review the status of the existing network and develop detailed plans for its expansion and improvement;

- Delineation of research needs (including inventories, monitoring, and long-term ecological studies) within individual protected areas and in the network as a whole; and

- A review of the status of Bulgaria's 17 biosphere reserves and their management needs.

Environmental Education and Cooperative Extension

In the long run, the conservation of Bulgaria's biological diversity will depend on the general public's understanding and appreciation of its value and the actions that are needed to protect it. This, in turn, requires that much more time, energy, and attention be devoted to environmental education at all levels. This is a long-term undertaking, but immediate steps can be undertaken to begin the process. These steps should include

- Development of a national strategy for environmental education, involving the relevant government ministries, the Bulgarian Academy of Sciences, nongovernmental organizations, and teachers;

- Appointment of an advisory group of scientists, educators, and conservationists to provide guidance and advice in the design of curricula involving biological diversity and its conservation;

- Development of teacher training programs to convey information about biological diversity, concepts of conservation, and principles of environmental education; and

- Support for opportunities for Bulgarian educators to interact with environmental educators, and to learn about successful environmental education programs, in other countries.

Educational programs should not be limited to students or to schools. This is especially important to the land restitution process. Extension services should be organized on the national level to disseminate information to new (as well as current) landholders, and to communicate landholder concerns back to the scientists and policy makers. Such services might include, for example, forming a national speakers' bureau, offering short courses for landholders, organizing demonstration days, and discussing biological diversity issues through mass media outlets. While this extension network will focus initially on biodiversity conservation in the context of land restitution, it can with time be more formally constituted to provide private landhold-

ers and other citizens with continual services related to conservation, environmental management, and land use in general.

Developing and Implementing an Ecotourism Policy

Ecotourism can be an important source of funding for conservation projects. Ecotourism opportunities must, however, be pursued carefully, especially as regional and site-specific plans are developed. It is highly important that the various ministries and committees soon develop a clear and workable national policy on ecotourism. Without such a policy, there is a danger that these various agencies will not adequately address key issues that ecotourism entails, including the identification of sensitive areas and potential "pressure areas," the environmental impacts of tourism activities, and the equitable distribution of economic benefits from tourism activities.

Immediate support should be sought to develop an ecotourism policy and implementing key provisions of the ecotourism component of the national strategy. With the development of the *Tourism Development Strategy for Bulgaria* (1992), the foundation for a comprehensive national ecotourism policy already exists. This policy should involve support for practical activities, including the publication of tourism-related literature on protected areas; establishment by the MOE of tourism management guidelines for protected areas; definition of conservation design guidelines for essential construction activities; establishment of an incentive system for conservation projects; and the dissemination of business development and marketing advice for craft industries.

Stimulating Conservation in the Black Sea Basin

The Black Sea requires both unilateral and international measures to recover and conserve its biological diversity and economic resources. Bulgaria's Black Sea coast is a critical region in terms of biodiversity conservation. It is among the most species-rich regions in the country, and contains unique communities, wetlands, and important migratory bird habitats. At the same time, it is subject to heavy anthropogenic impacts from pollution, industrial and recreational development, and overexploitation of its biological resources. Support should be given to the following unilateral actions that address these threats:

- Identification of biologically important areas not yet included within the protected areas network;
- Integrated planning to direct coastal zone protection and development (the Ministry of Regional Development and Construction has begun to develop such an integrated management program with the support of the World Bank);
- Increased investment in restoration and pollution mitigation projects; and
- Stronger enforcement of regulations and prohibitions involving pollution, bottom trawling, and overexploitation of fishery resources.

Unilateral actions alone will not suffice to protect the Black Sea's biological diversity. The ecological health of the Black Sea is affected by the inland activities of all the countries within the Black Sea basin, as well as the coastal and open-water activities of those countries on its shores. Conservation of the Black Sea's biological diversity and economic resources will thus require intensified cooperation among all the countries within its watershed. International support and collaboration is needed to provide accurate information on the Black Sea ecosystem and to address the problems of pollution, sedimentation and eutrophication, overexploitation of fishery resources, oil and gas exploration, and inappropriate development. Specific actions should include

- Explicit consideration of biodiversity conservation needs within the Fisheries Convention on the Black Sea that is now being prepared;

- Support for implementing the provisions of the Convention on the Protection of the Black Sea from Pollution;

- Support for biodiversity monitoring, research, and conservation planning as part of the proposed Black Sea Action Plan, a region-wide environmental management and protection program now being developed with the support of the Global Environmental Facility of the World Bank, the United Nations Development Programme, and the United Nations Environment Programme;

- Increased investments by all the countries within the Black Sea basin in the restoration of marine biodiversity; and

- Support for collaborative, ecosystem-level scientific research on the Black Sea and its biological diversity.

Stimulating Conservation in the Balkan Peninsula

The conservation of biological diversity within Bulgaria requires cooperation and coordination with neighboring countries. Conversely, actions taken with Bulgaria have ramifications for conservation beyond its borders. Immediate steps should be taken to explore shared concerns, exchange information, and coordinate biodiversity conservation plans with the other countries of the Balkan Peninsula. While regional conservation planning is a complex process, and should be viewed as a long-term goal, short-term actions can be taken to strengthen existing ties and to build the foundation for cooperative conservation projects. For example, limited investigations of biodiversity conservation issues in important transboundary areas (such as the Strandzha Mountain region shared by Bulgaria and Turkey and the Rhodope Mountain region shared by Bulgaria and Greece) could be initiated.

Other actions that deserve support include

- A region-wide conference to explore and discuss transboundary threats to biological diversity and opportunities for collaborative conservation projects;

- The establishment, in Bulgaria and other countries, of councils to provide advice and guidance on cooperative projects involving transboundary issues and programs (perhaps with the involvement of the IUCN as a neutral body);

- Collaborative scientific research on the biogeography and biological diversity of the Balkan Peninsula, the abundance and distribution of rare and endemic species, threats to biodiversity, sustainable management strategies, and other questions that are international in scope;

- The preparation of Balkan-wide red data books; and

- Landscape-level conservation planning in border areas, especially where adjacent protected areas, buffer zones, and habitat corridors have been, or can be, established.

Such actions are difficult to initiate given the current levels of political and economic instability in the region. This should not be regarded as an impediment, but as a challenge to conservationists, citizens, and leaders throughout the region. Even modest cooperative conservation projects can provide a positive focus for the region's peoples and contribute to the realization of a more secure and peaceful future for the Balkan Peninsula as a whole.

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APPENDIX A

INTERNATIONALLY SIGNIFICANT PROTECTED AREAS AND OTHER NATURAL AREAS IN BULGARIA

WORLD NATURAL HERITAGE SITES

Pirin National Park
Srebarna Nature Reserve

UNITED NATIONS EDUCATIONAL, SCIENTIFIC, AND CULTURAL ORGANIZATION, MAN AND THE BIOSPHERE (MAB) PROGRAM, BIOSPHERE RESERVES

Alibotoush
Bajoui Doupki-Dzhindzhiritsa (within Pirin National Park)
Bistrishko Branishte
Boatin
Chervenata Stena
Chouprene
Dzhendema
Doupkata
Kamchia
Koupena
Mantaritsa
Marichini Ezera (lakes)
Ouzounboudzhak
Parangalitsa
Srebarna
Steneto
Tsaritchina

CONVENTION ON WETLANDS OF INTERNATIONAL IMPORTANCE (RAMSAR), WETLANDS OF INTERNATIONAL IMPORTANCE

Arkoutino
Atanasovsko Lake
Dourankoulak Lake
Srebarna

Bulgarian Sites on the BirdLife International List of Important Bird Areas in Europe

Alepu Lake Natural Monument
Atanasovsko Lake Nature Reserve
Belene Island Nature Reserve
Boatin Nature Reserve
Bourgas Lake
Cape Emine
Cape Kaliakra Nature Reserve
Dourankoulak Lake Protected Site
Gintsi Natural Monument
Island in the Danube near Nova Cherna (unnamed)
Kamchia Nature Reserve
Malko Sharkovo Reservoir
Mandra Lake
Ovcharitsa Reservoir
Rusenski Lom National Park
Shabla-Ezerets complex
Srebarna Nature Reserve
Steneto Nature Reserve
Studen Kladenetz Nature Reserve
Tsarichina Nature Reserve
Vardim Island
Yatata Reservoir Natural Monument

APPENDIX B

WORKSHOP PAPERS: TITLES AND AUTHORS

BULGARIA'S BIOLOGICAL DIVERSITY: CONSERVATION STATUS AND NEEDS ASSESSMENT, VOLUME I

Section 1 Bulgaria's Biological Diversity

Bulgaria's National Biological Diversity Conservation Strategy as an Example of National Level Conservation Planning
Francesca T. Grifo

The Macromycetes Fungi of Bulgaria
Maria Drumeva-Dimcheva and Melania Gyosheva-Bogoeva

Biodiversity of Non-Vascular Plants in Bulgaria
Dimitar Vodenicharov, Dobrina Temniskova-Topalova, Ivan Kirjakov, Stefka Dimotrova-Konaklieva, Rumen Mladenov, Snezhana Moncheva, Slavcho Petrov, and Dobri Ivanov

Biodiversity of Higher Plants in Bulgaria
Dimitar Peev, Stefan Kozuharov, Mincho Anchev, Ana Petrova, Daniela Ivanova, and Sonia Tzoneva

Plant Communities of Bulgaria
Tenio Meshinev, Velcho Velchev, Pavel Vassilev, Iva Apostolova, Nikolay Georigiev, and Anna Ganeva

Invertebrates (Non-Insecta) in Bulgaria
Christo Deltshev, Stoice Andreev, Gergin Blagoev, Vasil Golemansky, Gabriela Milojkova, Vlada Peneva, Dobrin Dobrev, Milcho Todorov, and Zdravko Hubenov

Insects of Bulgaria, Part 1 : Odonata, Ephemeroptera, Plecoptera, Homoptera (Auchenorrhyncha), Heteroptera, Coleoptera
Vasil Gueorguiev, Venelin L. Beshovski, Boris K. Russev, Krasimir P. Kumanski, Michail V. Josifov, and Vladimir P. Sakalian

Insects of Bulgaria, Part 2: Blattodea, Mantodea, Isoptera, Orthoptera, Dermaptera, Embioptera, Megaloptera, Raphidioptera, Neuroptera, Mecoptera, Hymenoptera, Trichoptera, Lepidoptera, and Diptera
Zdravko Hubenov, Venelin Beshovski, Stoyan Beshkow, Janko Kolarov, Krasimir Kumanski, Alexi Popov, and Emiliya Vassileva

Biodiversity of the Danube River, Its Tributaries, and Adjacent Water Bodies
Boris Russev, Anelia Petrova, Ivanka Janeva, and Stoice Andreev

Aquatic Ecosystems of the Aegean and Black Sea Basins
Yordan Uzunov, Stanoy Kovachev, Krasimir Kumanski, and Jenny Ludskanova-Nikolova

Biological Diversity of the Black Sea Benthos and Plankton
Asen Konsulov and Tsenka Konsulova

The Freshwater Fishes of Bulgaria
Maria Karapetkova, Mladen Livkov, and Kojka Alexandrova-Kolemanova
Fishes of the Bulgarian Coastal Waters
Kamen Prodanov, Kristina Dencheva, and Ludia Ivanov
Bulgaria's Amphibians and Reptiles
Vladimir A. Beshkov
The Bulgarian Ornithofauna
Tanio Michev and Petar Iankov
Small Mammals (Insectivora, Lagomorpha, Rodentia) *of Bulgaria*
Vassil Popov
The Bats of Bulgaria
Vladimir A. Beshkov
Large Mammals (Macromammalia)
Geko Spiridonov and Nikolay Spassov

Section 2 Management of Bulgaria's Biological Resources

Protected Areas Management in Bulgaria
Michail Michailov and Lubomira Mileva
Contemporary Trends in the Development of Bulgaria's Protected Areas System
Geko Spiridonov and Lubomira Mileva
Forest Resources and Their Ecological Functions in Bulgaria
Christo Bojinov
Wild Medicinal Plant Resources in Bulgaria
Rayna Hardalova and Tchavdar Gussev
Plant Genetic Resources and Their Management in Bulgaria
Dimitar Stoyanov
Preservation of Livestock Genetic Resources in Bulgaria
Tsvetan Dimitrov, Ivona Dimitrova, and Dimitar Vassilev
The Preservation of Autochthonous Breeds of Domestic Animals in Bulgaria
Jordan Danchev
Status of the Populations of Wild Animals Subject to Economic Use in Bulgaria
Velichko Velichkov and Lubomir Profirov
Status and Assessment of Bulgarian Fish Resources
Nikolai Kissiov, Petar Kolarov, Tzvetan Dikov, Sonia Zlatanova, Atanas Boiadjiev, and Petar Petrov
Soil Cover, Land Use, and Soil Degradation in Bulgaria
Pencho P. Konishev, Alexander V. Koulikov, and Hachadur Tchuldjian

Bulgaria's Biological Diversity: Conservation Status and Needs Assessment, Volume II

Section 3 Socioeconomic Aspects of Biodiversity Conservation in Bulgaria

Legislative Protection of Biological Resources and Biodiversity in Bulgaria
Margarita Georgieva, Venelin Iliev, and Georgi Penchev
The Legal-Sociological Problems of Safeguarding Biological Resources in Bulgaria
Stefka S. Naumova
European Nature Protection Law and Its Significance for Bulgaria
James J. Friedberg
Protection of Biological Resources in Bulgaria under International Environmental Law
David Downes and Chris Wold

Economics and Biodiversity Conservation in Bulgaria
Carollyne Hutter
A Strategy for Institution-Building for Protecting Biological Resources
William J. Briggle
Regional Planning and the Conservation of Biological Resources in Bulgaria
Plamena Borisova
An Eco and Sustainable Tourism Development Strategy for Bulgaria
Nicholas Spall

Section 4 Reports of Bulgarian Non-Governmental Organizations

Summary Report of the Bulgarian Conservation Non-Governmental Organizations
Boriana Mihova
Five Hundred Opinions on People and Biodiversity: Analysis of an Opinion Poll
Julietta Penchovska
Report of the Bulgarian Bird Protection Society
Petar Iankov
Report of the Bulgarian Union for the Conservation of the Rhodope Mountains
Jordan Danchev
Report of Ecoglasnost-Varna: The Biological Diversity of the Black Sea Shelf Along the Bulgarian Coast and Its Adjacent Landscape
Rumyana Peteva
Report of the Green Balkans Movement
Hristo Nikolov, Blagoy Gruev, Dimitar Delipavlov, Dimo Gramitikov, Andon Daraktchiev, Andrey Stoyanov, Teodora Ivanova, Boian Petrov, Petko Tzvetkov, and Elena Tzvetanova with the assistance of other members of the Green Balkans Movement
Report of the Wilderness Fund: The Status and Conservation of Biological Diversity in the Central Part of the Stara Planina Mountains
Nikolai Spassov, Kiril Georgiev, and Pavel Vassilev with the assistance of other members of the Wilderness Fund

APPENDIX C

SOURCES OF INFORMATION AND ASSISTANCE

REFERENCES

Assistance to Bulgaria: Activities of U.S. Nonprofit Organizations
- a guide to organizations that support or engage in activities in Bulgaria
- published 1992; available for a fee of US$8.00
- contact:

Citizens Democracy Corps
1735 I Street, Suite 720
Washington, DC 20005
USA
Tel: (202) 872-0933
Fax: (202) 872-0923
Email:citdemco@sovusa.com

Citizens Democracy Corps
15 Joliot Curie Str.,
Block 3, Suite 1
1113 Sofia
Bulgaria
Tel: (359-2) 73-80-25
Fax: (359-2) 73-29-70
Telex: 23462

Catalogue of Environmental Nongovernmental Organizations in Bulgaria.
- a survey of Bulgarian Associations, Centers, Clubs, Foundations, Movements, Societies and Unions that focus on or operate within the environmental field
- published by the Regional Environmental Center for Central and Eastern Europe
- contact:

Dr. Julieta Penchovska
Institute of Culture
Tel: (359-2) 57-00-01

The International Guide to Foundation and Corporate Funding in central and eastern Europe
- a guide profiling foundations, corporations and governmental agencies that have funding programs in Central and Eastern Europe and the Newly Independent States
- published by the Orpheus Program, available for a fee of US$18 (ECU 40)
- contact:

European Foundation Centre (EFC)
Elan Garonzik
51, rue de la Concorde

B-1050 Brussels
Belgium
Tel: (32-2) 512-89-38
Fax: (32-3) 512-32-65

Libraries and Environmental Information Centers in Central Eastern Europe: A Directory

- a guide profiling libraries and other centers that collect and assist with the location of information on environmental issues
- the directory is presently being updated and will be accessible through internet
- published by The Władyslaw Poniecki Foundation and World Wildlife Fund, sponsored by the U.S. Agency for International Development, The University of Minnesota, The University of Pittsburgh's Center for Hazardous Materials Research and The Institute for Sustainable Communities in cooperation with the Environment Resource Management Division of The Special Libraries Association, available for a donation of US$27.95
- contact:

  Czeslaw Jan Gryez
  The Władyslaw Poniecki Foundation
  8637 Arbor Drive
  El Cerrito, CA 94530-2728
  USA
  Tel: (510) 526-0813
  Fax: (510) 527-4512

Organizations Grouped into Categories According to Their Focus or the Type of Assistance They May Provide

Community Participation, Volunteer Programs and Collaborative Partnerships

Atlantic Center for the Environment
The Lynde and Harry Bradley Foundation, Inc.
British Trust for Conservation Volunteers
Center for International Environmental Law
Coalition Clean Baltic
Environmental Law Institute
European Union for Coastal Conservation
International Institute for Environment and Development
Institute for Sustainable Communities
Johns Hopkins University Institute for Policy Studies
Organization Development Institute
Public Agencies Collaborating Together
Public Welfare Foundation, Inc.
Royal Society for the Protection of Birds
Rutgers University Local Democracy in Poland
Schweizerische Akademie der Naturwissenschaften/Académie Suisse des Sciences Naturelles/Swiss Academy of Natural Sciences
World Conservation Union (IUCN)

Educational Program and Curriculum Development

Agricultural University of Norway, Department of Biology and Nature Conservation
Atlantic Center for the Environment
The Lynde and Harry Bradley Foundation, Inc.
British Trust for Conservation Volunteers
Bund Naturschutz in Bayern/Bavarian Foundation for Nature Conservation
Česky Svaz Ochránce Prírody/Czech Union of Nature Conservation
Česky Ústav Ochrany Prírody
Council for Environmental Education
Dansk Ornitologisk Forening/Danish Ornithological Society
European Union for Coastal Conservation
Field Studies Council
The German Marshall Fund
Liga Ochrony Przyrody/Nature Conservation League
Muséum National d'Histoire Naturelle/National Museum of Natural History
Naturschutzbund Deutschland/Nature Preservation Society
Royal Society for Nature Conservation
Royal Society for the Protection of Birds
Stichting Milieu - Educatie/Institute for Environmental Communication
Stichting Natuur en Milieu/Society for Environmental Conservation
Television Trust for the Environment
Türkiye Tabiatini Koruma Dernegi/Turkish Association for the Conservation of Nature and Natural Resources
World Wide Fund for Nature National Organizations
Zoologische Gesellschaft Frankfurt von 1858 - Hilfe für die bedrohte Tierwelt/Frankfurt Zoological Society of 1858 - Help for Threatened Wildlife

Ecotourism and Commercial Enterprise

Center for the Study of Democracy
Citizens Democracy Corps
Deutscher Naturschutzring/German Association for the Conservation of Nature
Muséum National d'Histoire Naturelle/National Museum of Natural History
Peak Park Joint Planning Board
Public Agencies Collaborating Together
Schweizerischer Bund für Naturschutz/Ligue Suisse pour la Protection de la Nature /Swiss League for the Protection of Nature

Equipment or Materials

Fondation Internationale pour la Sauvegarde du Gibier/International Foundation for Conservation of Game
Organization Development Institute
Royal Society for the Protection of Birds

General Conservation Projects

The Center for Field Research
Svenska Naturskyddsföreningen/Swedish Society for the Conservation of Nature
World Wide Fund for Nature National Organizations

General Organizational Support/General Purpose

The German Marshall Fund
Public Welfare Foundation, Inc.
Sarah Scaife Foundation

Information Networking

Agricultural University of Norway, Department of Biology and Nature Conservation
Alliance for International Educational and Cultural Exchange
Biodiversity Action Network
Birdlife International
Brehm Fonds für Internationalen Vogelschutz/Brehm Fund for the International Conservation of Birds
British Association of Nature Conservationists
Bund Naturschutz in Bayern/Bavarian Foundation for Nature Conservation
Bureau Européen de l'Environnement/European Environmental Bureau
Center for International Development and the Environment
Center for International Environmental Law
Centrum voor Milieukunde, Rijksuniversiteit Leiden/Center for Environmental Science, Leiden University
Česky Svaz Ochráncu Prírody/Czech Union of Nature Conservation
Česky Ústav Ochrany Prírody
Coalition Clean Baltic
CORINE
Danmarks Naturfredningsforening/Danish Society for the Conservation of Nature
Deutscher Naturschutzring/German Association for the Conservation of Nature
Environmental Law Institute
European Natural Heritage Fund
EUROSITE
Föderation der Natur-und Nationalparke Europas/Federation of Nature and National Parks of Europe
Fondation Internationale pour la Sauvegarde du Gibier/International Foundation for Conservation of Game
Friends of the Earth International
Institut Français de recherche scientifique pour le développement en coopération (ORSTOM)/French Scientific Research Institute for Cooperation in Development
International Council of Environmental Law
International Institute for Environment and Development
Koninklijke Nederlandse Natuurhistorische Vereniging/Royal Dutch Natural History Society
Norges Naturvernforbund/Norwegian Society for Conservation of Nature
Organization Development Institute
Public Agencies Collaborating Together
The Royal Society
Royal Society for Nature Conservation
Sarah Scaife Foundation
Schweizer Vogelschutz/Swiss Association for the Protection of Birds
Slovenský Zväz Ochrancov Prírody a Krajiny/Slovak Union of Nature and Landscape Conservationists

Société Nationale de Protection de la Nature/National Nature Protection Society
Stichting Milieu - Educatie/Institute for Environmental Communication
Stichting tot Internationale Natuurbescherming (van Tienhoven Stichting)/Netherlands Foundation for International Nature Protection
Svenska Naturskyddsföreningen/Swedish Society for the Conservation of Nature
Television Trust for the Environment
Vogelbescherming Nederland/Netherlands Society for the Protection of Birds
World Conservation Union (IUCN)
World Wide Fund for Nature National Organizations
Zoologische Gesellschaft Frankfurt von 1858 - Hilfe für die bedrohte Tierwelt/Frankfurt Zoological Society of 1858 - Help for Threatened Wildlife

Internships/Fellowships/Exchange Programs

Alliance for International Educational and Cultural Exchange
American Library Association (through the Library Fellows Program)
Föderation der Natur-und Nationalparke Europas/Federation of Nature and National Parks of Europe
The German Marshall Fund
Johns Hopkins University Institute for Policy Studies
Rutgers University School of Planning and Public Policy
Trans-European Mobility Scheme for University Studies

Land and Resource Management

Agricultural University of Norway, Department of Biology and Nature Conservation
Bund Naturschutz in Bayern/Bavarian Foundation for Nature Conservation
Bureau Européen de l'Environnement/European Environmental Bureau
The Center for Field Research
Coalition Clean Baltic
Danmarks Naturfredningsforening/Danish Society for the Conservation of Nature
European Bank for Reconstruction and Development
European Natural Heritage Fund
EUROSITE
Friends of the Earth International
Landscape Institute
Naturschutzbund Deutschland/Nature Preservation Society
Norges Naturvernforbund/Norwegian Society for Conservation of Nature
Peak Park Joint Planning Board
Schweizerischer Bund für Naturschutz/Ligue Suisse pour la Protection de la Nature /Swiss League for the Protection of Nature
Société Nationale de Protection de la Nature/National Nature Protection Society
Stichting Natuur en Milieu/Society for Environmental Conservation
Türkiye Tabiatini Koruma Dernegi/Turkish Association for the Conservation of Nature and Natural Resources
Vereniging tot Behoud van Natuurmonumenten in Nederland/Dutch Society for the Preservation of Nature Monuments
The World Conservation Union (IUCN)

Legislative Initiatives

Bureau Européen de l'Environnement/European Environmental Bureau
Center for International Environmental Law
Center for the Study of Democracy
Conseil Européen du Droit de l'Environnement/European Council of Environmental Law
Environmental Law Institute
The German Marshall Fund
Greenpeace International
IUCN Environmental Law Centre
Schweizerische Akademie der Naturwissenschaften/Académie Suisse des Sciences Naturelles/Swiss Academy of Natural Sciences
Société Française pour le droit de l'environnement/French Society for Environmental Law
Stichting Natuur en Milieu/Society for Environmental Conservation

Organizational Development

Atlantic Center for the Environment
Citizens Democracy Corps, Inc.
Johns Hopkins University Institute for Policy Studies
Organization Development Institute
Projects in Development Training

Policy Development/Administration

The Lynde and Harry Bradley Foundation, Inc.
The Carthage Foundation
Center for International Development and the Environment
Center for the Study of Democracy
Deutscher Naturschutzring/German Association for the Conservation of Nature
Environmental Law Institute
The German Marshall Fund
International Institute for Environment and Development
LIFE Programme
Rutgers University School of Planning and Public Policy
Sarah Scaife Foundation
Schweizerische Akademie der Naturwissenschaften/Académie Suisse des Sciences Naturelles/Swiss Academy of Natural Sciences
Schweizerischer Bund für Naturschutz/Ligue Suisse pour la Protection de la Nature /Swiss League for the Protection of Nature
Stichting Natuur en Milieu/Society for Environmental Conservation
World Conservation Union (IUCN)

Protected Areas Enhancement

Birdlife International
The Center for Field Research
Dansk Ornitologisk Forening/Danish Ornithological Society
Deutscher Naturschutzring/German Association for the Conservation of Nature

European Natural Heritage Fund
EUROSITE
Hellenic Society for the Protection of Nature
Royal Society for the Protection of Birds
Schweizer Vogelschutz/Swiss Association for the Protection of Birds
The World Conservation Union (IUCN)
World Wide Fund for Nature National Organizations

Research - Scientific

Agricultural University of Norway, Department of Biology and Nature Conservation
Birdlife International
Brehm Fonds für Internationalen Vogelschutz/Brehm Fund for the International Conservation of Birds
The Center for Field Research
Centrum voor Milieukunde, Rijksuniversiteit Leiden/Center for Environmental Science, Leiden University
Dansk Ornitologisk Forening/Danish Ornithological Society
European Union for Coastal Conservation
EUROSITE
Field Studies Council
Institut Français de recherche scientifique pour le développement en coopération (ORSTOM)/French Scientific Research Institute for Cooperation in Development
International Waterfowl and Wetlands Research Bureau
Muséum National d'Histoire Naturelle/National Museum of Natural History
Peak Park Joint Planning Board
Royal Geographical Society
The Royal Society
Royal Society for the Protection of Birds
Schweizerische Akademie der Naturwissenschaften/Académie Suisse des Sciences Naturelles/Swiss Academy of Natural Sciences

Research - Policy and Issues

The Lynde and Harry Bradley Foundation, Inc.
The Carthage Foundation
Center for International Development and the Environment
The German Marshall Fund
International Institute for Environment and Development
Sarah Scaife Foundation

Restoration (land, habitat, ecosystem)

Bureau Européen de l'Environnement/European Environmental Bureau
The Center for Field Research
Friends of the Earth International

Teaching

Field Studies Council
Johns Hopkins University Institute of Policy Studies

Public Agencies Collaborating Together
Stichting Milieu - Educatie/Institute for Environmental Communication
Stichting Natuur en Milieu/Society for Environmental Conservation

Technical Assistance/Support

Atlantic Center for the Environment
Birdlife International
Center for the Study of Democracy
Citizens Democracy Corps, Inc.
Environmental Training Program
European Bank for Reconstruction and Development
Institute for Sustainable Communities
International Waterfowl and Wetlands Research Bureau
Landscape Institute
LIFE Programme
Royal Society for Nature Conservation
World Wide Fund for Nature National Organizations

Training

Atlantic Center for the Environment
British Trust for Conservation Volunteers
Citizens Democracy Corps, Inc.
Environmental Law Institute
Environmental Training Program
European Bank for Reconstruction and Development
The German Marshall Fund
Institute for Sustainable Communities
Johns Hopkins University Institute for Policy Studies
Organization Development Institute
Partners for International Education and Training
Projects in Development Training
Public Agencies Collaborating Together
Rutgers University School of Planning and Public Policy
Schweizerischer Bund für Naturschutz/Ligue Suisse pour la Protection de la Nature /Swiss League for the Protection of Nature
Trans-European Mobility Scheme for University Studies

Workshops, Conferences and Seminars (may include support for travel & expenses)

Atlantic Center for the Environment
Birdlife International
Bureau Européen de l'Environnement/European Environmental Bureau
Council for Environmental Education
Environmental Law Institute
Environmental Training Program
EUROSITE
The German Marshall Fund

Organization Development Institute
Royal Geographical Society
Rutgers University School of Planning and Public Policy
Stichting Milieu - Educatie/Institute for Environmental Communication
Trans-European Mobility Scheme for University Studies

Addresses of Organizations

Agricultural University of Norway, Department of Biology and Nature Conservation
- interested in resource management; environmental and conservation research; environmental leadership and public environmental education
- contact:

  Prof. Sigmund Hagvar
  P. O. Box 14
  N-1432 As-NLH
  Norway
  Tel: (47 64) 948500, 948122 or 941310
  Fax: (47 64) 948502 or 941310

Alliance for International Educational and Cultural Exchange
- a coalition of 66 organizations involved in educational and cultural exchanges
- provide a forum for discussion of policy issues relevant to exchanges; facilitate communication among US agencies; advocate on issues before the US Congress
- contact:

  1090 Vermont Avenue NW
  Washington, DC 20005
  USA
  Tel: (202) 371-2070
  Fax: (202) 371-2190

American Library Association
- US library professionals are placed in overseas institutions and non-US librarians are placed in US libraries
- application deadline October 1
- Outside the US:

  The U.S. Embassy
  U.S. Information Service
  1 A. Stamboliiski Blvd.
  1000, Sofia
  Bulgaria
  Tel: (359 2) 88 48 01
  Fax: (359 2) 88 18 77

  Within the US:

  Robert P. Doyle
  Library Fellows Program
  American Library Association
  50 East Huron Street
  Chicago, IL 60611
  USA
  Tel: (800) 545-2433 ext. 3200
  Tel: (312) 280-3200
  Fax: (312) 944-3897
  Email: U58539@uicvm.edu

Atlantic Center for the Environment

- interested in marine and freshwater environments; rural areas; traditional knowledge, anthropology, and social and cultural values; education and training; wildlife conservation; migratory species monitoring; forests and forestry; resource assessments; conservation strategies; acid rain and trans-frontier pollution; environmental law enforcement
- contact:

  Ms. Jessica L. Brown
  Director, International Programs
  39 South Main Street
  Ipswich, MA 01938-2321
  USA
  Tel: (508) 356-0038
  Fax: (508) 356-7322

Biodiversity Action Network (BioNET)

- Primarily oriented toward advocacy on behalf of biodiversity, BioNET serves as a conduit for information and access to expertise in the scientific, legal, technical assistance and research fields
- Produces a quarterly newsletter on biodiversity issues and document service for related papers
- contact:

  Sheldon Cohen
  424 C Street, NE
  Washington, DC 20002
  USA
  Tel: (202) 547-8902
  Fax: (202) 544-8483
  Email: bionet@igc.apc.org

Birdlife International

- Determines the status of bird species; identifies threats; initiates and coordinates conventions and conservation projects
- contact:

  Wellbrook Court, Dirton Road
  Cambridge CB3 ONA
  United Kingdom
  Tel: (44 223) 277318

The Lynde and Harry Bradley Foundation, Inc.

- grants for projects that develop citizenship, citizen participation and responsibility
- proposal submission deadlines December 15, March 15, July 15, September 15
- contact:

  777 East Wisconsin Avenue, Suite 2285
  Milwaukee, WI 53202-5393
  USA
  Tel: (414) 291-9915
  Fax: (414) 291-9991

Brehm Fonds für Internationalen Vogelschutz/Brehm Fund for the International Conservation of Birds

- active in conserving bird habitats, promotes scientifically-based action to protect wildlife, particularly birds, through international cooperation and conservation research
- contact:

  Mr. Wolf W. Brehm, Chairman
  Postfach 120369
  5300 Bonn 1
  Germany
  Tel: (49 228) 213453

British Association of Nature Conservationists (BANC)

- a voluntary organization promoting nature conservation by facilitating "the free and critical exchange of ideas and information in the conservation world" (reference IUCN)
- interested in wildlife and resource protection; public environmental education; ecology of rural and urban areas; conservation strategies; management and planning; and integration of conservation and development
- contact:

  Prof. Duncan Poore, President
  85 Smirrells Road
  Hall Green
  Birmingham B28 0LA
  United Kingdom

British Trust for Conservation Volunteers

- works to conserve and enhance the environment through voluntary action
- offers training courses; support for local groups; distribution of publications; workshops and conferences; camps and excursions; and advice on environment and conservation at all levels
- interested in protection of areas of natural beauty, buildings, monuments and archaeological sites; urban, rural and protected areas management and planning; public environmental education
- contact:

  Mr. Robert Morley, Chief Executive
  36 St. Mary's Street
  Wallingford, Oxon OX10 OEU
  United Kingdom
  Tel: (44 91) 39766
  Fax: (44 91) 39464

Bund Naturschutz in Bayern/Bavarian Foundation for Nature Conservation

- interested in sustainable development; conservation strategies;and public environmental education
- contact:

  Mr. Helmut Steininger
  Landesgeschäftsführer
  Kirchenstrasse 88
  8000 München 80
  Germany
  Tel: (49 89) 459918
  Fax: (49 89) 485866

Bureau Européen de l'Environnement/European Environmental Bureau
- promotes conservation and restoration of nature as well as sustainable use of natural resources
- holds conferences and assists with information networking; coordinates lobbying efforts by NGOs; and serves as liaison between NGOs and institutions
- contact:

  Rue de la Victoire 26 BTE 12
  B-1060 Brussels
  Belgium
  Tel: (32 2) 539 0037
  Fax: (32 2) 539 0921

The Carthage Foundation
- grants to "programs that will address public policy questions"
- contact:

  Richard M. Larry, Treasurer
  The Carthage Foundation
  Three Mellon Bank Center
  525 William Penn Place, Suite 3900
  Pittsburgh, PA 15219-1708
  USA
  Tel: (412) 392-2900

The Center for Field Research (affiliate of Earthwatch)
- reviews and recommends proposals for Earthwatch support
- grants for research expenses derive from volunteers who participate in the research as short-term, nonspecialist field assistants
- contact:

  Dee Robbins, Life Science Program Director
  680 Mount Auburn Street
  P. O. Box 403
  Watertown, MA 02272-9104
  USA
  Tel: (617) 926-8200
  Fax: (617) 926-8532
  Email: cfr@earthwatch.org (Internet); 62910226 (Easylink)
  Telex: 5106006452

Center for International Development and the Environment (CIDE)
- research and advise on issues of sustainable development and the integration of environment and development
- contact:

  Priscilla Tucker
  c/o World Resources Institute
  1709 New York Avenue, NW
  Washington, DC 20006
  USA
  Tel: (202) 638-6300
  Fax: (202) 638-0036
  Telex: 64414 wriwash

Center for International Environmental Law - US (CIEL-US)

- provides information, commentary and guidance on legal aspects of environmental protection
- contact:

  David Downes
  1621 Connecticut Avenue, NW, Suite 300
  Washington, DC 20009
  USA
  Tel: (202) 332-4840
  Fax: (202) 332-4865

Center for the Study of Democracy

- consultation and expertise only (no funds) in economic, legal and social aspects of environmental protection
- contact:

  Alexander Stoyanov, Director of Research
  1 Lazar Stanev Street
  1113, Sofia
  Bulgaria
  Tel: (359-2) 70 61 64
  Fax: (359-2) 72 05 09
  Email: csdbg@bgcict.bitnet
  Telex: 23 168 csd bg

Centrum voor Milieukunde, Rijksuniversiteit Leiden (CML)/Center for Environmental Science, Leiden University

- conducts research and provides education in the field of environmental sciences; integrates multiple disciplines including natural sciences, law, medicine and social sciences
- interested in wetland ecosystems; ecological and environmental management and planning; environmental policy; integration of conservation and development; sustainable development; women and environment
- contact:

  Mr. H. H. de longh
  Division of Environment and Development
  P. O. Box 9518
  2300 RA Leiden
  The Netherlands
  Tel: (31 71) 27 74 74
  Fax: (31 71) 27 74 96
  Telex: 39427 burul

Česky Ústav Ochrany Prírody (ČÚOP)

- contact:

  Dr. Jaroslav Hromas, Director
  Kalisnicka 4-6
  130 00 Praha 3 - Zizkov
  The Czech Republic
  Tel: (42 2) 215 1111
  Fax: (42 2) 25 45 55

Česky Svaz Ochráncu Prírody (ČSOP)/Czech Union of Nature Conservation

- union of conservation groups interested in protected areas; nature and natural parks; endangered species; wildlife habitats; gene banks; forest management; development and enforcement of environmental laws; sources of pollution; and education and training
- contact:

  Mrs. Zuzana Marisova
  International Relations
  U. Michelského lesa 366
  140 00 Praha 4-Krc
  The Czech Republic
  Tel: (42 4) 2195 extension 4506
  Fax: (42 2) 49 66 19

Citizens Democracy Corps, Inc.

- placement overseas of US advisors for business-related projects and development
- contact:

  Susan H. Berger, Program Officer
  1735 I Street, Suite 720
  Washington, DC 20005
  USA
  Tel: (202) 872-0933
  Fax: (202) 872-0923
  Email: citdemco@sovusa.com

  15 Joliot Curie Str.,
  Block 3, Suite 1
  1113 Sofia
  Bulgaria
  Tel: (359-2) 73 80 25
  Fax: (359-2) 73 29 70
  Telex: 23462

Coalition Clean Baltic

- a network of environmental NGOs from Baltic sea countries active protection of in marine environment and ecosystems; resource management; and international cooperation and networks
- provide financial assistance to NGOs
- contact:

  Mr. Gunnar Norén, Executive Secretary
  c/o SSCN
  P. O. Box 4625
  Asögatan 115
  116 91 Stockholm
  Sweden
  Tel: (46 18) 42 20 15 or 702 6500
  Fax: (46 18) 42 21 21

Conseil Européen du Droit de l'Environnement (CEDE)/European Council for Environmental Law

- promotes the study and development of environmental law
- contact:

  Université de Sciences Juridiques, Politiques et Sociales
  Place d'Athènes
  F-67084 Strasbourg CEDEX
  France

CORINE

- Established as an experimental project by the Commission of the European Communities to "gather, coordinate and ensure the consistency of information on the state of the environment and natural resources" in the European Community
- Priority areas include "biotopes for conservation, acid deposition, protection of the Mediterranean environment, and improvement in comparability and availability of data and methods of analysing data" (reference: Sally Mullard, Institute for European Environmental Policy)
- Work will be continued under the new European Environment Agency, to be based in Copenhagen

Council for Environmental Education (CEE)

- conducts seminars, advises on educational techniques, promotes understanding of the importance and role of environmental education
- contact:

  Dr. Ewan McLeish, Director
  University of Reading
  London Road
  Reading, Berks, RG1 5AQ
  United Kingdom
  Tel: (44 734) 756061
  Fax: (44 734) 756264

Danmarks Naturfredningsforening/Danish Society for the Conservation of Nature

- interested in wild and endangered flora and fauna; terrestrial and freshwater environments; resource protection; protected areas; and forests and forestry
- contact:

  Mr. David Rehling, Director
  Norregade 2
  1165 Copenhagen K
  Denmark
  Tel: (45 33) 32 20 21
  Fax: (45 33) 32 22 02

Dansk Ornitologisk Forening (DOF)/Danish Ornithological Society

- encourages awareness and interest in birds; promotes nature and bird protection and conservation; active in migratory species monitoring and assessments; field surveys; and camps and excursions
- contact:

  Mr. Knud Flemsted
  Conservation Officer
  Vesterbrogade 140
  DK-1620 Copenhagen V
  Denmark
  Tel: (45 31) 31 44 04
  Fax: (45 31) 31 24 35

Deutscher Naturschutzring (DNR)/German Association for the Conservation of Nature

- an association of 90 member organizations with interests in protected areas, tourism and recreation; agricultural practices and the use of chemical fertilizers; air, water and soil pollution; and influencing agricultural, governmental and industrial policy and regulation
- contact:

  Mr. Helmut Röscheisen
  Kalkuhlstrasse 24
  5300 Bonn 3
  Germany
  Tel: (49 228) 44 15 05 or 44 22 77
  Fax: (49 228) 44 42 90
  Telex: 8861170 dnr

Environmental Law Institute

- provide information and expertise (no funds)
- training in advocacy, partnership development, participatory and democratic process
- will assist with participation in workshops and conferences, may help organize workshops as joint initiative, but does not fund independent workshops
- contact:

  Director, Environmental Program CEE
  1616 P Street, NW, Suite 200
  Washington, DC 20036
  USA
  Tel: (202) 328-5150
  Fax: (202) 328-5002
  Email: eli@igc.org; elipal@igc.org

Environmental Training Program

- information, expertise and training in organizational management, environmental impact assessments, citizen participation, and conflict resolution
- grants for training courses and workshops
- contact:

  Director
  27B A. Stamboliiski Street, Ap. 18
  1000, Sofia
  Bulgaria
  Tel: (359-2) 87 57 77
  Fax: (359-2) 80 16 70

European Bank for Reconstruction and Development (EBRD)

- lends and invests in "technical assistance and training" to improve skills and "promote technology transfer;" economic initiatives including "decentralization, privatization and deregulation; public infrastructure; and environmental improvement projects"

- contact:
  1 Exchange Square
  London
  United Kingdom
  EC2A 2EH
  Tel: (44 71) 338-6000

European Natural Heritage Fund
- contact:
  Gattinger Strasse 19
  D-7760 Radolfzell
  Germany
  Fax: (49 77) 32 33 16

European Union for Coastal Conservation (EUCC)
- interested in issues of coastal development; coastal and wetlands ecosystems; coastal and marine protected areas; ecological monitoring; international cooperation, conservation education; and scientific research
- contact:
  Drs. A.H.P.M. Salman, Secretary General
  Stationsweg 12-14
  P. O. Box 11059
  2301 EB Leiden
  The Netherlands
  Tel: (31 71) 12 29 00/12 39 52
  Fax: (31 71) 12 40 69

EUROSITE
- an association of organizations that manage European natural heritage in 10 European countries
- interested in protected areas and database (information) management; ecological monitoring and assessment; and environmental education
- produce conservation publications and sponsor workshops
- contact:
  M. Peter L. Nowichi, Programme Officer
  9 rue de la Collégiale
  59800 Lille
  France
  Tel: (33 20) 55 90 44
  Fax: (33 20) 06 29 62

Field Studies Council (FSC)
- organizes field courses for members
- interested in environmental education in both formal (school) and informal settings; educational, conservation and scientific research

- contact:
  Mr. Chris Bayliss
  Secretary and Treasurer
  Preston Montford
  Montford Bridge, Shrewsbury SY4 1HW
  United Kingdom
  Tel: (44 743) 85 06 74
  Fax: (44 743) 85 01 78

Föderation der Natur-und Nationalparke Europas/Federation of Nature and National Parks of Europe
- facilitates contacts between parks; encourages exchanges of information and experience
- contact:
  Rathausgasse 1
  D-8353 Garfenau
  Germany
  Tel: (49 8552) 28 39

Fondation Internationale pour la Sauvegarde du Gibier (FISG)/International Foundation for the Conservation of Game
- promotes hunting practices that are compatible with wildlife protection and nature conservation; provides material assistance
- interested in protected areas; hunting practices and controls; monitoring of wildlife trade; control of poaching; environmental management and planning; monitoring of migratory species and biodiversity; environmental and agricultural policies
- contact:
  M. B. deClers, Directeur
  15 rue de Téhéran
  75008 Paris
  France
  Tel: (33 1) 45 63 51 33
  Fax: (33 1) 45 63 32 94
  Telex: 640430

Friends of the Earth International (FoE)
- committed to the conservation, restoration and responsible use of the environment
- information on Marine and Rivers and Dams issues available through FoE over Greennet
- contact:
  Bert van Pinxteren, International Coordinator
  Postbus 19199
  NL-1000 GD Amsterdam
  The Netherlands
  Tel: (31 20) 62 21369
  Fax: (31 20) 63 92181

The German Marshall Fund

- strong interest in Carbon dioxide (CO_2) reduction and global climate change
- emphasis on giving grants in Central and Eastern Europe that will encourage "environmental activists on the ground to form into advocacy, educational, problem-solving non-governmental organizations"
- contact:

11 Dupont Circle, NW, Suite 750
Washington, DC 20036
USA
Tel: (202) 745-3950
Fax: (202) 265-1662
Telex: 197533 gmf us

Juila Binder
Representative for Europe
Clara-Zetkini-Strasse 112
10117 Berlin
Germany
Tel: (49-30) 391-62-01
Fax: (49-30) 391-64-33

Greenpeace International

- focused on issues of toxic and nuclear pollution; ecosystems and species in the worlds oceans; and advocacy for laws and treaties protecting the environment
- contact:

Temple House 25-26
High Street
Lewes, East Sussex, BN7 2LU
United Kingdom
Tel: (44 273) 478 787
Fax: (44 273) 471 631
Telex: 878182 gpirtg

Hellenic Society for the Protection of Nature

- committed to the establishment of national parks and protected areas to conserve wildlife
- interested in wild flora and fauna; use of wildlife resources; forests and forestry; protected areas; wetland, coastal and marine ecosystems; and tourism
- contact:

Mr. George Sfikas, Honorary Secretary
24 Nikis Street
105 57 Athens
Greece
Tel: (30 1) 322 4944
Fax: (30 1) 322 5285

Institut Français de recherche scientifique pour le développement en coopération (ORSTOM)/French Scientific Research Institute for Cooperation in Development

- an international research organization (government agency) working in many fields throughout the world, but particularly concentrated in developing countries
- interested in scientific research; marine and terrestrial environments; atmosphere and climate; urban areas; developmental patterns, social and cultural values, and human health; and food and agriculture

- contact:
  M. Gérard Morel
  Directeur de Recherche
  213 rue LaFayette
  75480 Paris Cédex 10
  France
  Tel: (33 1) 48 03 77 77
  Fax: (33 1) 48 03 08 29
  Telegram: ORSTOM

Institute for Sustainable Communities
- provides information and expertise in community planning; land and resource management; organizational develop and institutional capacity-building; environmental education and public awareness
- associated with the Environmental Training Program in Sofia, Bulgaria which has a limited capacity to give grants
- contact:
  56 College Street
  Montpelier, VT 05602
  USA
  Tel: (802) 229-2900
  Fax: (802) 229-2919
  Email: isc@together.org

International Council of Environmental Law
- maintains a library and computer information base to encourage the exchange of information on environmental law, policy and administration
- contact:
  Adenauerallee 214
  5300 Bonn 1
  Germany
  Tel: (49 228) 269 240

International Institute for Environment and Development (IIED)
- researches issues surrounding sustainable development and the integration of environment and development in developing countries; produce publications based on research findings
- contact:
  3 Endsleigh Street
  London WC1H 0DD
  United Kingdom
  Tel: (44 71) 388 2117
  Fax: (44 71) 388 2826

International Waterfowl and Wetlands Research Bureau
- offers technical support to the RAMSAR convention bureau; promotes and conducts research into the status of waterfowl and trends in their populations

- contact:
  Slimbridge, Glos. GL2 7BX
  United Kingdom
  Tel: (44 45) 389 333
  Fax: (44 45) 389 827
  Telex: 437145 wwf g

Johns Hopkins University Institute for Policy Studies
- provides information and expertise for classroom teaching and workshop training
- provides training to NGOs in financial, business and project management; proposal, partnership, and enterprise development; fundraising; participatory appraisals; conflict resolution; and democratic process
- associated with Open Society Fund Bulgaria
- contact:
  Robert Seidel, Special Assistant to the Director
  Shriver Hall - Johns Hopkins University
  Charles and 34th Streets
  Baltimore, MD 21218
  USA
  Tel: (410) 516-7174
  Fax: (410) 516-8233

Koninklijke Nederlandse Natuurhistorische Vereniging (KNNV)/Royal Dutch Natural History Society
- interested in conservation strategies; and wildlife ecology
- contact:
  Oude Giracht 237
  3511 NK Utrecht
  The Netherlands
  Tel: (31 30) 31 47 97

Landscape Institute
- a professional body of landscape architects, managers and scientists
- interested in protection of landscapes, monuments and buildings; land use and restoration; landscape planning and management; and environmental assessments
- contact:
  Miss Catherine Bickmore
  IUCN Representative
  6/7 Barnard Mews
  London SW11 1QU
  United Kingdom
  Tel: (44 71) 738 9166

LIFE Programme
- provides information and expertise to support the establishment of policies and action programs

- contact:
  DGXI/C/2
  Commission of the European Communities
  T-174 4/88
  rue de la Loi 200
  B-1049 Brussels
  Belgium
  Tel: (32-2) 296-8822

Liga Ochrony Przyrody (LOP)/Nature Conservation League
- active in environmental education and developing public awareness on environmental issues
- contact:
  Zarzad Glowny
  ul. Wawelska 52/54
  PL-02-067 Warsaw
  Poland

Muséum National d'Histoire Naturelle/National Museum of Natural History
- promotes interest in natural history, anthropological and scientific research; and tourism, recreation and use of leisure time
- contact:
  Prof. Philippe Taquet, Directeur
  57 rue Cuvier
  75005 Paris
  France
  Tel: (33 1) 4079 3000
  Fax: (33 1) 4079 3484

Naturschutzbund Deutschland/Nature Preservation Society
- interested in birds and waterfowl; migratory and endangered animals species; wetland, river, stream, lake and pond ecosystems; mineral exploration; and public environmental education
- contact:
  Mr. Jochen Flasbarth, Präsident
  Bundesgeschäftsstelle
  Am Michaelshof 8-10
  5300 Bonn 2
  Germany
  Tel: (49 228) 35 80 31
  Fax: (49 228) 35 80 36

Norges Naturvernforbund/Norwegian Society for Conservation of Nature
- focussed on marine environments and legislation; fisheries; forests and forestry; atmosphere and climate; protected areas; conservation strategies; education and training; resource protection; and sustainable development

- contact:

  Mrs. Guro Tavjem, Information Secretary
  Postboks 2113
  Grunerlokka
  0505 Oslo 5
  Norway
  Tel: (47 2) 71 55 20
  Fax: (47 2) 71 55 20

Organization Development Institute

- provides information, expertise and some educational materials focused on improving skills in business and project management, enterprise development, resources appraisals, development of community participation processes and conflict resolution
- contact:

  Donald Cole, President
  11234 Walnut Ridge Road
  Chesterland, OH 44026
  USA
  Tel: (216) 461-4333
  Fax: (216) 729-9319
  Email: aa563%cleveland.freenet.edu @cunyvm

Partners for International Education and Training (PIET)

- a consortium of World Learning, Inc, the African American Institute, the Asia Foundation and AmidEast that arranges tailored training programs and exchanges (EMED, Enterprise Management and Executive Development) or short courses and on-the-job training (PTPE, Participant Training Project for Europe)
- focussed on business, management and organizational training for individuals or groups of individuals
- the PIET office in Sofia receives all applications and selects participants for training
- contact:

  60 Vasil Levsky Blvd. Ap. 10
  1000, Sofia
  Bulgaria
  Tel: (359 2) 65 15 11

  Kristin Aulenbach, EMED or
  Colin Davies, PTPE
  2000 M Street, Suite 650
  Washington, DC 20036
  Tel: (202) 429-0810

Peak Park Joint Planning Board

- interested in national parks and protected areas; planning and management; tourism and recreation; scientific research; forestry; and conservation strategies
- contact:

  Mr. Christopher Harrison
  National Park Officer
  Peak District National Park
  Aldern House, Blaslow Road
  Bakewell, Derbyshire DE4 1AE
  United Kingdom
  Tel: (44 629) 81 43 21
  Fax: (44 629) 81 26 59

Projects in Development Training (PIDT)
- a project of World Learning, Inc. that focuses on organizational development and capacity-building
- contact:

  Robert Chase, Vice President
  c/o World Learning, Inc.
  1015 15th Street, NW
  Washington, DC
  USA
  Tel: (202) 408-5420

Public Agencies Collaborating Together (PACT)
- produces publications on sustainable development and small enterprise; participatory approaches to education and appraisals; and developing community participation
- supports programs "committed to alleviating poverty, strengthening community life and preserving the environment" (reference: PACT)
- contact:

  777 United Nations Plaza
  New York, NY 10017
  USA
  Tel: (212) 697-6222
  Fax: (212) 692-9748

Public Welfare Foundation, Inc.
- provides assistance to NGOs and community groups only
- mainly supports development of community participation and collaborative partnerships
- contact:

  Larry Kresley, Executive Director
  2600 Virginia Avenue, NW, Room 505
  Washington, DC
  USA
  Tel: (202) 965-1800
  Fax: (202) 625-1348

Royal Geographical Society
- interests include terrestrial, coastal and tropical ecosystems; tropical forests; endangered animal species; field surveys; monitoring and assessment
- encourages international cooperation; sponsors workshops and conferences
- contact:

  Dr. John Hemming
  Director and Secretary
  1 Kensington Gore
  London SW7 2AR
  United Kingdom
  Tel: (44 71) 589 5466
  Fax: (44 71) 584 4447

The Royal Society

- a learned society for the promotion of natural and applied sciences, and scientific research
- contact:

  The Executive Secretary
  6 Carlton House Terrace
  London SW1Y 5AG
  United Kingdom
  Tel: (44 71) 891 5561
  Telex: 917876
  Telegram: LONROYSOC

Royal Society for Nature Conservation (RSNC)

- promotes nature conservation; educates the public; and encourages understanding and appreciation for nature and the need for conservation
- interested in wild flora and fauna; marine, coastal and wetland environments; coastal development; forests and forestry; development of public support; publicity; and database (information) management
- contact;

  T. S. Sands, Senior Head - Conservation Education
  The Green, Witham Park
  Waterside South, Lincoln, LN5 7JR
  United Kingdom
  Tel: (44 522) 54 44 00
  Fax: (44 522) 51 16 16

Royal Society for the Protection of Birds (RSPB)

- focussed on the study and protection of birds, waterfowl and migratory species and their habitats - specifically wetlands and forests
- provides financial and material assistance; active in public environmental education, development of international cooperation, and generation of public support
- contact:

  Mr. Ian Prestt
  Director General
  The Ledge
  Sandy, Bedfordshire SG19 2DL
  United Kingdom
  Tel: (44 767) 68 05 51
  Fax: (44 767) 69 23 65
  Telex: 82469 rsbp gb

Rutgers University Local Democracy in Poland

- interested in local government assistance and reform
- will not be soliciting proposals in 1994

- contact:
  Janna Regulska, Project Director
  Rutgers University
  172 College Avenue
  New Brunswick, NJ 08903
  Tel: (908) 932-8551
  Fax: (908) 932-1144

Rutgers University School of Planning and Public Policy
- scholarships may be available for studies in urban and regional planning, and environmental and public policy
- assistance for participation in workshops and conferences
- host of the Hubert Humphrey North-South Fellowship program
- sponsors conferences; provides information and expertise in project management, proposal development, conflict resolution and development of democratic process
- contact:
  Mark Lapping, Dean
  Lucy Stone Hall, B Wing
  Livingston Campus
  New Brunswick, NJ 08903
  Tel: (908) 932-5475
  Fax: (908) 932-2253

Sarah Scaife Foundation
- grants for "support of organizations involved in research, publications and education concerning major public policy issues"
- contact:
  Richard M. Larry, President
  Sarah Scaife Foundation
  Three Mellon Bank Center
  525 William Penn Place, Suite 3900
  Pittsburgh, PA 15219-1708
  Tel: (412) 392-2900

Schweizer Vogelschutz (SVS)/Swiss Association for the Protection of Birds
- protects birds and their habitats; supports Swiss cantonal organizations
- contact:
  M. Fritz Hirt, Président
  Postfach
  8036 Zurich
  Switzerland
  Tel: (41 1) 463 7271
  Fax: (41 1) 461 4778

Schweizerische Akademie der Naturwissenschaften (SANW)/Académie Suisse des Sciences Naturelles (ASSN)/Swiss Academy of Natural Sciences (SAS)

- promotes natural sciences and scientific research; public environmental education; and international cooperation
- interested in environmental policy; protection area management; and environmental advocacy
- contact:

  Dr. P. Schindler
  Secrétaire Général
  Bärenplatz 2
  3011 Berne
  Switzerland
  Tel: (41 31) 22 33 75
  Fax: (41 31) 21 32 91

Schweizerischer Bund für Naturschutz (SBN)/Ligue Suisse pour la Protection de la Nature (LSPN)/ Swiss League for the Protection of Nature

- protects and manages over 500 natural reserves
- interested in highland, alpine, wetland, lake, pond, river and stream ecosystems; protected area and forest management; and agricultural and pesticide policy
- conducts workshops, environmental education programs, camping trips and excursions
- contact:

  Monsieur le Secrétaire
  Case Postale
  4020 Bâle
  Switzerland
  Tel: (41 61) 312 7442
  Fax: (41 61) 312 7447

Slovenský Zväz Ochrancov Prírody a Krajiny (SZOPK)/Slovak Union of Nature and Landscape Conservationists

- union of conservation groups active in education and training; environmental impact assessments; protection of buildings, monuments and areas of natural beauty; human health and environment; waste disposal; and nuclear and energy issues
- contact:

  Dr. Jozef Gregor, Secretary General
  Gorkého 6
  81101 Bratislava
  The Republic of Slovakia
  Tel: (42 7) 50665
  Fax: (42 7) 50665

Société Française pour le droit de l'environnement (SFDE)/French Society for Environmental Law

- interested in the development, promotion, application and enforcement of international and national environmental law; conservation economics; development and planning; conservation ethics; international cooperation; conservation strategies; and environmental research

- contact:
  M. Gilles Martin, Président
  Université Robert Schuman
  Place d'Athènes
  F-67084 Strasbourg Cédex
  France
  Tel: (33 88) 41 42 57
  Fax: (33 88) 61 30 37

Société Nationale de Protection de la Nature/National Nature Protection Society
- interested in terrestrial and freshwater environments; wild and endangered flora and fauna; use of wildlife resources; resource protection; protected areas; and forests and forestry
- contact:
  M. Marc Gallois, Directeur
  57 rue Cuvier
  F-75231 Paris Cédex 05
  France
  Tel: (33 1) 47 07 31 95

Stichting Milieu - Educatie/Institute for Environmental Communication
- "a non-profit private institution specializing in environmental education and communication" (reference IUCN) with expertise in formal and informal education, communication and environmental management
- interested in education technology; teacher training, conservation education, and environmental education for youth; publicity; promotion of natural sciences; development of audiovisual materials
- provides workshops and conferences
- contact:
  Mr. Frits Hesselink, Managing Director
  FC Dondersstraat 17
  Postbus 13030
  3507 LA Utrecht
  The Netherlands
  Tel: (31 30) 71 37 34

Stichting Natuur en Milieu/Society for Environmental Conservation
- an association of local and provincial NGOS that influences political decision making
- supports education in areas of animal husbandry; fisheries and irrigation
- interested in atmosphere and climate; pollution control; hazardous substances; energy; acid rain; soil conservation; water resource management; environmental law and legal assistance; and international cooperation
- contact:
  Mr. P. Nijhoff, Director General
  Donkerstraat 17
  NL-3511 KB Utrecht
  The Netherlands
  Tel: (31 30) 33 13 28
  Fax: (31 30) 33 13 11

Stichting tot Internationale Natuurbescherming (van Tienhoven Stichting)/Netherlands Foundation for International Nature Protection

- interested in endangered animal species; wildlife trade; and international cooperation
- contact:

  Dr. P.J.H. van Bree, Honorary Secretary
  c/o Institute of Taxonomic Zoology
  Zoological Museum
  University van Amsterdam
  Mauritskade 61
  1092 AD Amsterdam
  The Netherlands
  Tel: (31 20) 525 5437
  Fax: (31 20) 525 7238

Svenska Naturskyddsföreningen/Swedish Society for the Conservation of Nature

- a citizen's association that informs, educates and encourages active participation in environmental protection
- acts as a consultant to governmental agencies
- interested in acid rain; water, soil, and atmospheric pollution; waste disposal and sources of pollution; resource management; sustainable development; and conservation strategies
- contact:

  Mr. Gunnar Landborn, Director
  P. O. Box 4625, Asögatan 115
  116 91 Stockholm
  Sweden
  Tel: (46 8) 702 6500
  Fax: (46 8) 702 0855

Television Trust for the Environment (TVE)

- seeks to advance the environmental education of the public worldwide through dissemination of knowledge and information on development, and the management and conservation of human and environmental resources of the world;
- interested in formal and informal education programs; production and use of audio visual materials, cinema and publicity; development of educational technology
- contact:

  Mr. Robert Lamb, Director
  46 Charlotte Street
  London W1P 1LX
  United Kingdom
  Tel: (44 71) 637 4602 extension 208
  Fax: (44 71) 580 7708
  Telex: 291721

Trans-European Mobility Scheme for University Studies (TEMPUS)

- funds urgent training needs
- provides financial support for joint European projects; travel grants for staff and students; and "complementary activities" (reference: Sally Mullard, Institute for European Environmental Policy)

- contact:
  EC Tempus Office
  14 rue Montoyer
  B-1040 Bussels
  Belgium
  Tel: (32-2) 504-0711

Türkiye Tabiatini Koruma Dernegi/Turkish Association for the Conservation of Nature and Natural Resources
- interested in forests and forestry; wetland and freshwater environments; wild flora and fauna; water and air pollution; and environmental education and training
- contact:
  Mr. Hasan Asmaz, President
  Menekse Skak 29/4
  Kizilay, Ankara
  Turkey
  Tel: (90 4) 425 1944
  Fax: (90 4) 417 9352

Vereniging tot Behoud van Natuurmonumenten in Nederland/Dutch Society for the Preservation of Nature Monuments
- interested in land use; protection of landscapes, monuments, buildings, archaeological sites, areas of natural beauty, and national parks;
- contact:
  The Director
  "Schaep en Burgh"
  Noordereinde 60
  1243JJ 's - Graveland
  The Netherlands
  Tel: (31 35) 62004
  Fax: (31 35) 63174

Vogelbescherming Nederland/Netherlands Society for the Protection of Birds
- activities concentrated in 5 European countries and Africa
- interested in marine birds, waterfowl, and migratory species; wetlands and freshwater ecology
- contact:
  The Director
  Driebergseweg 16C
  3708 JB Zeist
  The Netherlands
  Tel: (31 3404) 25406
  Fax: (31 3404) 18844

The World Conservation Union (IUCN)
- provides information and expertise on policy and environmental impacts of human activities
- assistance is project dependent

IUCN has offices in Hungary, the Czech and Slovak Republics, Poland and Russia

- contact:

  Zbigniew Karpowicz or Liz Hopkins
  Europe Programme
  Rue Mauverney 28
  CH-1196 Gland
  Switzerland
  Tel: (41-22) 999-0001
  Fax: (41-22) 999-0002
  Telex: 419624 iucn ch

World Wild Fund for Nature National Organizations in

- Denmark:

  Kim Carstensen
  3 F Ryesgade
  DK-2200 Copenhagen N
  Denmark
  Tel: (45 1) 35 36 36 35
  Telex: 4531392062

- Germany:

  Umweltstiftung
  Dr. Hartmut Junguis, Dir. of Conservation
  Hedderichstrasse 110
  P. O. Box 70 11 27
  6000 Frankfurt am Main 70
  Germany
  Tel: (49 69) 605 0030
  Fax: (49 69) 61 72 21

- Norway:

  Ms. Vera Selnes, Secretary General
  Post Box 6784
  St. Olavspl
  0130 Oslo 1
  Norway
  Tel: (47 2) 20 37 77
  Fax: (47 2) 20 06 66

- Switzerland:

  Directeur
  WWF-Schweiz
  Forrlibuckstrasse 66
  Postfach 749
  8037, Zurich
  Switzerland
  Tel: (41 1) 272 2044
  Fax: (41 1) 272 2844

France:

Association Française du Fonds
Mondial pour la Nature
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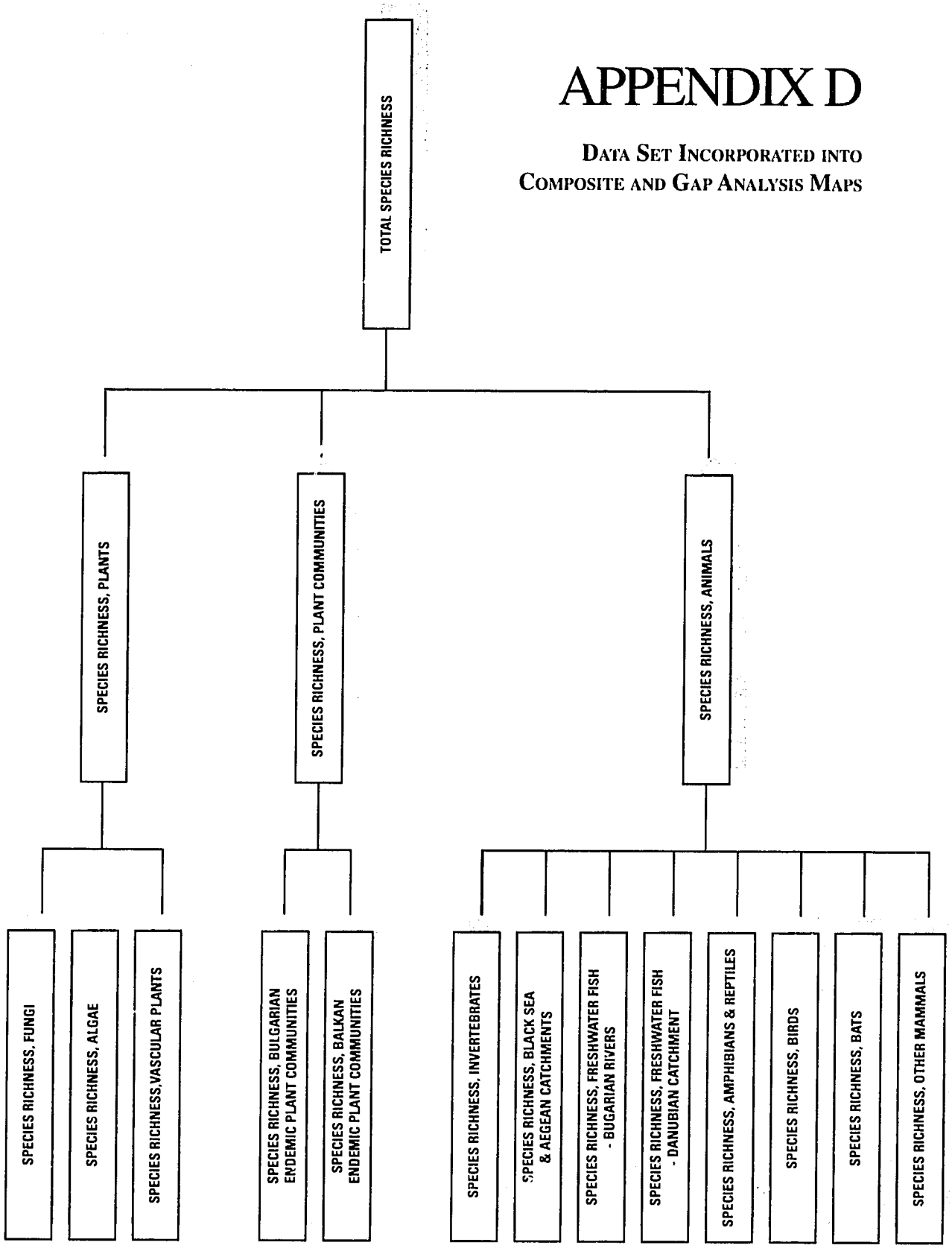
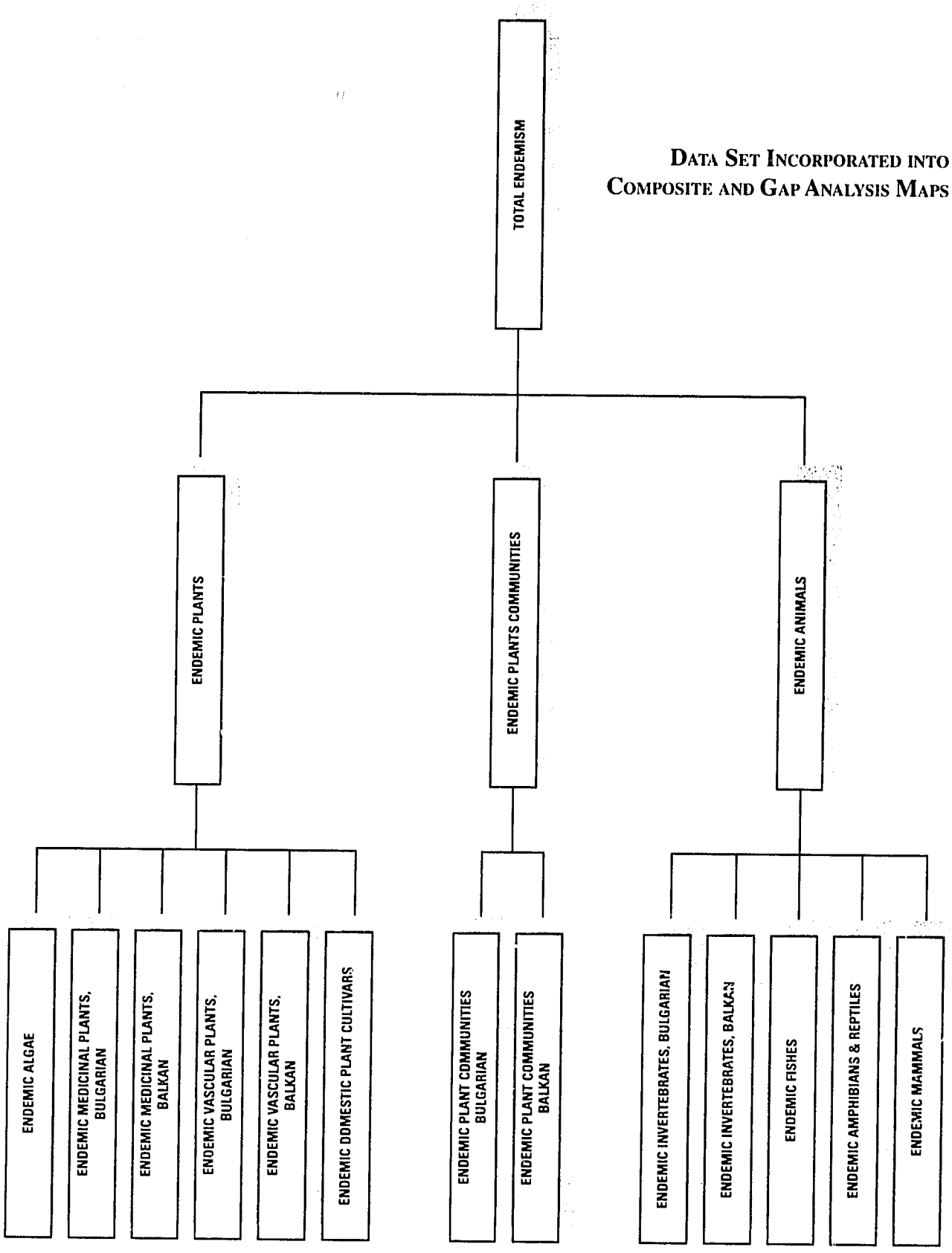
APPENDIX D

Data Set Incorporated into Composite and Gap Analysis Maps



Data Set Incorporated into Composite and Gap Analysis Maps



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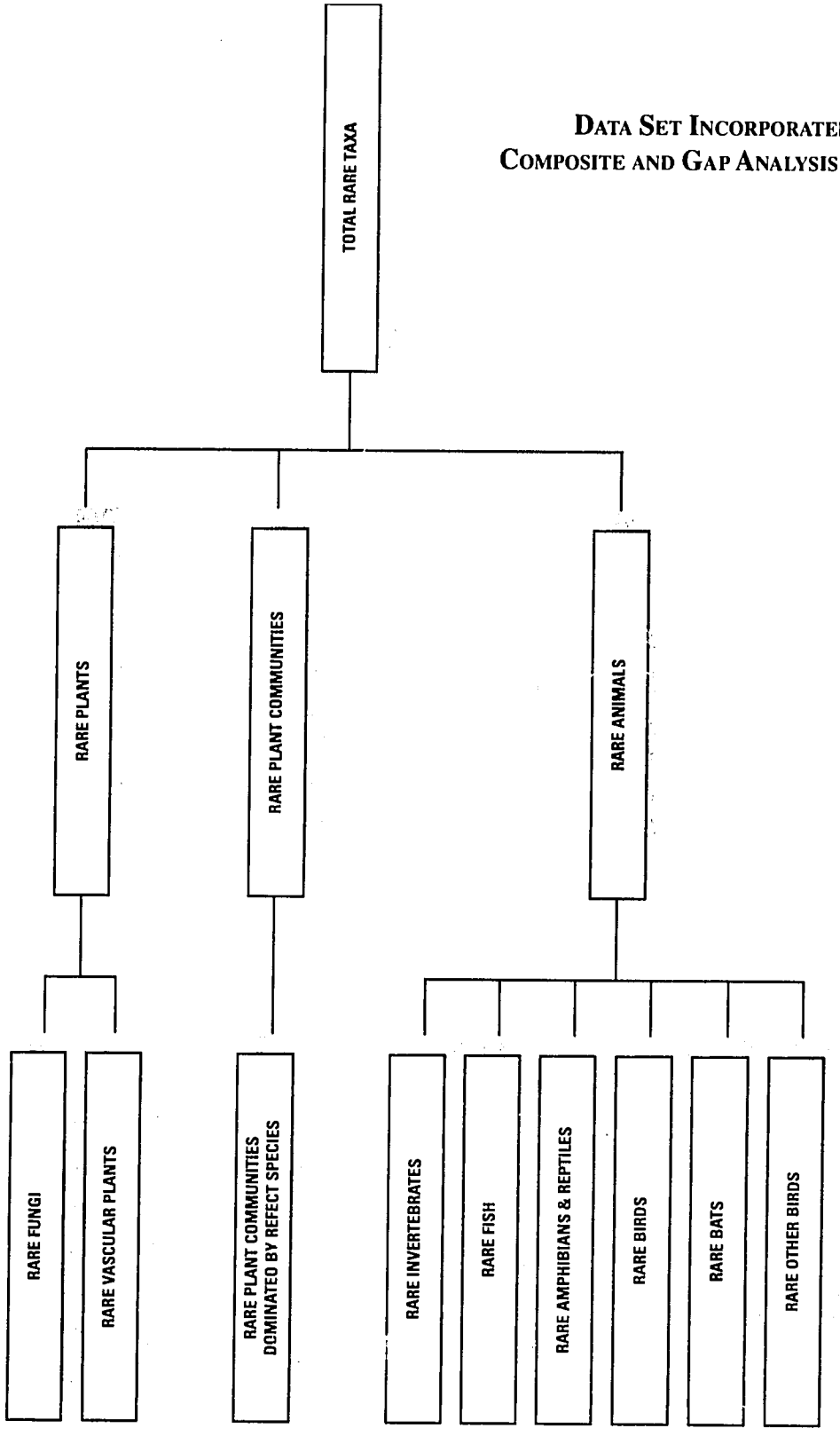

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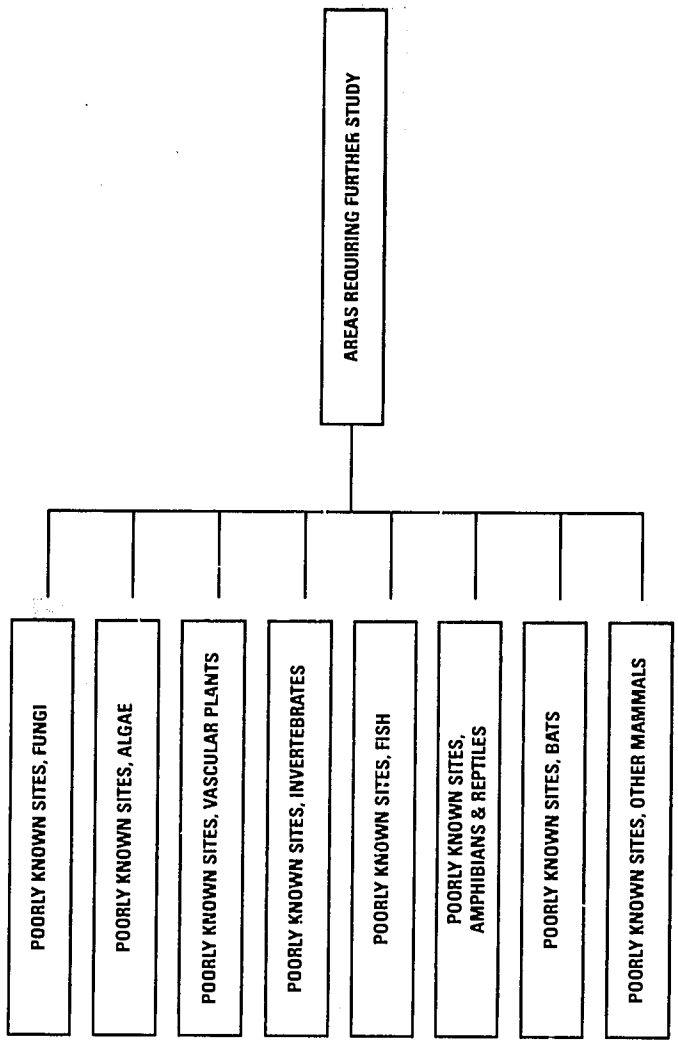

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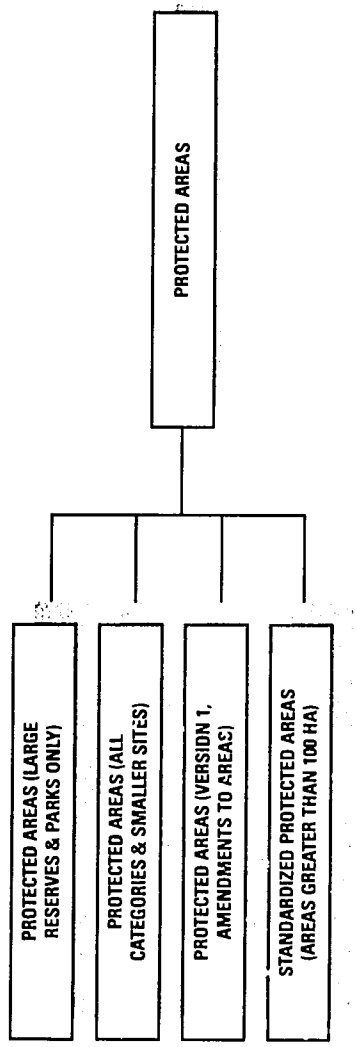

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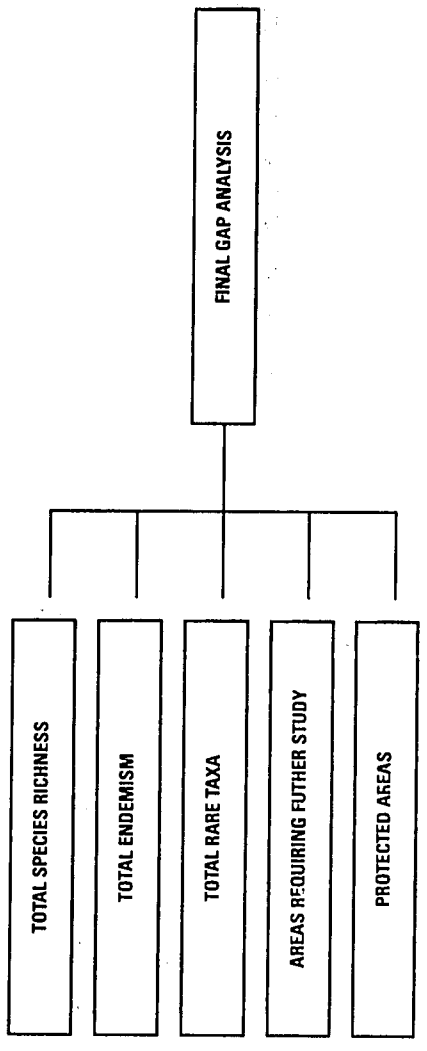

APPENDIX E

List of Acronyms

BAS	Bulgarian Academy of Sciences
BSP	Biodiversity Support Program
CITES	Convention on International Trade in Endangered Species
COF	Committee of Forests
ESRI	Environmental Systems Research Institute, Inc.
GIS	Geographical Information System
IUCN	World Conservation Union (formerly the International Union for the Conservation of Nature and Natural Resources)
LIC	Laboratory and Information Center of the Ministry of Environment
MAB	Man and Biosphere Program of the United Nations Educational, Scientific, and Cultural Organization
MOE	Ministry of Environment
NBDCS	National Biological Diversity Conservation Strategy
NGO	Nongovernmental organizations
NNPS	National Nature Protection Service of the Ministry of Environment
PHARE	European Community Poland and Hungary Action for Restructuring the Economy
RAMSAR	Convention on Wetlands of International Importance
USAID	United States Agency for International Development
USAID/ENI	United States Agency for International Development, Bureau for Europe and the New Independent States

APPENDIX F

GLOSSARY

ANTHROPOGENIC	Resulting from human activity.
BIOTA	All the organisms found in a given area.
BIOLOGICAL DIVERSITY	(Also biodiversity). The variety in life at all levels, but often described at three distinct levels: genetic, species, and ecosystem.
CONSERVATION BIOLOGY	An emerging interdisciplinary field that integrates ecology, genetics, resource management, anthropology and other fields in the effort to conserve biological diversity.
ECOSYSTEM	The organisms that comprise a community, along with their physical environment and the interactions that unite them into a functioning unit.
ECOTOURISM	Tourism that encourages visits to areas of natural beauty, or significant natural features for the purpose of enjoying and learning about the sites in a manner that does not cause a negative impact.
ENDEMIC	Native to or found only in a specific geographic area.
EXOTIC SPECIES	Species found in a given area as a result of purposeful or incidental introduction by people.
EX SITU CONSERVATION	Removed from the natural habitat or location; most often referring to species or individual organisms propagated and cultivated or bred and raised in a man-made environment, separated from their natural habitat or function.
GAP ANALYSIS	A method for reviewing the effectiveness of protected areas within a given region by identifying important species and habitats not yet represented.
IN SITU CONSERVATION	Protected and managed in the natural habitat of the species or individual organism.

Landscape Ecology	The application of ecology and natural resource management at scales larger than the individual species or habitat, especially through an understanding of interrelationships within broader areas of land that share environmental, geological, climatic and ecological features.
Perverse Incentives	As applied to conservation, those legal and economic policy elements that encourage behaviors and activities counter-productive to the conservation of biological diversity and natural resources.
Restoration Ecology	The discipline that seeks to reestablish natural ecosystems, floral and faunal communities, and ecological processes in degraded areas.
Sustainable Agriculture	Practices for producing adequate food and fiber crops for individual and commercial consumption that, at the same time, conserve top soil, soil moisture and nutrients, minimize the use of pesticides or artificial fertilizers, and do not require expansion onto fragile lands or habitat critical for the conservation of biological diversity.