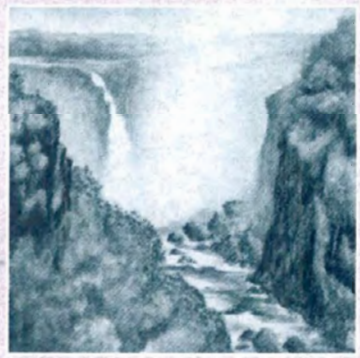
CONSERVING TROPICAL FORESTS AND BIOLOGICAL DIVERSITY

1988–1989 Report to Congress on the USAID Program



U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT, WASHINGTON, D.C. 20523

FOREWORD

I am pleased to provide this report by the United States Agency for International Development (USAID), entitled "Conserving Tropical Forests and Biological Diversity." Scientific analysis and public opinion are increasingly recognizing that deforestation and loss of biological diversity are critical constraints affecting sustained productivity and economic growth in developing countries. The prospects of global climate change and other environmental changes reflecting natural resource degradation are providing the stimulus for worldwide consensus that effective action must be taken to slow these disturbing trends. USAID's program for 1988–1989 and beyond is based on a firm commitment to achieve sustainable economic growth and to maintain and enhance the natural resource base.

Dealing with the causes of natural resource deterioration requires a dual approach. Conservation measures and projects to improve the economic and social prospects of local people must be reinforced by efforts to reform and improve broader policies, market structures, and incentives that presently encourage economically unsound and unsustainable resource exploitation.

USAID has continued to make progress toward integrating tropical forestry, biological diversity, and other natural resource concerns into the mainstream of its economic development agenda. Major factors in the prescription for success include efforts to provide food, fodder, firewood, increased income, and wider economic opportunities, augmented by environmental education programs, within and surrounding parks and reserves. Conservation is now increasingly being integrated into project activities, as is local participation in identifying effective solutions to development and environmental problems.

Partnerships with conservation organizations with whom USAID shares common objectives in improving resource management are more important than ever to maintain and expand progress in meeting conservation needs. Especially noteworthy in this regard was the signing and implementation during 1988–1989 of a new agreement with a consortium of conservation organizations composed of the World Wildlife Fund , the World Resources Institute, and The Nature Conservancy which will collaborate with local institutions to carry out a worldwide conservation of biological diversity program in USAID-assisted countries.

This report to Congress, covering fiscal years 1988 and 1989, differs from previous reports. By citing selected projects, it presents some of our solid accomplishments in the conservation of tropical forests and biological diversity. These projects show the varied approaches taken by USAID and their on-the-ground impact.

Some of the projects have tested innovative approaches to sustainable resource management. Others have built upon earlier program initiatives. Several have become models for other donors, and many demonstrate the crucial relationship between economic growth and development and sound natural resource management.

As USAID continues to mobilize its long-standing development experience to deal with conservation needs, the continued staunch leadership and commitment of both the Congress and the American people will be essential to sustain our efforts.

Sincerely,

Mark L. Edelman

Mark L. Edelman
Acting Administrator
U.S. Agency for International Development

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OVERVIEW

The health of the earth's environment, so dependent on its tropical forests teeming with diverse species, cannot be separated from the human needs and economic aspirations that drive the development process. The challenge to the United States Agency for International Development (USAID) is to work with the developing countries to ensure that the biological riches of tropical forests and other ecosystems are sustained in the process of economic growth.

Since the turn of the century, more than one-half of the world's tropical forests have been lost. More than 11 million hectares of tropical forest are cleared each year, and much larger areas are degraded.

Although most of the disappearing tropical forests belong to the developing world, the consequences of these actions threaten the future of both developed and developing nations alike.

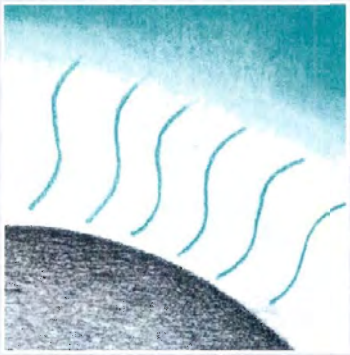
Since tropical forests store carbon, the loss of forests can increase the carbon dioxide in the atmosphere. There is growing scientific concern that the burning of tropical forests contributes significantly to the total release of carbon dioxide to the atmosphere. Increased carbon dioxide in the atmosphere is believed to contribute to global climate change, and such climate changes could have negative consequences for much of the world's population.

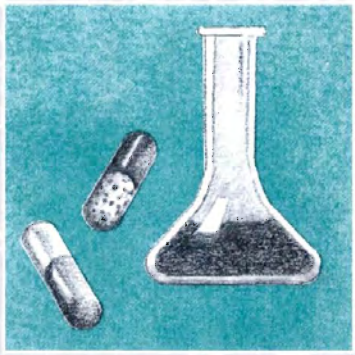
The loss of tropical forests also threatens the very ability of the land to maintain life. It results in soil erosion, flooding, and often leads to unsustainable agricultural practices. Severe forest loss has already affected more than one billion of the world's people, and land degradation has diminished their capacity to produce food.

Tropical forests provide habitats for more than half of the world's plant and animal species. By the year 2000, at current rates of deforestation, nearly five to ten percent of plant and animal species will become extinct. Most of these species will vanish without even having been discovered or classified. The present species extinction rate has not been matched since the dinosaurs died.

Biological diversity—the wealth of life on earth including the millions of plants, animals, and microorganisms as well as the genetic information they contain and the ecosystems that they create—is the net result of millions of years of evolution. Its loss has profound consequences for economic growth and the quality of life.

The destruction of biological diversity severely limits the future. When natural systems are disrupted, so is the role they play maintaining the normal ecological and hydrological functions. The loss of species could reduce the availability of natural products used as raw materials for manufacturing and industry, including marketable goods such as dyes and fibers. It could rob the medical profession of many lifesaving drugs that come





from plants. Almost half of all prescription drugs in industrialized nations, for example, were derived or synthesized from natural sources. Yet only 5000 of the 250,000 flowering plants in the world—barely 2 percent—have been analyzed for medicinal purposes. And some 25,000 species of plants—or about five species a day—are expected to disappear before the end of the century.

These losses also will diminish the future availability of new genetic resources and wild germplasm essential for breeding crop varieties with higher productivity and with greater resistance to insects, diseases, and adverse climatic conditions. Some 85 percent of food is derived from just 20 kinds of plants—two-thirds from corn, wheat, and rice. Yet, there are at least 75,000 edible plants in existence, and many may have characteristics superior to currently used plants.

Deforestation is often associated with images of farmers slashing and burning forests to gain additional land for agriculture, yet their yields and income decrease in a degraded environment. Cutting for fuelwood and commercial exploitation of timber also eat away at the forests. But the many causes of deforestation vary. Forests and other natural resources are often undervalued in domestic and international markets due to economic distortions. Government policies and incentives may wrongly encourage exploitation of forests that is unsound economically and unsustainable. Poverty and population factors contribute to the losses. So do the lack of good information about the extent and economic value of resources, the lack of institutional capacity and human resource skills, the lack of local participation in planning, the power of special interests, the question of tenure rights, and the lack of economically viable alternative technologies to the unsustainable, short-term uses of forest and other resources.

The world is now realizing that new approaches to the management of natural resources are essential. USAID has been a leader among international donor agencies in responding to the need to conserve tropical forests and biological diversity.

This report to Congress, covering fiscal years 1988 and 1989, differs from previous reports. Through the presentation of actual projects, it emphasizes accomplishments of the U.S. foreign assistance program in the conservation of tropical forests and biological diversity. These projects show the varied approaches taken by USAID and their on-the-ground impact.

Some projects presented in this report have tested innovative approaches to sustainable resource management. Others have built upon earlier program initiatives. Many projects have become models for other donors. The majority demonstrate the crucial relationship between economic development and sound natural resource management.

The need to protect tropical forests and other natural habitats while simultaneously providing livelihoods for local people is reflected in the Wildlands and Human Needs Project, carried out by the World Wildlife Fund in Latin America and Africa.

The Central Selva Project in Peru demonstrates the benefits of a natural forest management model based on local resource ownership.

The Honduras Forestry Development Project shows how policy reform and the strengthening of institutions can work toward sustainable forest management.

The project on reforestation in Guatemala shows how private industry, environmental groups, private voluntary organizations and government agencies, including the Peace Corps, can work together.

Clearly, USAID is not alone among government agencies in its efforts to promote the conservation of tropical forests and biological diversity. The Agency works in close collaboration with the Peace Corps, the Forest Service of the U.S. Department of Agriculture, and other agencies. USAID has found partners such as World Wildlife Fund, The Nature Conservancy, and the World Resources Institute in the environmental community. The far-reaching potential of this type of collaboration is illustrated by the description of the Cooperative Agreement for the Conservation of Biological Diversity.

Cooperation extends to other donors as well. USAID has recently joined with the World Bank, other international agencies, and the government of Madagascar to develop an Environmental Action Plan for Madagascar, a country where the conservation of unique biological resources constitutes an international priority. A multi-donor follow-up project developed by the Bank will be implemented

next year with a significant component from USAID.

USAID has continued to work with the Tropical Forest Action Plan (TFAP) developed by the United Nations Food and Agriculture Organization (FAO), the United Nations Development Program (UNDP), bilateral and multilateral development agencies, non-governmental organizations, and representatives from the countries which house most of the world's tropical forests.

Still in its early stages, the TFAP has led to some increases in forestry assistance and is viewed by many donors and recipients as the primary mechanism for donor coordination in forestry. In July 1989, at the fifteenth Economic Summit, the heads of state of the several major industrialized nations recognized the urgent need to safeguard the environment and called for the adoption of sustainable forest management practices. Specifically, strong support was given to the "rapid implementation of the TFAP."

USAID has also looked inward, in an effort to strengthen its own commitment to conservation of tropical forests and biological diversity. In April 1988, USAID issued a policy paper on environment and natural resources which stated that conservation of tropical forests and biological diversity can be most effectively addressed by their integration into the Agency's overall development effort. In addition, a strategy aimed specifically at priorities for the conservation of biological diversity is being developed.

Regional bureaus concentrated their own efforts for tropical forestry and biological diversity with thorough strategies. *Environmental and Natural Resource Management in Central America: A Strategy for AID Assistance,* for example, was issued by the Bureau for Latin America and the Caribbean in FY 1989. As a result, the Bureau has initiated in late FY 1989 a ten-year, $46 million Regional Natural Resources Management Project that responds to the issues raised in the strategy. It will include a significant component on biological diversity.

The Bureau for Asia and the Near East is completing a regional natural resource strategy that will identify program priorities early in FY 1990.

The Bureau for Africa's 1987 *Plan for Supporting Natural Resource Management in Sub Saharan Africa* incorporates a biological diversity strategy focused on Madagascar and Africa's tropical highlands, including the Afromontane forests of Uganda, Rwanda, Burundi, and Zaire.

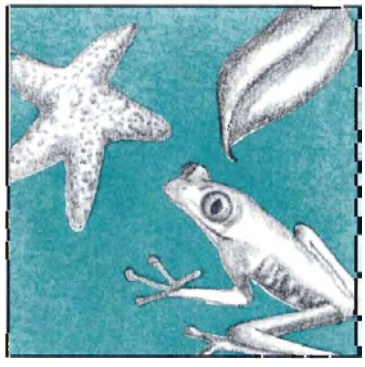
FUNDING LEVELS

Including these initiatives, USAID supported 145 active and planned projects during FY 1988, and 171 active and planned projects during FY 1989 that dealt with tropical forests. By the end of FY 1989, 23 tropical forestry projects were in the planning stage, ready to start in the next two years. Estimated total obligations for tropical forestry activities exceeded $50 million in FY 1988, and $76 million in FY 1989. The fiscal data cited here is obtained primarily from USAID's recently revised project activity classification system.

The total number of projects active and planned in FY 1989 increased from FY 1988 and previous years, and more of the planned 1989 forestry projects were concerned with biological diversity than ever before.

Funding levels for biological diversity are based primarily on the definition in Section 119 of the Foreign Assistance Act. This definition includes: 1) protecting and maintaining wildlife habitats, and developing sound wildlife management and plant conservation programs; 2) establishing and maintaining wildlife sanctuaries, reserves, and parks; 3) identifying, studying, and cataloging animal and plant species; and 4) assisting countries to enact and enforce anti-poaching measures. Other development project activities contributing directly to biological diversity objectives have also been included in the figures for biological diversity. These efforts include environmental education, agroforestry for sustainable agriculture in buffer zones around parks and preserves, as well as the strengthening of legislation, policies, and institutions to advance these objectives. Since many tropical forest projects are also helpful in preserving biological diversity, there is some overlap in the reported funding, reflecting, in part, increased attention to the needs of local people in buffer zones surrounding forested parks, reserves, and other protected areas.

USAID funding for biological diversity in FY 1988 exceeded $12 million with 43 active projects and 21 in the planning stage. Funding levels in FY 1989 exceeded $17 million with 59 active projects and



another 29 being planned. During FY 1988, 25 forestry projects contained biological diversity conservation activities (with a $2.3 million funding overlap reported) from a total of 90 active forestry projects that received funding that year.

In FY 1989, 31 forestry projects among a total of 112 active projects that received funding that year contained biological diversity activities (with a $5.1 million overlap in reported funding).

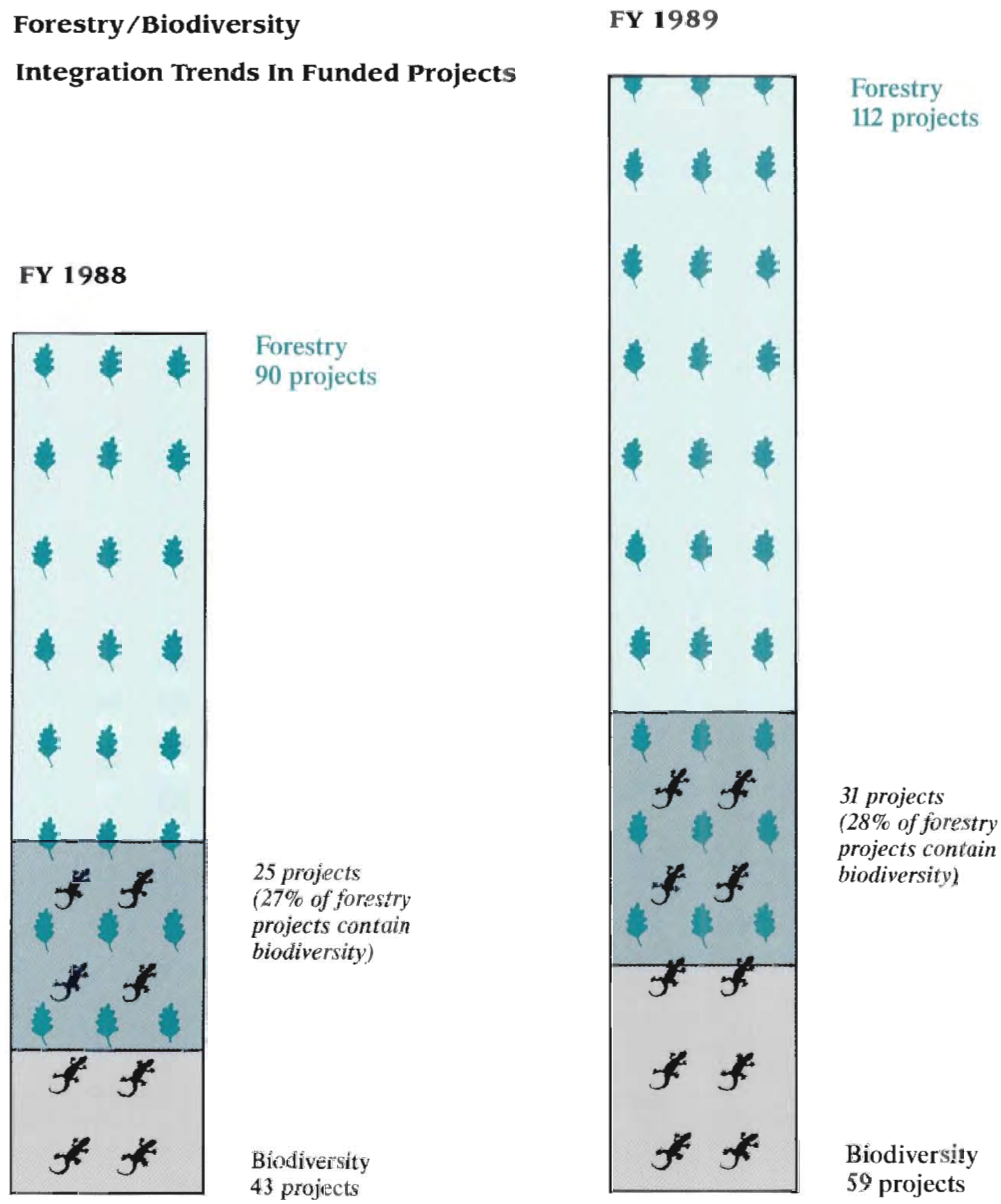
(millions of dollars)

	FY 1988	FY 1989
Tropical Forest (TF) Conservation	$50.2	$76.8
TF/BD Overlap	($2.3)	($5.1)
Biological Diversity (BD) Conservation	$12.3	$17.9
Annual Totals	$60.2	$89.6

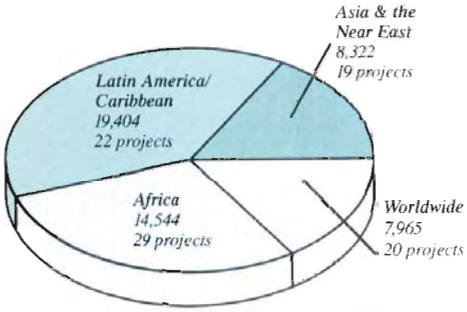
The emphasis on conserving biological diversity throughout Agency development projects is increasing rapidly, and a growing percentage of planned tropical forestry development projects include habitat protection and wildlife conservation.

This report presents some key projects, along with an overview of the program for each regional bureau and for the centrally funded programs as well.

Forestry/Biodiversity Integration Trends In Funded Projects

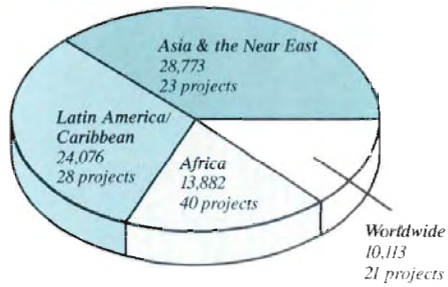


Active Forestry Projects with FY 1988 Obligations



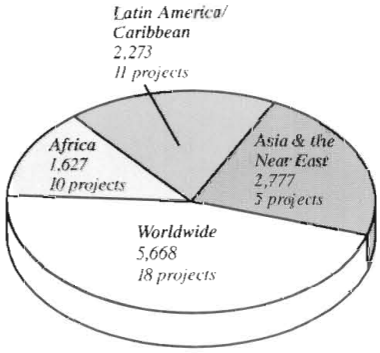
FY 88 TOTALS: $50,235 90 PROJECTS

Active Forestry Projects with FY 1989 Obligations



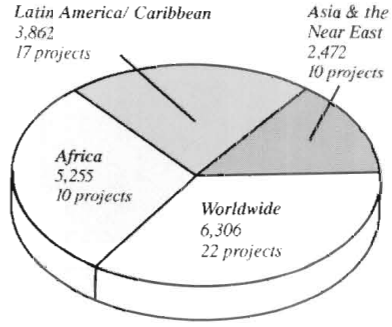
FY 89 TOTALS: $76,844 112 PROJECTS

Active Biodiversity Projects with FY 1988 Obligations



FY 1988 TOTALS: $12,345 44 PROJECTS

Active Biodiversity Projects with FY 1989 Obligations



FY 1989 TOTALS: $17,895 59 PROJECTS

Distribution by Region
($000's)

Pie slices based upon funding obligations, NOT number of projects.

118/119 ASSESSMENTS SUMMARY

Congress first amended the Foreign Assistance Act (FAA) in 1983 to direct USAID to address the conservation of biological diversity and tropical forests. Section 118 addresses public concerns about the accelerating human impacts on tropical forests and authorizes USAID to increase its tropical forest development and conservation activities. Section 119, most recently amended in October 1986, authorizes USAID to include the conservation of biological diversity as a priority development goal. USAID is instructed to work with host country governments to promote conservation through:

- establishment and maintenance of national parks and other protected areas;
- development of sound plant and wildlife management programs;
- identification, inventory, and study of wild species; and
- development of anti-poaching measures and other legislation to protect biological diversity.

Each USAID mission is now required by Congress to include in its country or regional development strategy an assessment of the biological diversity and

tropical forest resources in that country (or region). The analysis will include first, the actions necessary to conserve biological diversity in that country, and second, the extent to which the actions proposed for support by USAID meet identified needs.

During FY 1988 and 1989, USAID significantly expanded the scope of its work in meeting the goals set forth in Sections 118 and 119 of the Foreign Assistance Act of 1961 (as amended).

By the end of 1989, more than 45 USAID country missions and sub-regional field offices were working on, or had completed, background assessments of conservation needs in biological diversity and tropical forests.

In Latin America and the Caribbean region, all nineteen USAID developing and advanced developing country offices have now completed conservation needs assessments. The assessment for Ecuador, for example, completed in January 1989, found that although conservation of Ecuador's tropical forests is among the top priorities for biological diversity, the deforestation rate in the country (put at 2.3 percent per year) could result in a loss of 340,000 hectares annually. Ecuador's deforestation rate exceeds that of neighboring Colombia (1.7 percent) and Peru (0.4 percent).

The assessment noted that few remaining pockets of primary forest remain in the western part of the country, and the Amazon forests are under increased pressure from logging, agroindustry, cattle grazing, and subsistence farming. Several recommendations were made. One was to concentrate on specific conservation efforts of sites critical for biological diversity, such as the Awa Forest reserve—the largest tract of primary rain forest remaining in western Ecuador. Another was to provide assistance to the government for policies that enhance long-term conservation efforts, such as the reform of resettlement, colonization, and land-titling legislation which has encouraged deforestation. It also recommended continued coordination between agriculture and forestry projects to enhance biological diversity conservation by promoting land use planning, environmental education, and support for basic research as well as inventory of biological resources and management systems.

Thirteen tropical forestry and biological diversity assessments have been completed so far in Africa. The assessment for Mali was the first written for that country, where at least 80 percent of the population depends on vegetation and wildlife resources for food security and income. The assessment noted that, without significant financial aid by donors, and political changes by the government, there will be no significant large mammal populations left in the country within five to 10 years.

The assessment recommended upgrading the Gourma, which supports the last Sahelian and Malian herd of elephants as well as a variety of threatened antelopes, to a national park and creation of a Bafing/Falema area national park to protect chimpanzee and Derby's eland as well as bird nesting areas in the inner delta.

Since widespread poaching and illegal trade in endangered species is a significant threat to Mali's biological diversity, revisions to the hunting code, support for antipoaching measures, and the establishment of a revolving fund to stabilize pay for agents charged with environmental protection were all recommended.

In the Asia and Near East region, 13 assessments of conservation needs have been completed. The Tunisia assessment, for example, found a drastic decline in fauna in the past century, noting that almost all large mammals in the smallest of the Maghreb nations are currently threatened. Lake Ichkeul, the most important single wetland for birds in North Africa, is threatened not only by cattle overgrazing, but recently by a series of six dams being constructed on all five of the main rivers flowing into the lake. The reduction of freshwater flowing into the lake in Ichkeul National Park, and increasing salinity levels, will have serious ramifications for many bird species.

The assessment recommended increased protection for a number of areas including Ichkeul. It also suggested that a base for floral protection be developed, which includes an inventory of the national flora and the development of a national herbarium.

CENTRALLY FUNDED PROGRAMS

Several projects managed from Washington provide technical leadership and assistance in the area of natural resources management to USAID field missions.

Among these are the Forest Resources Management Project, which provides funding for the Forestry Support Program (FSP) and a joint project initiative with the Peace Corps.

The $40 million Forestry/Fuelwood Research and Development Project supports collaborative research networks in Asia and Africa with the International Council for Research in Agroforestry (ICRAF). This effort is aimed at developing and improving multipurpose tree species and encouraging their socio-economic acceptance over a 10-year project life.

The Bureau for Science and Technology's Environmental Planning and Management Project (EPM) was initiated in 1982 to strengthen the capabilities of developing country institutions to manage their natural resources for sustainable development. It was recently extended until 1992. The project, implemented largely through the Center for International Development and Environment of the World Resources Institute, enables countries to develop resource assessments and management strategies, including their own environmental profiles. It also helps strengthen the organizational and management skills of local environmental organizations.

The Development Strategies for Fragile Lands (DESFIL) Project was initiated in 1986 to improve national, regional, and international strategies for fragile land management and is jointly managed by the Bureaus for Science and Technology and Latin America and the Caribbean. A donors' conference on Fragile Land Development and Conservation in Latin America and the Caribbean, arranged by the project in late 1989, led to the development of a multicountry consultative group on fragile lands.

In FY 1989, the Bureau for Science and Technology's Office of Agriculture obtained $300,000 in support from USAID's Biodiversity Working Group (BDWG) reserve fund to implement three projects designed to manage, conserve, and use genetic diversity in crops and fish.

These projects include:

- the Diversity of Crop Genetic Resources in the Sumaco Reserve of Ecuador, conducted by the Plant Exploration Office of The Nature Conservancy. This project will survey protected genetic resources of crop plants and their wild relatives, then formulate recommendations for *in-situ* management. Crop germplasm with potential economic value, especially of under-exploited plant species found in the tropical forests, is critical to agricultural improvement;
- the Biodiversity Assessment in the Philippines' Coastal Marine and Coral Communities, conducted by the University of Rhode Island and the University of the Philippines-Visayas. With special emphasis on destructive fishing methods, this project will test new methods for assessing changes in species diversity in coral reef communities affected by blast-fishing. It will increase the protection and use of aquatic genetic resources, which are valuable natural resources for improving fisheries;
- the Ecology, Management and Conservation of Native Fruits in West Kalimantan, Indonesia, conducted by the New York Botanical Garden and the Indonesian Academy of Science. This project will identify economically-promising cultivated fruits and evaluate sustainable tropical forest management practices.

The Access to Land, Water, and Natural Resources Project of the Bureau for Science and Technology's Office of Rural Development has stimulated policy dialogue on land tenure-related issues affecting natural resource management. In the last two years, studies conducted by the University of Wisconsin's Land Tenure Center have resulted in a USAID mission-funded pilot project in Mali to test the impact that changes in the country's forest code would have as incentives for improved management. In Uganda, a study of social and economic issues related to land tenure, including the causes of human encroachment on protected areas, became the basis for a land tenure workshop attended by the Prime Minister and other high level officials in May 1989.

A grant from the Bureau for Program and Policy Coordination (PPC) to the International Union for Conservation of Nature and Natural Resources (IUCN) is assisting senior Thai government officials to apply economic incentives for biological resource conservation. This project is based on the IUCN study *Economics and Biological Diversity,* funded by PPC, which includes recommendations for incentives and disincentives at local, regional, and national levels. As a follow-up, the

London Environmental Economics Center is preparing an overview of literature and programs in the field of economics and the environment.

Another effort supported by PPC is the preparation of a draft text for an international convention on biological diversity. The draft is being prepared by the IUCN Law Center in collaboration with the Natural Resources Defense Council and is expected to be adopted by a United Nations Environment Program working group as the basis for negotiating such a convention.

A cooperative agreement to enable USAID to benefit from the broad range of expertise in the U.S. conservation community on the means of promoting sustainable development through better use of biological resources was signed with the World Wildlife Fund (WWF) in October 1988.

As part of this agreement, a ten-year Conservation of Biological Diversity Project is being implemented by WWF as a joint venture with two other U.S. conservation groups—The Nature Conservancy and the World Resources Institute's Center for International Development and Environment. The project will improve the capabilities of non-governmental and governmental organizations in USAID-assisted countries to resolve resource problems and create new opportunities for biological conservation.

The agreement provides technical assistance to establish national and local conservation strategies, define priorities, design conservation activities, and prepare national assessments of biological diversity. A small grants program is being set up to support key research on questions such as the effectiveness of buffer zones in insuring the integrity of protected areas, and on the economic cost-benefit analysis of conservation investments. The agreement also includes training in local resource management skills, a conservation information and evaluation network, and pilot field demonstrations of innovative approaches to biological diversity conservation.

The agreement enables USAID missions and bureaus to join the project, thus providing easy access to the expertise of the implementing organizations as well as the broader U.S. conservation community. Potential contributions from USAID overseas missions, regional bureaus, and other entities could increase funding of the project to $28.4 million over the next 10 years.

In the first six months of the Conservation of Biological Diversity Project, over $1.3 million in biological diversity activities has been launched. These include projects to develop a regional Pacific conservation data center based in Fiji, a national biological diversity assessment for Pakistan, an environmental profile for Oman, a national institute for conservation training in Nepal, and eleven programs in Thailand ranging from buffer zone development to a botanical research needs assessment. In southeastern Madagascar, a program to encourage the integration of community development activities into the consolidation of the Andohahela natural reserve is part of Africa's first debt-for-nature agreement. (See box on Debt-for-Nature Swaps.)

The Cooperative Agreement represents a long-term investment by USAID in its partnership with the conservation community, as part of the effort to conserve biological diversity in developing countries by finding viable development alternatives that provide direct social and economic benefits to local people.

CONSULTATIVE GROUP ON BIOLOGICAL DIVERSITY

USAID helped to form the Consultative Group on Biological Diversity (CGBD) in 1987. The CGBD is a consortium of private U.S. foundations interested in the conservation of biological diversity, particularly in developing countries. The group seeks to expand interest in biological conservation, increase funding, and improve the quality of grant-making in this area. Consultative Group membership has grown from nine foundations in FY 1987 to 30 by FY 1989.

In FY 1988, the CGBD emphasized the building of institutions for biological diversity conservation and science in the Neotropics, and the economics of maintaining biological diversity. Grants totalling over $800,000 have been made to organizations working in Indonesia on biological diversity conservation.

In June 1989, CGBD established six program priorities: promoting appropriate economic policies and natural resource accounting; reconciling resource management strategies with both short-term and long-term human needs; building the institutions and human resources for development; exploring the potential for collaborative undertakings with Japanese foundations and non-governmental organizations; and focusing on marine biological diversity and crop germplasm. The first of several workshops focusing on these topics ("priorities for resource and environmental economics") took place in March 1989.

It is estimated that U.S. foundation funding for international biological diversity conservation has now reached an annual level of between $15 and $20 million.

DEBT-FOR-NATURE SWAPS

In response to the mounting debt crisis facing many developing countries, USAID announced a Debt-for-Development initiative in May 1988. This new mechanism enables USAID to leverage additional fiscal resources for its development assistance efforts including conservation.

USAID supports the purchase—normally through private non-governmental organizations—of discounted debt owed by developing countries to foreign commercial banks. Prior to the purchase, the debtor governments and private non-governmental organizations work out arrangements to convert the debt to local currency that will be invested in designated projects.

In June 1988, a debt-for-nature agreement was signed by the World Wildlife Fund, the Philippine Department of Environment and Natural Resources, and the Haribon Foundation (a Philippine non-governmental organization) to exchange up to $2 million of debt into pesos. USAID provided $45,000 through its cooperative agreement with WWF to be used for the debt swap. WWF allocated $150,000 for the swap. With a total of $195,000, WWF purchased a first tranche of $390,000 (face value) of Philippine debt at about 50 cents on the dollar.

Proceeds in pesos from the initial exchange of 1988 debt will be used to fund several conservation activities, including the protective management of two parks on the remote island of Palawan. St. Paul Subterranean River National Park contains mountain forests, coastlines, and a navigable river that runs for five miles through caverns. The other park, El Nido National Marine Park, encompasses the reefs and seagrass surrounding small, rugged islands. Endangered species such as marine turtles and dugongs swim through this park.

The projects funded by this debt swap include management plans, buffer zones, and infrastructure for the park. They will also support research and environmental education, help the government crack down on illegal trading and exploitation of wildlife resources, and finalize a plan for an integrated system of protected areas.

In August 1989, USAID announced a $1 million grant to WWF to support a major debt-for-nature swap in Madagascar. This commitment helps WWF to acquire up to $2.1 million of Madagascar's commercial debt. The debt swap will produce local currency to support conservation, education, and sustainable development activities concentrating on the Andringitra and Marojejy reserves, and to protect six parks by training, equipping, and supporting a minimum of 400 park rangers.

Another such effort is the Wildlands and Human Needs Program (WHNP) with the World Wildlife Fund, initiated in 1985 with a three-year $350,000 a year matching grant from USAID's Office of Private and Voluntary Cooperation. This program was the first joint venture between a development agency and a conservation organization to integrate natural resource management with grassroots economic development. In FY 1988, an additional five-year matching grant of $1.75 million was provided to support eight long-term model projects in Mexico, Costa Rica, Dominica, St. Lucia, Peru, Cameroon, Central African Republic, and Zambia.

These projects link natural resource management and human development needs in a variety of ways: income generation, land titling, better access, and management of wildland resources by small-scale community development efforts. The projects also strengthen community conservation organizations and environmental education efforts. WWF has developed other innovative programs based on the WHNP model. Some of these, such as the Annapurna Conservation Area Project in Nepal and the Khoa Yai National Park in Thailand, were recently funded by USAID missions in those countries.

The centrally funded model projects include:

MEXICO:
Sian Ka'an Biosphere Reserve

In Mexico's 1.2 million acre Sian Ka'an reserve, a buffer zone management project includes an income-producing lobster fishery now being studied in order to enhance productivity and sustainability, a horticulture project to stabilize migrating agriculturalists, and a harvesting program to alleviate pressure on several valuable palm species.

Amigos de Sian Ka'an, a local environmental organization, receives support to strengthen its education and extension programs. The group manages the operational plan for the reserve and publishes educational materials. About 20 percent of the residents of Sian Ka'an work on WHNP-related projects in the reserve.

ST. LUCIA:
Coast Resources Management

In St. Lucia, coastal fisheries, mariculture development, and mangrove conservation through tree planting are helping to raise local incomes in a community on

the island's southeast coast. Through the Eastern Caribbean Natural Areas Management Program (ECNAMP), fuelwood plantations are being developed to relieve stress on a threatened mangrove area used by small-scale charcoal producers. The fuelwood project is based on previous work with local fishermen, who became resource managers and helped develop a sustainable management strategy for fisheries around the Maria Islands Nature Reserve.

DOMINICA:
Cottage Forestry Project

Coordinated by ECNAMP, this project focuses on cottage forestry and incorporates a private sector approach to conservation and development. A labor-intensive, small-scale business approach to forest utilization is expected to reduce high-volume logging, streamline the use of harvested wood by furniture and craftmakers, and promote reforestation. The results should increase employment and income in rural communities, while reducing the waste of forest resources.

COSTA RICA: ***Gandoca Land Titling and Wildlife Refuge***

Legal assistance to help local farmers obtain land titles is part of an integrated program of nurseries, agricultural diversification, and local management of a wildlife refuge. The project encompasses a wild strip of Caribbean beach (including almost all the coral reefs outside the Cahuita National Park), lowland primary rainforest, and an important wetland area. The result of road building in this region was an influx of subsistence farmers and commercial logging operations. Forests are cleared for agriculture in order to demonstrate ownership of untitled land; according to Costa Rican law, land not titled must be "improved" or "deforested" to show ownership.

The New Alchemy Institute (ANAI), a private Costa Rican non-profit association, is working to secure land titles for long-term residents to test the premise that land titling of small farming plots will retard deforestation rates. More than 23 cooperatively-managed tree nurseries were established, and agroforestry extension work was carried out to insure that tree crops are successfully established, sustainably managed, and marketed.

A national wildlife refuge has been declared within the project area as a direct result of the Land Titling Program and other ANAI efforts. Jointly managed by ANAI and the Government of Costa Rica, the wildlife refuge will permit some sustainable use of plants and animals.

PERU: ***Pacaya Samiria National Reserve***

In 1986, the WHNP helped develop and implement the first comprehensive management plan for Peru's Pacaya Samiria National Reserve. One of the largest conservation units in Latin America, at over two million hectares—the size of the state of New Jersey—Pacaya Samiria National Reserve is also one of the few Amazonian reserves where rational use of renewable resources is permitted. The plan provides for protection, research, sustainable resource use, and environmental education. In FY 1988 and 1989, special workshops emphasized environmental education and extension programs.

ZAMBIA: ***ADMADE Administrative Management and Design for Game Management Areas***

The Lupande Development Project in Zambia's Luangwa Valley, one of Africa's most important wildlife areas, incorporates local villages into a program of integrated revenue generation and sustained yield management of wildlife resources. It includes a culling scheme supported by Africare, a U.S.-based private voluntary organization, and the development of a local safari industry.

As part of the project, safari companies must now hire at least a minimum number of local residents. Safari concession fees are paid into an innovative revolving fund which is shared by the National Parks and Wildlife Service for conservation in Game Management Areas (the multiple-use buffer zones adjacent to national parks) and a committee of local chiefs. The chiefs use the funds for local development projects. To guard against poachers, the project employs residents who serve as village scouts. As a result, elephant- and endangered black rhino-poaching over the first three years of the project has declined 90 percent.

The techniques developed at Lupande will be extended to four additional sites as part of a nationwide effort to make Zambia's

Left: View of tropical rainforest gorges in the Braulio Carrillo National Park, Costa Rica.

Gary S. Hartshorn
World Wildlife Fund

Right: Iguana iguana, Santa Roda National Park, Costa Rica.

K. Miller
World Wildlife Fund

PVOs and NGOs

USAID is working closely with an increasing number of private voluntary and non-governmental organizations, both in the United States and abroad, in its efforts to conserve tropical forests and biological diversity. Among these are:

Adventist Development and Relief Agency
African Wildlife Foundation
Africare
Amasachina (Ghana)
Asian Wetlands Bureau
CARE
Caribbean Conservation Corporation
Catholic Relief Services
CATIE (Costa Rica)
Center for Environmental Education
Christian Children's Fund
CODEL
Conservation Foundation
Conservation International
Environmental Problems Foundation of Turkey
Experiment in International Living
Food for the Hungry
Fundacion Natura (Ecuador)
Global Tomorrow Coalition
Haribon Foundation (Philippines)
Holy Land Conservation Fund
International Council for Bird Preservation
International Union for Conservation of Nature and Natural Resources (IUCN)
King Mahendra Trust for Nature Conservation (Nepal)
LIDEMA (Bolivia)
Missouri Botanical Garden
The Nature Conservancy
New York Botanical Garden
Nitrogen Fixing Tree Association (NIFTA)
Nitrogen Fixation by Tropical Agricultural Legumes (NIFTAL)
Pan American Development Foundation
Royal Society for the Conservation of Nature (Jordan)
Save the Children
SHARE
SKEPI (Indonesia)
Technoserve
VITA
WALHI (Indonesia)
Wildlife Conservation International, New York Zoological Society
Wildlife Fund (Thailand)
Winrock International
World Resources Institute (WRI)
World Vision
World Wide Fund for Nature (WWF-International)
World Wildlife Fund (Pakistan)
World Wildlife Fund (United States)

Game Management Areas self-supporting. Additional counterpart funds have recently been provided by USAID.

CENTRAL AFRICAN REPUBLIC:
Dzanga-Sangha Forest

Efforts are underway in the Central African Republic to conserve the last remaining undisturbed lowland tropical forest located within the proposed Dzanga-Ndoki National Park and to manage the surrounding area, the Dzanga-Sangha Forest Reserve, for sustainable use. The reserve contains the country's last strongholds of the gorilla, forest elephant, and chimpanzee as well as diverse habitats. The forest is also home to pygmies who practice traditional hunting and gathering.

The innovative management plan envisions multiple use in what has been primarily a protection-oriented park system. The plan includes hands-on training of local inhabitants and government personnel in joint management of the reserve and long-rotation gardening. It also includes a health care system for the pygmies.

CAMEROON: ***Mt. Kilum***

In the Bamenda Highlands of Cameroon, a project on Kilum Mountain is helping to stem further degradation of the Afromontane forest and surrounding agricultural land by developing existing sustainable forest-based industries through education programs and the planting of native tree species.

An estimated 180,000 people depend largely on the forest for livelihood. The WHNP resource management effort works with local people to mark the boundaries of the forest reserve, to conduct environmental extension programs and tree propagation trials.

PROGRAM OUTREACH

In 1989, the Wildlands and Human Needs Program began to provide technical assistance, training, and evaluation to the regular WWF programs. This effort has helped to strengthen the development side of other traditional conservation projects.

Conversely, the development community is becoming more concerned with resource management and conservation goals. Links between WWF and other private voluntary and non-governmental organizations have been forged through the WHNP Advisory Committee. This committee has stimulated interest in resource implications of development among its 13 development organization members. Joint projects have been initiated between WWF and groups such as CARE, Africare, and Cultural Survival.

Forest Resources Management Project

The Forest Resources Management Project was initiated by USAID in 1980 with two principal components: the Forestry Support Program (FSP) and the joint USAID/Peace Corps Initiative.

The FSP, with a present staff of 10 full-time professional foresters, provides technical consultation to USAID's bureaus and missions, research support, forestry training and forestry program studies, and technical reference services. It supports forestry-related initiatives in agriculture, private enterprise, and food aid. The FSP also manages a roster of 2,500 expert consultants in forestry and natural resources, maintains the principal database for USAID's forestry activities, and provides technical support to the forestry and natural resource management programs of the Peace Corps.

The program is jointly managed by the U.S. Department of Agriculture's Forest Service and Office of International Cooperation and Development.

In FY 1988 and 1989, the Forestry Support Program:

- identified experts on behalf of USAID for over 150 consultations, an increase over previous years due to: the expanded Forestry Private Enterprise Initiative (FPEI) in Latin America, new funds supplied by the Natural Resources Management Support Project (NRMS) for Africa, and expanded social forestry efforts with new funds provided by the Office of Rural Development;
- supplied technical experts for a biological diversity and tropical forestry assessment in Botswana and for a biological diversity action plan for Morocco;
- completed and distributed *Forestry Activities Supported by the U.S. Agency for International Development,* a study summarizing the FSP data;
- supported the International Conference on Educating Forest Technicians into the 21st Century, which brought together 49 forestry program administrators from 19 countries in New York's Paul Smith's College in August 1988. This conference was one of the first attempts by a development agency to focus on the educational needs of technician-level foresters in the developing world. Complete proceedings of the conference were published in 1989;
- organized an International Tree Seeds Training Course in cooperation with USAID's Regional Office for Southern Africa (REDSO) in Nairobi, Kenya in late 1988;
- funded CARE's production of its *Agroforestry Extension Training Sourcebook* which will be useful in training agroforestry extensionists in Africa. FSP also provided assistance for Save the Children Federation's handbook, *Planning for Agroforestry: With Special Reference to Low Rainfall Areas;*
- adapted into Spanish for Latin American use, through a cooperative agreement with Michigan State University and the Institute of International Agriculture, a leading U.S. forestry investment analysis computer program called QUICKSILVER. It will be a valuable tool for practicing foresters in that region;
- continued to provide monthly reports on USAID natural resource management activities to a network of over 150 key USAID/Peace Corps field managers. Quarterly memos sent to some 600 collaborators have regularly alerted readers to new technology development, upcoming training opportunities, and recently released technical literature;
- sustained support, through the Forestry Private Enterprise Initiative, for the INFORDE project in Ecuador. In 1988, INFORDE completed the establishment of the Center for Technical Support to Wood Products and Furniture Industries of Ecuador (CORMADERA), a non-profit corporation for the development of Ecuador's forestry and wood products sector. INFORDE also conducted a number of workshops, seminars, conferences and field demonstrations in conjunction with the Wood Products Manufacturers' Association of Ecuador (AIMA). A small-grant program financing masters'-level research for students at Loja University was initiated. In 1989, the INFORDE activity was completed in Ecuador and transferred to Guatemala;
- expanded the forestry-agriculture initiative of the FSP into more technical support and training activities during its second and third years. Three-week agroforestry training courses were held in Bolivia and Costa Rica while an agroforestry short course was designed and taught in St. Vincent. In March 1988, the FSP forestry-agriculture initiative was extended for two more years.

The FSP continues to provide technical support for food aid-supported forestry activities such as the development of a small food aid grant program through SHARE, a U.S.-based private voluntary organization working on erosion control and reforestation in Guatemala, and the design of a multi-year agriculture, range management, and forestry support program in northwestern Tunisia by the Peace Corps. The FSP also worked with the Peace Corps to organize the successful Food Aid and Natural Resources Programming Workshop for Latin America in Guatemala in February 1988. The FSP continued to strengthen cooperation between USAID, PVOs, and the UN World Food Programme.

An evaluation of the Forestry Support Program in late 1989 concluded that the FSP and its support to Peace Corps natural resource programs had been highly effective. It recommended a continuation of the basic project, with additional areas of emphasis, in anticipation of emerging worldwide issues of concern to USAID.

The Peace Corps

Since 1980, USAID and the Peace Corps have worked as partners through a Participating Agency Service Agreement (PASA) to assist developing countries in forest management, agroforestry, forestry extension, wildlife management, environmental education, and biological diversity.

The objectives of the agreement include:

- developing and promoting the use of tropical reforestation and natural resource conservation techniques;
- expanding the number of trained Peace Corps Volunteers serving in forestry projects;
- providing material support for forestry, environmental education, and biological diversity projects;
- strengthening cooperation between USAID, World Bank, Peace Corps, private voluntary organizations, and non-governmental organizations working in community natural resource projects supported by PL 480 food aid;
- increasing the number of Volunteers assigned to biological diversity projects such as wildlife protection and environmental education.

To achieve these goals, the Peace Corps conducts field assessments and consultations, programming and training workshops, preservice training for Volunteers, and in-service training for Volunteers and their host country counterparts.

In FY 1988 and 1989, USAID and Peace Corps collaboration continued to grow. Under the auspices of the Peace Corps/USAID Forestry program, training was provided to 160 new natural resource Volunteers. In-service technical training was given to 260 Volunteers and 200 host country nationals in 1988. In 1989, the program provided technical training, program assessments, and support for the design and implementation of workshops for 300 Peace Corps Volunteers and 260 host country counterparts in nursery management, agroforestry, and forestry extension.

Over the last two years, 19 natural resource workshops were held in Latin America and Africa to improve technical cooperation and communication among USAID, private voluntary organizations, and the Peace Corps. In April 1989, for example, the Peace Corps/Paraguay Natural Resources Program held a workshop on agroforestry practices in Paraguay. The five-day program brought together 44 Peace Corps Volunteer foresters with their formal and informal counterparts from the national forest service, agricultural extension service, and various private organizations.

In addition to support for general forestry and natural resources, USAID funds enabled the Peace Corps to launch a Global Environmental Education Initiative and to increase the number of Volunteers trained in the conservation of biological diversity.

The number of Peace Corps Volunteers placed in protected area management, habitat protection, and environmental education has increased over 30 percent in the last two years. In FY 1988 and 1989, more than 18 countries received assistance for the development of natural resource programs through the Peace Corps. In Burundi, the Peace Corps provided support to the National Institute of Environment and Conservation of Nature (INECN) to develop management plans for protected areas. In Honduras, Peace Corps provided technical assistance to five Honduran agencies for the design of a five-year environmental education strategy that was integrated with a national wildlands management plan developed by the Honduran government, Peace Corps, and 10 host country agencies.

The Environment Sector of the Office of Training and Program Support conducted two regional environmental education workshops in Tanzania and Belize in FY 1989. The workshops were designed to increase the effectiveness of work with local communities to promote protected area management and develop local environmental awareness plans. The African environmental education workshop resulted in requests for natural resource assistance from Botswana, Kenya, Tanzania, Rwanda, Swaziland, and Malawi. Peace Corps/Belize provided assistance to the Belize government for the development of a five-year environmental initiative in that

Peace Corps forestry extension Volunteer, Thomas Erdman, and his local community counterpart, (animator) Alassane Diallo, showing villagers in Mali how to care for trees that were transplanted from the USAID-funded Bandiagara tree nursery to this village.

Carolyne Watson
U.S. Peace Corps

country. Another regional environmental education workshop is proposed for Asia in 1990.

Significant steps have been taken to strengthen the integration of food aid into natural resource programs, a joint USAID and Peace Corps initiative which began in 1985. Following the success of the Africa-wide Natural Resource and Food Aid Programming Workshop held in Mombasa, Kenya in 1987, an Inter-American Natural Resources and Food Aid Workshop was held in Panajachel, Guatemala in 1988. The regional workshops were attended by senior representatives of the Peace Corps, USAID, and private voluntary organizations as well as officials from host governments. Their aim was to strengthen collaboration in natural resource activities and to raise awareness of ways that food aid can contribute to other conservation efforts.

Results of the workshops included four pilot projects that are currently underway in Kenya, Ecuador, Bolivia, and Ghana.

The Ghana project, the Collaborative Community Forestry Initiative (CCFI), evolved from the Mombasa workshop. It provides a model case study of the development of a successful collaborative forestry/food aid project. CCFI was planned and developed by USAID, Peace Corps, Adventist Development Relief Agency, the Ghanaian Forestry Department, Ghana's National Secretariat, and Amasachina, a Ghanaian non-governmental organization, during three subsequent workshops held in Ghana in 1987 and 1988.

The project will establish 20 income-generating community forestry nurseries over a six- to eight-year period. The locations chosen for nursery establishment are in areas under severe environmental stress in Ghana, areas affected not only by periodic drought but also by over-grazing, heavy fuelwood demand, and uncontrolled bush fires. Lower soil fertility and declining food production have resulted, and the lack of fuelwood has in some cases reached crisis proportions, causing an increase in deforestation.

Each of the CCFI project nurseries will produce up to 50,000 seedlings annually. The project includes a training and environmental education component for nursery managers and community leaders, and a food wage is included for recurrent personnel costs and tree planting incentives to small private farmers.

Peace Corps forestry Volunteer assigned to the Ministry of Agriculture in Qacha's Nek, Lesotho working with ten Catholic Relief Service-sponsored PL 480 Title II Food-For-Work laborers, all women, in the largest tree nursery in Lesotho.

U.S. Peace Corps

PL 480
FOOD ASSISTED FORESTRY PROJECTS

During the last two fiscal years, USAID has dedicated increasing attention to the use of non-project resources to support natural resources management. Such resources include the support for policy dialogue, self-help measures, local currency generations, project food aid, technical assistance, and evaluation.

Local currency generations from PL 480 Title I, Economic Support Fund (ESF) and the Commodities Import Program (CIP), for example, are used alone or in conjunction with development assistance and other resources in a number of countries including Bolivia, Egypt, India, Indonesia, Morocco, Pakistan, the Philippines, Sudan, Tunisia, and Uganda.

A new five-year Natural Resources Management Project in Indonesia now under design for $16.5 million will be supplemented by a $10 million dedication of PL 480 Title I local currency resources.

In Cape Verde, the PL 480 Title II Section 206 program continues to provide the local currency equivalent of a little over $2 million annually for partial salary payment of workers in the associated Watershed Development Project. Since FY 1982, more than 2.4 million trees have been planted, 240,000 cubic meters of earthworks for dams and dikes, and 800,000 meters of rock walls have been constructed.

In Peru, the food-assisted USAID agroforestry program administered by CARE uses a combination of resources to accomplish its objectives. A FY 1989 distribution of 1,700 metric tons of Title II food commodities complements financial contributions from an Operational Program Grant from USAID, PL 480 Title I local currency generations, a PL 480 Title II monetization program, regular budgetary contributions of participating agencies, and a centrally-funded USAID grant to CARE.

Ten Years of Achievement

In September 1990, USAID and the Peace Corps will mark the tenth anniversary of their collaborative effort to assist less-developed nations in the improvement of natural resources management practices.

This partnership has brought advantages to both agencies. For USAID, the cooperation provides direct access to the grassroots level of development—the communities and people most in need of assistance. It also furnishes skilled support for USAID in countries where the Agency has limited staff. The Peace Corps benefits by being able to offer more programming expertise and technical training to its staff, Volunteers, and host country counterparts. This, in turn, upgrades the effectiveness of the Peace Corps personnel who implement conservation programs in the three continents and 45 countries where natural resource assistance is requested.

USAID has invested $4.8 million in the joint programming initiative since its inception in 1981. During this time, Peace Corps has assigned 1,400 Volunteers to conservation projects consistent with the goals of the joint natural resource initiative and has trained 1,530 host country counterparts. The number of Peace Corps Volunteers working in natural resource programs has almost tripled from 200 in 1980 to 580 at the present time. This is due, in large part, to the increased level of professionalism that Peace Corps is able to offer those experienced in conservation—a result achieved through the joint USAID/Peace Corps initiative by means of pre-service and in-service training, material support, and upgraded programming. The increased professionalism of the Peace Corps is one of the reasons why in recent years it has become one of the largest employers of forestry graduates in the United States.

Collaboration has also helped increase the effectiveness of natural resource programs at a modest cost. When USAID and Peace Corps work together in reforestation projects, for example, they frequently reforest more acreage at less cost than other reforestation projects. The survival rates of trees in joint initiative plantings are usually also higher. Due to Peace Corps' extensive outreach network and collaborative approach to development with local organizations, the benefit gained from every dollar invested has been much greater.

USAID has reciprocated in this partnership by adding its extensive expertise to many Peace Corps projects and training sessions aimed at improving the technical skills of Volunteers and host country counterparts. At a number of training events, such as the PL 480 Workshops and the Environmental Education Conferences, USAID technical personnel and contractors were available to share their experiences with conferees. Through application of such extensive training, the Volunteers and host country counterparts share their skills and knowledge with people in their communities, multiplying the benefits of the training.

Since 1985, more than 270 participants from 17 countries and over 50 different organizations have attended regional and country-specific PL 480 Food-for-Work programming workshops in Africa and Latin America to learn more about food assistance and natural resource possibilities.

Through the Microenterprise Development program between USAID and the Small Enterprise Development sector of the Peace Corps which began during FY 1988, natural resource Volunteers are being trained in basic business skills to expand small income generation in wood and non-wood forest products.

Funds provided by USAID specifically for biological diversity during FY 1988 have allowed Peace Corps to respond to an ever increasing need from the field to provide technical assistance in parks and wildlife management and environmental education. In Honduras, Peace Corps trainees receive a three-day course on raising environmental awareness in their communities. Volunteers and counterparts who express interest in becoming actively involved in environmental education projects are offered more extensive training. The Africa-wide Environmental Education and Awareness Conference held in May 1989 prompted Tanzania to ask Peace Corps for assistance in developing a parks and wildlife program.

Many joint USAID/Peace Corps programs have been made possible by expanded funding and increased manpower and expertise. The combined initiative of the agencies will continue support for PL 480 projects, increase training courses for parks and wildlife personnel, and expand environmental education activities.

Sofia Sanchez, a Peace Corps forestry/environmental education Volunteer, working with local NGOs and school children to promote reforestation and conservation education in Guatemala.

U.S. Peace Corps

NOTE: At least 40% of the more than 580 Peace Corps forestry/natural resources Volunteers serving in over 40 countries around the world are U.S. women Volunteers.

REGIONAL SUMMARY: LATIN AMERICA AND THE CARIBBEAN

In Latin America and the Caribbean, every USAID mission has included biological diversity and tropical forestry sections in their country development strategy statements and action plans written in FY 1988 and 1989. In most countries these have been derived from larger sector studies in biological diversity and tropical forestry.

Environmental and Natural Resource Management in Central America: A Strategy for AID Assistance was issued by the Bureau for Latin America and the Caribbean in FY 1989 and is being implemented by the Central American missions and the Regional Office for Central American Programs (ROCAP). This new strategy emphasizes sustainable agriculture, production from natural forests, management of wildlands to protect biological diversity, management of critical watersheds, as well as policy formulation, institutional strengthening, and environmental education.

To address the issues identified in the Central America strategy, a Regional Natural Resources Management Project was initiated in late FY 1989. This $46 million, ten-year start of a decade's effort will include significant components on wildland conservation and biological diversity as well as components to address each of the other parts of the Central American strategy. This regional project will support a much larger effort by the USAID missions that presently is estimated at over $300 million over the next five years.

Among other regional efforts supported by USAID is the Development Strategies for Fragile Lands (DESFIL) Project, a ten-year technical assistance effort to halt degradation of marginal steep slopes and lowland humid areas.

In the last two years, DESFIL has provided assistance in the preparation of the Regional Environment and Natural Resource Management Project and for the development of a Natural Resource Management Strategy in El Salvador. The project also helped to develop Tropical Forest Action Plans in a number of countries including Belize and Guatemala, and worked with the New York Botanical Garden to design a comprehensive management plan to save Haiti's highly threatened Carossier Palm (*Attalea crassistatha*).

Under the regional Environmental Management Systems Project, eight biological diversity grants totalling $765,000 were awarded to non-governmental organizations in FY 1988. These have included conservation programs in Peru's Manu Biosphere Reserve, another in the Dominican Republic, and a comprehensive plan to set up a system of parks and protected areas on St. Lucia. This project also supported ethnobotanical surveys in Belizean forests, a survey of trees in the diverse and nearly untouched Pilon Lajas region of Bolivia, the establishment of biodiversity survey centers, and staff training in five Costa Rican national parks.

In FY 1989, the USAID office in Jamaica obligated $1.75 million for a three-year pilot project to develop the first national park system in the country. The Protected Area and Resource Conservation (PARC) Project will begin with a marine park and a mountain park to become prototypes for the country.

Also in FY 1989, the USAID mission in Costa Rica obligated $5.5 million of the $7.5 million Forest Resources for a Sustainable Environment (FORESTA) Project. This will manage the volcano national parks north of San Jose and undertake a large buffer zone forest management program in the national forests surrounding the parks.

In Guatemala, a successful policy dialogue has resulted in new protected areas legislation and an improved forestry law.

The projects described below illustrate the ways that USAID is working with Latin American and Caribbean nations to protect tropical forests and biodiversity.

Peru's Sustainable Forest Management in the Central Selva

Natural forest management in the Peruvian Amazon has been supported by USAID through an innovative pilot research and development project—the Central Selva Resource Management Project. It is an example of flexibility, because substantial modifications in project design were prompted by a comprehensive environmental assessment and social soundness analysis.

As first proposed to USAID by the Peruvian government, this typical rural development scheme envisioned the Palcazú valley as a potential breadbasket for Lima, the Peruvian capital. Initial plans for large-scale agro-industrial development included increased colonization in an area with large tracts of primary tropical rain forest. To support colonization and agricultural development, a highway was to cut through the valley.

The initial design, based on the incorrect assumption that the land was suitable for agriculture, was limited by a host of factors including steep terrain, heavy rainfall, and soils that are easily eroded, infertile, and limited for agricultural uses due to an abundance of aluminum.

The extraordinary biological diversity in the region was not originally considered. The Palcazú valley is one of the last valleys on the eastern flank of the Andes before the Amazon basin. Tropical rain forest covers 85 percent of the lower valley—75 percent of it representing primary forest cover. The region supports some 1,000 different species of trees.

USAID's environmental assessment reoriented the project in favor of natural forest management as the principal activity, but also included limited small-scale agriculture. The direct and immediate beneficiaries are the 5,000 Palcazú valley inhabitants, including 3,500 Amuesha Indians who received legal title to their communal lands as well as political recognition of their extensive native communities as part of the project. The Amuesha will also be able to increase their income through sustained-yield forest production, local processing, and national marketing. Although project activities attracted some new colonists, the government did not actively promote colonization in the valley.

USAID contracted the Tropical Science Center, a private, nonprofit organization based in Costa Rica, to prepare a forest management plan for the lower Palcazú valley. Based on long, narrow "clear-cut strips," which mimic tree-falls in a natural forest, timber is harvested in 30- to 40-year rotations from strips 30 to 40 meters wide on contour to prevent erosion. In the first few cutting cycles, no strips were closer than 100 meters to each other. Intact forest, bordering the strips, is the source of seed for natural regeneration. Stump sprouts also contribute to the aggressive and rapid regeneration of trees.

Experience gleaned over a four-year period (1985–1988) shows that the regeneration of tree species is excellent, with an actual increase in the diversity of tree species, including many rare ones. Fast-growing young trees on the regenerated strips also provide improved habitat and food for wildlife.

The project has also increased the income and involvement of the local people. The Amuesha, for example, formed the Yanesha Forestry Cooperative in 1986, one of the first such enterprises organized among indigenous groups in the Amazon Basin. The cooperative, owned and operated entirely by the Amuesha Indians, serves as a processing and commercial marketing enterprise as well as a training center for other native communities. Representatives from Indian tribes in Bolivia, Ecuador, and Panama, for example, have recently visited the Yanesha Forestry Cooperative for "cross-tribal" transfer of technology.

The Central Selva natural forest management system is now a model that integrates local forest ownership, harvesting and processing of timber with marketing of the forest products. This pilot project incorporates animal labor for logging, and nearly complete utilization of timber, including charcoal-making from non-commercial woods and natural regeneration of native tree species. Wood utilization increased from two to five cubic meters of wood per hectare cut in traditional systems to over 300 cubic meters of wood used from each hectare under the new system. This dramatic increase means profits can increase while areas of forest cut can decrease. Possibilities exist for applying the management system developed as part of the project to other tropical regions.

An added component of the Central Selva project is the government's designation of the upper Palcazú watershed as the 122,000 hectare Yanachaga-Chemillen National Park and the 33,000 hectare San Matias/San Carlos Protection

Top: Carlos Mateo and Juan Quijano identifying tree seedlings in the natural forest management project, Palcazú Valley, Peru.

Bottom Left: Michael Krones inside 16-month-old natural regeneration of native trees on the second demonstration strip, Palcazú Valley, Peru.

Bottom Right: Portable charcoal kiln and ox cart, that are part of the forest extraction component of the Palcazú project in Peru.

Gary S. Hartshorn
World Wildlife Fund

Honduras Forestry Development Project

Zone. These conservation units include areas of forests on the steep slopes to protect the upper Palcazú watershed. A buffer area of primary forest between the national park and the native communities has been decreed as a Forest Reserve for traditional use including hunting, fishing, and foraging for medicinal plants.

The five-year Central Selva project, which began in 1982 with a commitment of $22 million in loans and grants, received a nine-month extension in 1987. A three-year second phase was agreed to in 1988, but was soon suspended for security reasons due to increased activities in the area by Peru's Shining Path guerrillas and coca growers. Instead, a second, much reduced phase of the project is based in Lima and uses the Palcazú model to train technical-level personnel and some rural inhabitants.

This USAID-funded project has kindled much interest and enthusiasm in using natural forest management as a local development model. Success will be measured by the integration of sound ecological principles, direct economic benefits to owners of the managed forest resources, and a strong social commitment to bettering rural well-being.

Top: Goat pulling cart with firewood in Honduras.

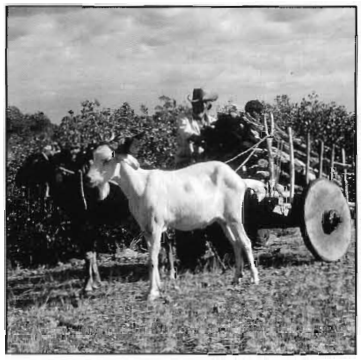
World Wildlife Fund

Bottom: USDA Forest Service is assisting Honduras to improve management and sustainable productivity of natural pine forests in that country.

Kathryn Hunter
Forestry Support Program
USDA/OICD Forest Service

The six-year Honduras Forestry Development Project was initiated by USAID in 1988 to improve the management and sustainable productivity of commercial pine forests in a country where, at current rates, the remaining mature pine stands will be exhausted in 18 years. The $20 million effort is also enhancing the efficiency of wood-product processing and marketing.

The project assists the Honduran Forest Development Corporation (COHDEFOR) in improving management practices and operating procedures. COHDEFOR, the principal public sector institution responsible for forest management, has for the first time included the private sector as a participant in marketing and divestment of its industries, thus enabling COHDEFOR to focus primarily on management of forestry resources.



As a result of the project, a new timber sale procedure is being developed for all commercial pine lumber transactions. All lumber exports will be handled and negotiated by the private sector, with an appropriate sales commission to the national government. The new timber sale preparation procedure, as well as a newly designed timber sale contract, has been adopted by the management at the La Union Forest Management Area in Olancho.

These procedures are expected to eventually be adopted throughout the country.

The project will develop a methodology for efficiently managing forest resources at the La Union Forest Management Area, a 100,000 hectare unit in the central portion of the country. A forestry management plan has already been developed. A system of fire protection, wildlife management, protected forest areas, pest control, soil conservation, range management and agroforestry practices is being put into place. The local population is expected to derive significant, sustained income from forest-based industries and activities. The pilot program in La Union will be replicated in a second area to be selected in the fourth year of the project. Hardwood forest areas within the larger pine forest harbor most of the region's wildlife and will be set aside in permanent protected sections.

Training courses for field personnel have been completed in sales administration, sales preparation, and geographic and management information systems.

The project is a collaborative effort involving USAID, the U.S. Department of Agriculture's Office of International Cooperation and Development (OICD) and Forest Service, and COHDEFOR. The National Forestry School, which trains forest technicians, is part of the field operations. Support for training is also provided to the Honduras Lumbermens' Association, AMADHO.

The Honduras Forestry Development Project shows how policy reform, together with the strengthening of a public forest management organization and with technical cooperation from the U.S. Forest Service, can work effectively together to achieve sustainable management of natural forests.

Reforestation in Guatemala

One of the negative effects of coal-burning electrical power generation is the contribution to global climate change. Generating plants that produce power through the combustion of carbon-based fuels emit considerable quantities of carbon dioxide into an already carbon-laden atmosphere.

The problem is global rather than local in nature. Carbon emitted in one part of the planet is widely spread by atmospheric circulation. The solution must also be global.

The disappearance of tropical forests also exacerbates the greenhouse effect. Trees are the planet's most efficient tool for removing, or sequestering, carbon from the atmosphere. Tropical forests, due to their climatic advantages, benefit from longer growing seasons and faster annual growth rates, and therefore are more efficient at carbon sequestration during their active growth stage than most forests of similar size in more temperate zones. When trees are burned or left to rot, their carbon is put back into the atmosphere.

Guatemala community reforestation project.

Kathryn Hunter
Forestry Support Program
USDA/OICD Forest Service

Through the Guatemala Agroforestry and Carbon Sequestration Project, a coalition of public and private funding agencies, including USAID, hopes to make up for the effects of carbon emissions from a new coal-fired generation plant in Connecticut. In addition to offsetting carbon dioxide emissions from the Uncasville power plant now under construction, the Guatemalan reforestation project is expected to benefit about 40,000 small landholder farmers who depend upon forests for much of their livelihood.

Funders of the Guatemala project include, in addition to USAID: the Peace Corps; CARE, a private voluntary organization; the government of Guatemala; and AES Thames, a subsidiary of Applied Energy Services. In 1988 the firm decided that before building its Connecticut plant, it would to try to offset the carbon dioxide emissions through reforestation.

The World Resources Institute (WRI) analyzed the needs of Applied Energy Services, and reviewed the projects in developing countries which could offset the approximately 15.5 million tons of carbon to be emitted by the Connecticut power plant during its 40-year life. The Guatemalan project offered the best opportunity for carbon sequestration at a rate of 387,000 tons per year for 40 years, through the planting of 52 million trees over that period.

Approximately 30,000 acres of woodlots will be created during the project life and roughly 150,000 acres of agricultural land will benefit from expanded agroforestry practices. Fast-growing species will be planted, enabling farmers to begin reaping benefits within three to five years.

In addition to tree planting, the project entails training local populations in forestry management and soil conservation techniques, and the development of forest fire brigades and other activities aimed at improved biomass conservation. About 1,800 miles of live fencing will be planted and 5,000 miles of terraces will be built to protect slopes from erosion.

Initial funding for the project was provided by a $2 million grant from AES, which will establish an endowment that will last for the ten-year project cycle. In addition, the Guatemalan government will contribute at least $1.2 million in services to the project, and CARE is committed to raising an additional $1.8 million in matching funds of its own. USAID will also contribute $2.5 million in funding. The Peace Corps and USAID will contribute resources in the form of volunteer assistance and food aid. Total expenditures in goods and services are estimated at $14 million. Because all planting and tree maintenance will take place on farmer- or community-owned property, no land purchases or labor expenditures will be required.

Tree planting under the project began in July 1989. WRI estimates for the project a total sequestration of 18.1 million tons of carbon over 40 years. If these estimates are correct, then the project will remove about three million tons more carbon from the atmosphere than AES's new power plant will emit.

It is, of course, too early to predict total sequestration with any certainty. Any projected achievement may be easily outdistanced by external developments, such as greater-than-predicted population growth. On the other hand, the need is clear, and the local benefits are equally apparent. From 1950 to 1979, Guatemala is estimated to have lost 30 to 50 percent of its forests. The nation's population is growing at an annual rate of 3.3 percent; by the turn of the century, Guatemala's population will reach 12.2 million.

By combining carbon sequestration and economic development rather than pitting them against each other, the project is a good example of taking actions that are needed and well-justified for developmental reasons, that will also contribute to diminishing the risk of global climate change.

Haiti Agroforestry Outreach Project

The Agroforestry Outreach Project, originally an $8 million four-year project initiated by USAID in 1981 in Haiti, is among the largest and the most successful USAID-funded agroforestry efforts in Latin America. USAID has committed a total of $27 million through 1989 in addition to other donor support, and further extensions are planned to 1995.

The project has not only greatly exceeded its original goals as a private, non-governmental effort to motivate farmers to plant and maintain fast-growing tree species on their farms, but it also has contributed to the overall objective of reducing and, at least on certain pieces of land, ultimately reversing the degradation of Haitian natural resources.

Deforestation is a dramatic problem in Haiti. As recently as 1950, more than 80 percent of the Caribbean nation was covered by forest. Today, mainly as a result of population pressure which expands demand for fuelwood and agricultural acreage, forest covers less than two percent of the land. Growing demand for agricultural land has led to severe deforestation along the steep mountain sides that typify the landscape. Increasing erosion, and reduced soil availability and soil productivity, significantly limit potential for economic growth.

USAID provided grants to the Pan American Development Foundation (PADF) and CARE to train and supervise extension workers, promote regional nurseries, and arrange for the distribution, planting, and care of tree seedlings.

PADF operates through an outreach network of over 80 local private voluntary organizations which provide training to local extension agents throughout the country. CARE, with activities primarily in the arid Northwest peninsula of Haiti, works directly with farmers.

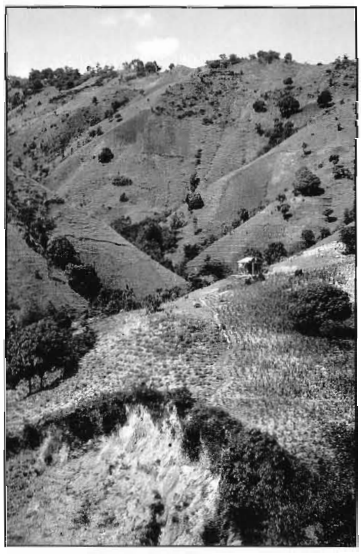
The Agroforestry Outreach Project has resulted in the development of a network of 50 containerized seedling nurseries currently growing nine million trees a year. By the end of 1989, a total of 50 million hardwood and fruit tree seedlings will have been planted by 130,000 farmers. Over 1,000 part-time and full-time extension workers have been trained in agroforestry techniques.

A new seed and germplasm improvement component of the project was initiated in mid-1988 and contracted to the International Resources Group (IRG) to improve the genetic quality, diversity, and provenance matching of the indigenous and exotic tree species with the most potential. Applied research on social, economic, and agroforestry aspects of the project initially supplied by the University of Maine continues through the Southeast Consortium for International Development (SECID), with Auburn University as the lead institution.

The success of the project can be attributed to a number of factors, including high local demand for charcoal, fuelwood, and fruit. One key factor is the growing perception by farmers that planting and sustaining trees is in their own best economic interest. Another factor is the effective provision of low-cost extension services to farmers, which included seedlings, advice on planting and maintenance, and the introduction of soil conservation techniques such as bench terraces and living hedges with food intercrops.

While the project is scheduled to be completed in December 1989, its principal components will be integrated into a National Program for Agroforestry to begin in 1990. The new five-year project is the first phase of a planned ten-year effort to achieve sustainable increases in on-farm productivity, not only through trees, but also through other agricultural endeavors that can improve farmer income.

Haitian Agroforestry Outreach is an example of an effective and well-implemented project that has not only more than met its goals, but provided the foundation for a broad national program.



Left: A group of planters observing an animator who is demonstrating the techniques of tree planting in Taillefes, Haiti.

Right: Foresters of the Pan American Development Foundation are helping peasants recover the steep rocky slope in the foreground.

Pan American Development Foundation.

COSTA RICA: A RANGE OF PROJECTS

Costa Rica is renowned both for its efforts to protect park land and for its rich natural heritage.

The Costa Rican park and natural reserve system, presently consisting of a network of 33 park and wildlife refuges, contains over 12 percent of the country's land. If Indian reserves, forest reserves, and partially protected or managed areas are included, that figure more than doubles to 27 percent—well above the world average of 3.3 percent.

Cespedesia macrophylla, a canopy tree whose bright yellow flowers are pollinated by euglossine bees in the La Selva tropical rain forest, Costa Rica.

Gary S. Hartshorn
World Wildlife Fund

It is appropriate that the Spanish name for this small Central American country means "rich coast." Costa Rica's diverse landscape—from lowland rain forests to cloud forests reaching up the sides of mountains over two miles high—is home to over 850 bird species (more than inhabit the United States and Canada combined) as well as over 10,000 plant and 200 mammal species.

USAID programs in Costa Rica demonstrate recent major Agency initiatives in conservation of tropical forests and biological diversity and show the broad range of USAID-supported environmental activities in one country.

USAID's strategy in Costa Rica calls for the management of national parks as well as contiguous commercial forests. Protection and enhancement of national park value can only be secured by progress in improving the economic efficiency and sustainability of Costa Rican forestry. The combination of park and forestry management offers unusual opportunities for demonstrating the complementarity between conservation and development and for creating models that can be utilized in other parts of Central America.

Such an approach is particularly necessary since many of Costa Rica's parks are under various degrees of siege by squatters, poachers, farmers, loggers, miners, or developers seeking to satisfy their economic needs at the expense of the valuable natural heritage the parks and protected areas provide.

Currently underway is the Forest Resources for a Sustainable Environment (FORESTA) Project, a $7.5 million, seven-year project, initiated in FY 1989. The project will support protected area management, and develop forestry and agroforesty as economically appropriate land uses in the buffer zones around the Braulio Carrillo, Poas, and Irazu National Parks and other natural protected areas of the Central Cordillera.

To improve park and protected area management, an independent private authority, the Central Cordillera Natural Resource Management Unit, will be created to provide direction, technical assistance, and coordination.

The FORESTA Project will provide for the sustainable production from the natural forest buffer zones around the parks. At least 5,000 hectares will be managed according to officially approved plans, and an integrated forest industry with access to a sustainable supply of raw materials will be developed with no encroachment on park land. Assistance will also be provided to area residents to increase their income and improve their land by integrating tree planting into their farming systems. This project will also lead the way to implementing Costa Rica's plans to consolidate its parks and protected areas into seven or eight mega-parks with decentralized management units and major private participation.

The Forest Conservation and Management Project (BOSCOSA) initiated in FY 1987, like FORESTA, is helping to conserve a national park by assisting surrounding communities to create a buffer zone and improve the use of their land. The project, focused in the Golfo Dulce Forest Reserve which forms a buffer zone around Corcovado National Park, is designing and demonstrating an economically and environmentally

Sea turtle hatching on the beach

George H. H. Huey
World Wildlife Fund

viable forest management system using agroforestry and natural forest management techniques. The project, jointly implemented by the Conservation Foundation/World Wildlife Fund and the Neotropical Foundation, a Costa Rican nongovernmental organization, offers assistance to local communities in agriculture, forest management, wood processing, and community development.

Through the BOSCOSA Project in 1989, USAID/Costa Rica designed a complementary watershed management project that will serve as a model for the FORESTA project.

Tortuguero, Costa Rica
World Wildlife Fund

The BOSCOSA Project will help to protect the unique biological diversity of the 42,000-hectare Corcovado National Park. Located on the Osa Peninsula in southwest Costa Rica, the park contains the only large remnant of low wet forest on Central America's Pacific Coast with its rich diversity of neotropical species of flora and fauna.

Corcovado has come under increasing pressure by goldminers, who have invaded the park in search of a living from gold deposits, causing substantial damage to wildlife, forests, and aquatic natural resources. While the government has resettled many of the miners, the situation requires an improved system of protection and management which the BOSCOSA Project will help address.

USAID's grant of $125,000 in September 1988 to the Caribbean Conservation Corporation (CCC) was a first step toward the implementation of a comprehensive conservation and development plan for Tortuguero National Park and Barra del Colorado Wildlife Reserve—an area of world renown as the largest nesting beach for the endangered green sea turtle and encompassing unspoiled tropical forest, wetland, and coastal habitat in a region otherwise suffering from rapid environmental deterioration. The CCC matched this grant with $355,000.

The USAID mission in Costa Rica provided an additional $550,000 to CCC in early FY 1989 to support a development plan for Tortuguero. This grant facilitates the creation of a mega-park in the region by connecting Tortuguero National Park and the Barra del Colorado Wildlife Reserve through a natural corridor, which helps maintain the biological diversity of both protected areas.

This effort also includes the construction and expansion of an environmental education and interpretation center, the training of local residents as naturalist guides, and the expansion of research and training facilities. A comprehensive zoning plan will also be developed for Tortuguero, insuring compatibility of future development with the natural environment and the protection of sea turtle nesting beaches.

Through a USAID grant of $125,000 to the Neotropical Foundation in FY 1988, biological diversity survey centers are being established in five Costa Rican National Parks—Corcovado, La Amistad, Braulio Carrillo, Tortuguero, and Palo Verde. Building on existing facilities at Santa Rosa National Park, a principal training center is being developed to train "parataxonomists"—park personnel trained in ecology to carry out first-rate biological diversity surveys in a tropical environment. While plans included training of 12 parataxonomists during the first year, the high demand for training resulted in 22 students graduating in July 1989 at ceremonies attended by Costa Rican President Oscar Arias.

USAID efforts in Costa Rica also include the mission's local currency support for the Cano Negro Wildlife Reserve in north central Costa Rica. This wetland refuge drains into Lake Nicaragua and is home to a number of threatened and endangered species, including the tapir, paca, cayman, jaguar, ocelot, and the six-foot jabiru stork which, with its eight-foot wing span, is the largest stork in the world.

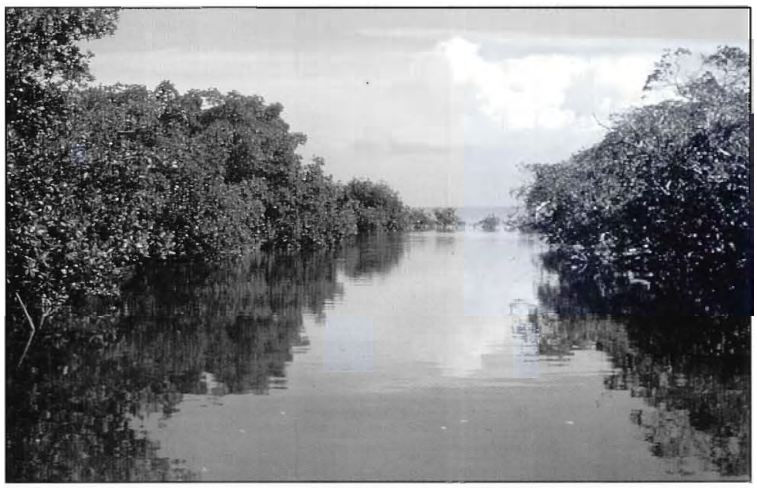
Belize: Hol Chan Marine Reserve

USAID is collaborating with The World Wildlife Fund, the Peace Corps, and the Belize Fisheries Department in a joint effort to establish and manage a unique marine ecosystem.

The Hol Chan coral reef area was declared a marine reserve by the government of Belize in May 1987 in an effort to prevent ecological damage caused by overfishing, pollution, on-shore development, and increasing tourism.

The Hol Chan Marine Reserve became the first reserve established on any part of the Belize Barrier Reef, the most extensive and complex coral reef system in the Atlantic, second in size only to the Great Barrier Reef of Australia.

The two-year project, with a $60,000 USAID grant matched by $75,000 from WWF, is leading to the development and implementation of a management plan for the Hol Chan Marine Reserve to maintain a coral reef community and associated multi-habitat ecosystem in its natural state. This effort will preserve the great biological diversity of the area while allowing low-impact tourism and fishing in surrounding buffer zones. It is expected that with the integration of conservation and sustainable development in this area, a well-managed reserve could serve as a model and catalyst for the establishment of other marine parks along the barrier reef.



Hol Chan, Belize.
World Wildlife Fund

In FY 1988 and 1989, the reserve management plan was completed, and several research projects were initiated to survey sea life and reef communities. Local fishermen have been surveyed as part of a study estimating effects of imposed regulations on recovery of the depleted fish stocks. A public education plan has also been completed with slide presentations and a brochure developed for enhanced public awareness.

Local fishermen, who were originally skeptical of the park, are now convinced their catches have improved because of it, and they talk about expanding the model to other parts of the reef to improve the catch.

As part of the environmental management of the project, the five-square mile Hol Chan Marine Reserve was divided into three zones. The first, which includes the Hol Chan cut and the surrounding reef, is used only for non-extractive recreational activities. It is strictly patrolled, and removal or disturbance of any flora or fauna is strictly prohibited.

A second zone encompasses the lagoon area, where established uses and activities may continue, specifically commercial fishing for conch and lobster. Collaborative research programs between Hol Chan Marine Reserve and other agencies involving the use of this area are being promoted.

The third zone, consisting of mangrove cays and the channels among them, serves primarily as a productive nursery area for many species. The mangroves and other plants found here are protected. Sport fishing and subsistence fishing, however, are permitted.

The park is administered by a reserve management unit established by WWF under the authority of the Belize Fisheries Unit. At least half of the staff of this unit is hired locally to enhance community involvement. Training for reserve personnel has already been conducted. Reserve personnel have also taught a course in marine biology to 60 of the 70 students at the local high school. The course included field trips to Hol Chan Marine Reserve.

The impact of the project is already felt in other parts of Belize. Since Hol Chan Marine Reserve was established, a Honduran group based in the Bay Islands is considering the creation of its own reserve, based on visits by diving guides from the islands to Hol Chan.

The promotion of rational management of marine ecosystems such as coral reefs reflects USAID's commitment to the preservation of biological diversity.

Conserving Biological Diversity in Ecuador

Ecuador, where 42 percent of the population depends on agriculture for its livelihood, has lost 10 percent of its tropical forest cover in the last decade. The Amazon region of eastern Ecuador is particularly rich biologically, but is under increasing pressure from colonization and agricultural use, following in the paths of oil companies.

USAID has funded collaborative efforts to conduct dendrological and economic botany studies in the Amazon forests of Ecuador by the New York Botanical Garden, the Missouri Botanical Garden, and the counterpart Ecuadorian institutions, including the National Forestry Directorate (DINAF) since 1985.

In its work throughout the Amazon River Basin over the years, the Missouri Botanical Garden has collected over 5,000 Amazonian trees with an estimated 70 percent representing species, varieties, or provenances that had not been recorded previously. A guide to tree identification of northeastern Ecuador is currently in production. Collection of tree species continues, particularly in areas threatened by oil exploration and new road development.

In ethnobotanical studies conducted by the New York Botanical Garden, over 600 medicinal plants used by Shuar Indians have been identified. Commercial activities based on useful plants were documented. Ecuadorian scientists were trained in botanical methods through either formal training in Ecuador, or at the New York and Missouri Botanical Gardens, or through informal training as part of participation in field work. The project also assisted the Ecuadorian Museum of Natural Sciences to establish and maintain an herbarium. The Shuar Federation, stimulated by USAID-supported programs to study the flora of the Ecuadorian Amazon, now maintains a small herbarium in Bomboza.

USAID also funded a two-year study by the New York Botanical Garden in August 1987 to prepare a manual on Amazonian Ecuador's useful plants. The manual, when completed, will encompass between 1000-2000 taxa. This reference guide, which will incorporate original fieldwork, herbarium data, and published ethnobotanical studies, will help foresters, botanists, agronomists, and anthropologists to manage and rationally use Ecuador's lowland forests.

Upper Left: Grias neuthberthii—Shuar name Wapai, Quichua name Piton. Edible fruit is also applied to tumors.

Upper Right: Domingo Antich, a Shuar Indian, preparing fermented beverage called chicha.

Lower Left: Chocolate relative, *Thechroma*, may be important source for genetic improvement of cultivated chocolate.

Lower Right: Potato relative in the genus *Solanum* used as a natural insecticide.

Bradley C. Bennett
New York Botanical Garden

Above: Peace Corps works with CARE to carry out USAID-supported agroforestry activities in Ecuador.

Kathryn Hunter
Forestry Support Program
USDA/OICD Forest Service

REGIONAL SUMMARY: AFRICA

In Africa, the goal of supporting the conservation of biological diversity and tropical forests is linked to the enhancement of agricultural productivity.

The Natural Resource Management program of USAID's Bureau for Africa is based on the resource management plan for Sub-Saharan Africa that was prepared in 1987. This plan's intent is to assist African governments in developing better approaches toward managing tropical forests and biologically diverse resources, and creating incentives for farmers to adopt these approaches.

The plan emphasizes specific geographical sub-regions: Arid and Semi-Arid, Tropical Highlands, and Madagascar (Indian Ocean Islands). Within these sub-regions, three priority concerns are addressed—the biological diversity of tropical forests, the loss of vegetation, and the decline in soil fertility.

Within the plan, a strategy to address biological diversity and tropical forests focuses on two geographic sub-regions: Madagascar and the tropical highlands including the Afromontane forests of Uganda, Rwanda, Burundi, and Zaire.

In 1987, USAID initiated the $14.6 million Natural Resources Management Support Project (NRMS) to implement the management plan and assist missions in the development of long-term natural resource management strategies.

The NRMS Project provides technical assistance to undertake country assessments, conduct workshops, and assist non-governmental organizations in the design of natural resource management projects. It also supports the development of natural resource management assessments that identify promising farmer-level field techniques and necessary socio-economic conditions for success. These serve as the first step towards providing farmers with alternatives to deforestation.

Natural resource management assessments have been completed for the following countries: Madagascar, Rwanda, Burundi, Uganda, Zaire, Kenya, Botswana, Malawi, Lesotho, Niger, Mali, Gambia, and Senegal. Assessments for Tanzania, Ghana, Cameroon, and Somalia are planned in FY 1990.

Natural resource management assessments provide the foundation for country action programs, including those actions necessary to conserve tropical forests and biological diversity.

To evaluate and monitor activities under the NRMS Project, indicators of progress have been developed, and they are now being validated in the field. These include: the number of promising technologies identified; the policy changes adopted and implemented by governments; Africans trained as specialists, park reserve managers, guides or extension agents; parks and reserves identified for intensive management and tourism; plus the buffer zones established around parks. These all indicate some advances in natural resource management. These indicators will assist USAID missions in designing, monitoring, and evaluating field activities, and determining their impact on natural resources.

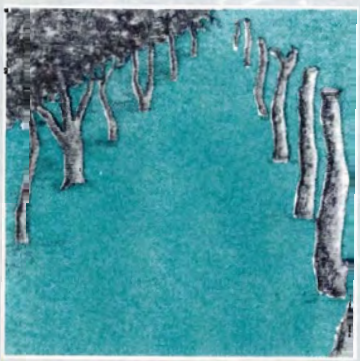
The Bureau for Africa obligated $1.5 million in FY 1988 and $2.1 million in FY 1989 for biological diversity and tropical forest activities through both missions and the NRMS Project. USAID missions are supporting an increasing share of these activities. Mission-funded projects are currently underway in Rwanda, Uganda, Madagascar, Cameroon, Kenya, Botswana, Senegal, Niger, and Mali.

Donor coordination in the natural resources field in Africa has been significantly strengthened in the last two years. USAID recently joined with the World Bank, other international agencies, and the government of Madagascar in the development of an environmental action plan for the country. As a result, a multidonor project, Environment I, developed by the World Bank, is expected to include a significant component from USAID in FY 1990. USAID is also assisting in multidonor environmental action plans being put together in Rwanda and Guinea, and is investigating how to contribute to action plan efforts in Lesotho, Ghana, and Mauritius.

Regional cooperation in natural resource management was strengthened by a USAID-supported Afromontane forest workshop held in Rwanda in June 1989. The workshop, sponsored by Wildlife Conservation International, represented the first time African professionals, donors, non-governmental organizations, and host governments in Uganda, Rwanda, Burundi, and Zaire have come together to discuss common issues in forest management. A regional agroecological approach of this nature can bring about collaborative activities and have a positive impact on natural resource management at both the farmer and policy level.

Among the 65 participants were 45 professionals from each of the concerned countries and 20 professionals from non-African countries. Discussions focused on ways to balance conservation and development interests in Afromontane forests through multiple use management, better forest protection, tourism development, education, and training.

At the workshop, participants agreed to form a standing committee on regional cooperation with two members from each of the four



countries. The committee will facilitate continuing cooperation through reciprocal site visits and professional and informational exchanges. This cooperation will improve planning within the region. Plans are underway to hold a second workshop next year in Burundi to follow up on recommendations from the Rwanda workshop.

USAID has funded a number of studies directly related to the conservation of biological diversity and tropical forests in Africa. These include a study to determine the role of African deforestation and afforestation as a factor in worldwide global climate change being conducted by Oak Ridge National Laboratories. This study, to be concluded in December 1989, complements a similar effort in a global context conducted by the Bureau for Science and Technology's Energy and Natural Resources Directorate.

Through the NRMS Project, several related studies are also being conducted by Energy Development International, including one that examines how policies on incentives and subsidies affect the protection, management, and exploitation of natural resources, a review of the state-of-the-art literature on management of tropical forests in sub-Saharan Africa, and an analysis of how to enhance the effectiveness of government and non-governmental partnerships in natural resource management in sub-Saharan Africa. All three studies will be completed in FY 1990.

Nature Tourism in Rwanda

USAID-supported projects in Rwanda are making the connection between the economic benefits of tourism and the conservation of two unique, species-rich protected areas—the Volcanes National Park and the Nyungwe Forest.

The Volcanes National Park is home to the mountain gorilla (*Gorilla beriengi*). A decade ago, the gorillas were severely threatened—killed by poachers at an alarming rate, their forest habitat being disturbed by cattle and destroyed to make way for subsistence farming. The gorillas and the park land were viewed by local residents only in terms of their short-term needs.

Since 1979, the Mountain Gorilla Project, established as a management consortium of several international conservation organizations, has assisted the Rwandan government in its efforts to protect the mountain gorillas and their habitat.

These efforts have been highly successful. Access to the gorillas and the park is now carefully controlled by the Rwandan government's Office of Tourism and National Parks. Conservation education programs in the local schools and community enabled local people to better understand the importance of the forest as a watershed, and the gorillas as a unique and valuable asset.

Mountain gorilla, *Virunga Volcanoes* Rwanda.

R. A. Mittermeier
World Widldlife Fund

When researchers and visitors came from all around the world to see the forest and the gorillas, local residents discovered that they could benefit from these resources. Demand for porters, produce, and hotels stimulated the local economy by providing employment and a market for local goods and services.

In part because of the international recognition of the conservation efforts in Volcanes National Park, tourism in Rwanda has increased dramatically, making it the country's second most important source of foreign currency. The government, as a result, is creating a network of park and forest reserves, building interpretive centers to enrich park visits, developing local handicraft markets to stimulate local employment, and providing incentives for visits to other parks and forest reserves.

The USAID-supported Extension Program for the Mountain Gorilla Project builds on these changes. Through a two-year $88,550 grant, the African Wildlife Foundation is promoting conservation education in Volcanes National Park in collaboration with the Peace Corps. By training local teachers and park guides, the project has permitted the expansion of conservation education programs so that both tourists and local residents could learn about the mountain gorillas and other unique resources in the Volcanes National Park. The project also increases the capacity of park staff to identify, study, and catalogue the park's plant and animal species.

Through the USAID-supported Nyungwe Forest Reserve Project, Wildlife Conservation International, a division of the New York Zoological Society, is helping to evaluate and promote non-consumptive uses of the Rwandan Afromontane forest, including tourism. This two-year $128,000 project was initiated in FY 1988 in the southwestern Rwandan forest reserve to develop a buffer zone for regulated logging and other development efforts while retaining the natural environment in a large core area.

To further promote sustainable natural resource management in Rwanda, USAID initiated in FY 1989 a seven-year $9.4 million project nationwide, which is being implemented in part by private non-governmental organizations, such as the African Wildlife Foundation and Wildlife Conservation International, working in the area of tropical forestry.

USAID-supported projects in Rwanda are helping to manage important forest and wildlife habitat, strengthen environmental training, and increase public awareness of the long-term value of natural resources through partnerships with non-governmental organizations and the Peace Corps.

From Plan to Action in Madagascar's Parks

Conserving the biological diversity of Madagascar—a nation often called a "living laboratory of evolution"—has become an international priority. Because of its isolation and wide diversity of ecosystems, Madagascar has over 150,000 species of plants and animals that exist nowhere else but on this California-sized island off the southeastern coast of Africa.

To some degree all of Madagascar's 36 protected areas (covering about 10,000 square kilometers or 1.7 percent of its national territory) are threatened from fires, slash-and-burn cultivation, poaching, drainage of wetlands, and uncontrolled grazing by livestock.

Together with the World Bank, other international donors, and the government of Madagascar, USAID has helped to develop an environmental action plan for the country that includes:

- restructuring and reinforcement of protection for reserves and national parks;
- creation of new protected areas;
- environmentally sound rural development programs;
- rational utilization of natural environments outside protected areas; and
- thorough review of existing native forest cover using satellite imagery and aerial photography.

As a result of this effort, a multi-donor project has been developed by the World Bank, aimed at implementing the main components of the Madagascar plan. USAID and the World Wildlife Fund co-sponsored a meeting on the action plan at the World Bank in January 1989. The meeting made donors aware of the concept and design of the action plan, enabling them to share information and discuss the major issues.

In coordination with the Madagascar plan, USAID is working closely with non-profit organizations and the government to protect biological diversity. Through the Missouri Botanical Garden, for example, USAID began a two-year $450,000 project in FY 1988 to establish a national park on the Masoala Peninsula. The peninsula, located in the northeast portion of Madagascar, maintains one of the island's largest intact blocks of tropical rain forest, considered by the international conservation community as an area of high priority in terms of its biological diversity.

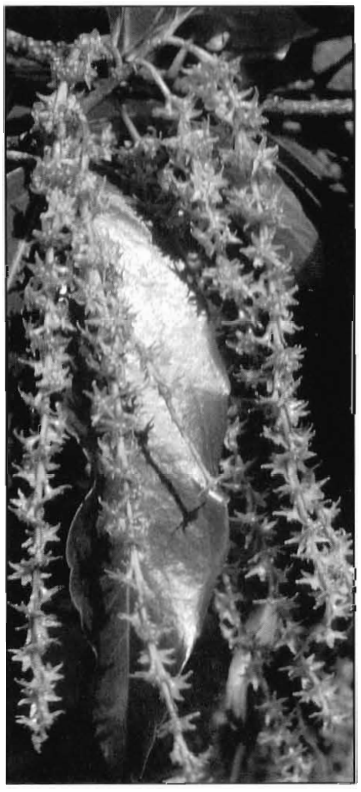
The national park, to be located on the southwestern side of the Masoala Peninsula, will have clearly marked boundaries and a well-trained, well-equipped staff. A biological inventory and research will be conducted on plant and animal species. The project will help protect 3,000 square kilometers of the remaining tropical forest and establish rural development activities aimed at providing food self-sufficiency, income generation, basic health care, and education for the local population.

Based on a dialogue with local communities surrounding the park to assess their needs, small-scale development projects will be selected. These are likely to include construction of small irrigation systems for intensive sustainable cultivation; introduction of improved seed varieties and cultivation techniques; pilot projects in small animal production; improved fishing and fish-processing techniques; and agroforestry. All projects will have a strong self-help component and involve training of local people.

The Missouri Botanical Garden is implementing the project's resource management activities while Lutheran World Relief is implementing the development component through its Agricultural Development Branch (SAFAFI).

In FY 1989, USAID provided $100,000 to the World Wildlife Fund to build on its FY 1987 effort to conserve and sustainably manage the Beza Mahafaley and Andohahela reserves in southwestern Madagascar.

To further increase the funding for resource management around Madagascar's parks and reserves, USAID joined with WWF in Africa's first debt-for-nature swap. (See Box on Debt-for-Nature.) In August 1989, a $1 million grant was announced to assist WWF in acquiring up to $2.1 million worth of commercial Madagascar debt, which then is converted into local currency and used to support conservation activities, including the training, equipping, and support for over 400 park rangers.



Top: Flacourtiaceae, *Homalium* in Madagascar.

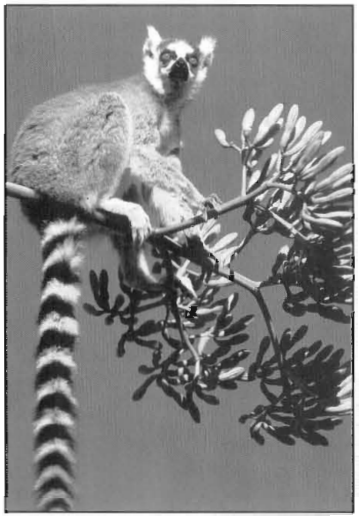
Right: Mt. Beondroka in R.N. Marojejy part of Massif Marojejy, Madagascar.

G. Schatz
Missouri Botanical Garden

Niger's Forestry and Land Use Model

In 1948, Niger's Guesselbodi National Forest, a 5000 hectare site some 25 kilometers from the capital city of Niamey, was a rich, dense woodland. By 1980, however, 40 to 60 percent of the forest vegetation had been slashed and burned to create farmland for the growing population, and most of the topsoil had washed away as a result. Foraging by farm animals, growing fuelwood demands, and recurring droughts further exacerbated the situation.

USAID began working with the government of Niger in 1980 to reverse the deterioration of the forest through a seven-year $4.4 million Forestry Land Use Planning Project. Rather than depending solely on planting large numbers of trees, small-scale, low-cost measures to encourage regeneration of the natural forest that provided sustainable yields of wood and forage were instituted. These techniques included installation of microcatchments, check dams, and earth-and-stone banks to slow down the flow of rainwater. Wherever moisture collected, project personnel planted local species of trees, and there were some cuttings brought in. Twigs and branches previously considered waste were used as mulch to protect and improve the soil. This helped to retain moisture, attracting termites to aerate the soil and make root growth easier. Adjacent plots were plowed (to open the soil to rain penetration) or left bare, as control plots. Two years later, the mulched plots produced five times as much vegetation as plowed strips, while control plots produced no vegetation at all.



Ringtail Lemur, Madagascar.

R.A. Mittermeier
World Wildlife Fund

Simultaneously, the project worked with local residents to create the Guesselbodi Woodcutters Association to share in the stewardship of the forest and to accrue the benefits and share the costs with the government. In 1987, the cooperative negotiated a contract with the government to jointly manage the Guesselbodi National Forest. This, by all accounts, is the first official partnership to manage state lands that has been concluded between the Niger government and a private group. Under this agreement Association members, who live in nine villages surrounding the forest, have the right to harvest fuel and forage under a sustained yield plan. They also now have a vested interest in providing stewardship. They care for the trees and environment because they reap the benefits from crops, controlled grazing, and wood products.

The revenues from the Guesselbodi National Forest provide a profit for members of the Woodcutters Association and also pay for the management of the forest. This enables the Niger Forestry Service to control the forest with minimal outlay.

The project has improved nearly 3000 of the 5000 hectares in Guesselbodi Forest. Each year 500 additional hectares come under management. The project has also practiced approaches for inventorying and monitoring the forest to determine levels of sustained growth. These approaches have widespread application, enabling planners to provide for optimum use of a forest while ensuring the integrity of the forest itself.

The project trained Nigerians to carry out inventories, surveys, and management plans, as well as provided internships for students from the School of Forestry at the University of Niamey.

Some techniques used in the Guesselbodi model site have widespread application in the Sahel and are now being adopted by other donors.

The Guesselbodi experience demonstrates that indigenous resources can be economically managed for sustaining yields of wood and forage without loss of vegetation cover and with the ability to recover the costs. It also indicates that there is promise in Africa for management of natural resources in a manner that is ecologically sound while meeting the financial concerns of farmers.

Village Reforestation in Mali

The goal of the Village Reforestation Project seemed simple—to assist the Malian Forestry Service in getting villages to establish wood plantations in the Fifth Region. The farmers, however, had no incentive to manage village forests since they saw no direct benefit to themselves.

Since the project was initiated in 1983, it has evolved into a successful approach that helps farmers increase their production and income through reforestation and land restoration. Today, Mali's Village Reforestation Project is a model, showing how tree planting can be accomplished at relatively low cost.

First, the project had to change the function of the forestry agents, whose role had been to police tree cutting by fining the offenders, into technical extension services. Forestry agents worked with village leaders with help from Peace Corps Volunteers to establish pole plantations, small gardens on abandoned soil areas, soil and water conservation works, windbreaks, living hedges, and fruit orchards. Once farmers knew that assistance was available, they initiated their own economic enterprises. Providing forestry agents with training, vehicles, and field expenses allowed them to serve an outreach function and respond to farmers' initiatives.

In one instance, a farmer near the town of Bandigiara requested assistance from agents in establishing four hectares of Eucalyptus trees in his garden. Within three years, he reaped considerable income from the sale of poles cut from the planting. As a result, 100 neighboring farmers requested and received assistance from forestry agents in establishing their own plantations. Once the expense had been put into establishing one viable model in which a farmer showed a profit, the next step was to bring farmer leaders to talk to the successful farmer to further encourage replication.

Agents helped farmers along the Niger river replace dead thorn fences with living hedges, which reduce the amount of labor required each year to collect thorns, provide fuel and forage, and also reduce the amount of vegetation cut each year for fencing.

The project supported a water catchment workshop in February 1987 that trained agents and farmer leaders in construction of contour dikes, which slow soil erosion. That summer, agents and farmers established pilot dikes in several villages and brought farmers in to demonstrate the effectiveness of the dikes.

Through the AID-supported Village Reforestation Project, hundreds of farmers have improved the management of natural resources. Much of the investment in raising and protecting seedlings, or in conserving soil and water, comes from individual farmers. The project offers insights into how donors and host governments can effectively assist farmers by using model sites of natural resource management as a powerful tool in reducing the donor's role and demonstrating economic benefits to the farmer.

The project suggests that instead of aiming at a given number of hectares to reforest or protect, governments and donors should try to establish a number of model sites and provide technical assistance to farmers who choose to adopt improved land-use management. Farmers then have the opportunity to see alternative management systems firsthand, and host governments have the opportunity to make informed decisions about tenure and institutional policies.

Peace Corps forestry Volunteers Mitchell Muchaud and Thomas Erdman, assisting local counterparts to grow citrus fruit trees in the USAID-funded Bandiagara project tree nursery in Mali. The fruit trees will later be transported to smaller village nurseries and planted by farmers as a part of the agroforestry program.

Carolyne Watson
U.S. Peace Corps

Alley-Cropping: The Importance of a Research Network

Shifting cultivation, known for its slash-and-burn method of clearing land, is a widely practiced traditional system of subsistence farming in the tropics. With increasing pressure for more food and land resources, this once-sustainable system is now a worrisome cause of deforestation and increased atmospheric carbon dioxide levels.

USAID is helping to provide innovative alternatives to slash-and-burn agriculture through its support of agroforestry techniques—particularly alley-cropping—now emerging from Africa's international agricultural research centers. Agroforestry is generally defined as a mixture of agricultural and tree crops on the same land, simultaneously or sequentially, in contrast to slash-and-burn practices where several years of cultivation are followed by a period of "bush fallow." Agroforestry systems are used for a variety of purposes, including erosion control on hillsides, windbreak rows in dryer regions, and mixing tree crops using banana, coffee, cocoa, coconut with various annual crops. Alley-cropping combines row crops, such as maize, cowpeas or cassava, with small trees, generally from the nitrogen-fixing legume family, mimicking the natural forest or bush. Shrubs or trees, with their deep roots, provide for the cycling of nutrients essential for crop growth and soil structure. Trees provide a nutrient-rich mulch for the soil, cool it, and add organic fertility. They can also provide valuable fodder for livestock and fuel for cooking.

On the macro level, alley-cropping provides a means of stable cultivation, maintaining soil fertility, and permitting more intense management of resources. Increasing the productivity of land over time reduces pressure for new land clearing and resulting destruction of forest.

USAID helped to establish an alley-cropping research network with its contribution of $2 million in FY 1988 to support three institutes sponsored by the Consultative Group on International Agricultural Research (CGIAR), with outreach to national research programs and a series of collaborative programs with U.S. universities.

The collaborative activities focused on key scientific aspects of the alley-cropping system as well as important socio-economic questions. The International Livestock Center for Africa (ILCA) established a cooperative program with the University of Wisconsin Center on Social Sciences to examine issues of land tenure. The introduction of alley-cropping, which allows continuous use of farm lands, can entail fundamental shifts in patterns of land holding, both for individuals and for communities. Other studies with the University of Wisconsin will examine nutritional aspects of forage from leguminous trees used in the system. Forage research will be critical to designing alley-cropping combinations that favor sheep and goats.

The International Institute for Tropical Agriculture (IITA) has developed a collaborative agreement with Michigan State University to analyze root competition in the soil, since crops must have sufficient nutrients and space to grow properly. Michigan State has special expertise in the area of root competition and mineral nutrition that will be valuable to IITA programs studying the production of maize, cassava, cowpea, and other crops grown in the alleys between the hedgerows.

The University of Hawaii has a long history of leadership in biological nitrogen fixation in tropically adapted leguminous shrubs. IITA will work with the University of Hawaii to determine advantageous associations between tree roots and soil organisms providing nitrogen fixed from the atmosphere. These activities will run over a three-year period.

USAID's Bureau for Science and Technology also made a special grant in FY 1988 to the International Council for Research on Agroforestry (ICRAF) to work with IITA and Oregon State University on the genetic screening and improvement of woody species used in alley-cropping. This genetic basis for alley-cropping is seen as a missing link in the cross-institutional research chain.

These collaborative activities provide vital support for the alley-cropping research network. The other major connection is with the national research programs. At present, thirteen African countries are participating in the network, and these cooperative programs at the national level are key to designing systems using trees, crops, and livestock that are well adapted to local farmers' needs. The network joins the national and international center programs into an effective unit for planning and implementing a comprehensive research and development program.

The inaugural workshop to develop the network was held at IITA in Nigeria in August 1989. This initiative was based on a long-time USAID interest in alley-cropping, as well as a concerted effort to develop a broad-based, collaborative program going back to 1985. Today funding is coming from many donors, including Canada, Denmark, and Germany, as well as United Nations agencies. USAID's one-time contribution was key in generating interest from other donors. The program is now approaching $10 million—funding a range of coordinated activities over several years.

Alley cropping is a form of agroforestry that combines row crops with multi-purpose leguminous tress.

Robert Wagner
Rodale Institute

Burundi: Protecting Biological Diversity

Management plans for five biologically diverse protected areas are being developed by Burundi's National Institute of Environment and Conservation of Nature in collaboration with the Peace Corps, through a USAID-supported four-year project initiated early in 1988. The areas—Kibira and Ruvubu National Parks and Bururi, Rumonge, and Kigwena Forest Reserves—include some of the few remaining Afromontane forests.

Due to their evolutionary history, these forests harbour a rich and unique assemblage of plant and animal species. In addition to their scientific value, the Afromontane forests are also playing a critical role in water catchment that is vital to the well-being of surrounding human populations.

The population density surrounding the forests is unusually high, because Burundi has the second highest density on the African continent, and 95 percent of the population live as subsistence farmers. With increasing demands for fuel and construction wood as well as land for agriculture, the pressure on the forests and other protected areas is continually growing.

The Peace Corps/Burundi Biological Diversity Project includes a vegetation and wildlife inventory for each of the five reserves. A general management plan will be developed for each reserve, with a focus on resource protection, tourism, and rural development. Guards in each reserve will receive ecological training to be able both to provide interpretation for tourists and to record data on wildlife species and behavior. Conservation education efforts will include information materials to be developed for each of the reserves, with field guides and slide shows, as well as programs to increase awareness among the local population about the role these natural areas play in soil conservation and watershed protection.

Much has been accomplished since the project began. Management plans for the Kibira and Ruvubu National Parks are practically complete. A training program for park guards has been planned, and the first training-of-trainers phase of the project took place in September 1989.

The Peace Corps/Burundi Biological Diversity Project builds on a recently completed USAID project in the Bururi forest to protect more than 1,600 hectares of montane forest by surrounding it with 750 acres of fast-growing trees that can be used for fuelwood and building poles. It helped reduce soil erosion and increased the availability of alternative fuelwood sources.

The Peace Corps has worked in cooperation with the Burundian government since 1983, providing nine forestry, wildlife, and conservation education Volunteers to assist in the protection of the country's natural resources. Assigned to the National Institute, the Volunteers have played a significant role in improving the management of Burundi's parks and protected areas, and in initiating countrywide conservation education programs.

By combining resources, strengthening institutional ties, and building on experience, the Burundi project has a significant role in supplying the information, management, and training resources needed to help sustain local efforts to protect some of the world's most unique forest areas.

REGIONAL SUMMARY: ASIA AND THE NEAR EAST

The Bureau for Asia and the Near East has given priority to gathering the information needed to learn what actions are necessary in each country to achieve sustainable management of tropical forests and to conserve biological diversity.

Background assessments have been completed for Morocco, Tunisia, Egypt, Nepal, Sri Lanka, Thailand, and Indonesia. Assessments are underway in Jordan, Yemen, India, Bangladesh, the Philippines, and the 10 nations of the South Pacific. Countries that will be covered next year include Pakistan and Oman.

This background information is obtained in a variety of ways, depending upon the interest and involvement of the host country. In Nepal, Sri Lanka, and Jordan, for example, it is part of a larger and more collaborative effort to prepare national conservation or environmental strategies which require two or three years to prepare. These strategies are intended to incorporate the environmental concerns in national five-year development plans. If formally adopted by governments, they are normally included in the national budget with dedicated funds and the assignment of responsibility for implementation.

The National Conservation Strategy of Nepal has been completed with support from USAID and other donors, and has been formally adopted. It will be presented to the donor community in December 1989 for support. The USAID mission in Kathmandu, however, is already supporting conservation programs in the Chitawan, Sagarmatha, and Annapurna protected areas.

In Jordan, a National Environmental Strategy is underway. For the first time, a national strategy will include cultural and historic sites that are socially and economically important to the country. USAID has provided funding to the International Union for Conservation of Nature and Natural Resources (IUCN) to carry out these efforts.

In other instances, the needed information is assembled as part of a country environmental or natural resources profile, as with the USAID-funded Natural Resources Profile for Thailand, prepared by the Thailand Development Resources Institute at the request of the Royal Government of Thailand. This effort provided the basis for the $44 million Management of Natural Resources Project, a part of which will support biological diversity conservation over the next six years.

In the unique situation of Turkey, where there is no USAID mission but great interest on the part of a non-governmental organization, funds were provided to the Environmental Problems Foundation of Turkey (EPFT) to prepare a report on Biological Diversity Conservation. This provided the impetus for a new biological diversity institute, established at the request of the government, which USAID will help support with FY 1989 funds.

When governments have initiated national conservation strategies or other comprehensive planning efforts with support from other donors, USAID has supported these background assessments as a contribution to the larger program. One is being prepared for the Philippines as a contribution to the World Bank natural resources sector loan, and one in Bangladesh will be a contribution to the Nordic-funded National Conservation Strategy.

Where no government or donor effort is available, USAID prepares the background assessment as a separate report. These are used by missions for planning activities, and as in Morocco and Egypt, will be incorporated in the forthcoming country environmental profiles planned by USAID for those countries. Support for these assessments has been funded through a central reserve allocated to biological diversity.

In addition to the collection of the information necessary for the

planning of activities, funds have been provided to initiate small on-the-ground programs in several countries through cooperative agreements between the Bureau and World Wildlife Fund, and the US Fish and Wildlife Service. This seed money has been used, in so far as possible, to initiate activities that will be funded in the future by field missions. This transition is already underway in Jordan, Nepal, Thailand, and Indonesia.

New natural resources projects are planned to begin in 1990 and 1991 in Morocco, Sri Lanka, the Philippines, Indonesia, and the South Pacific. India will substantially increase the level of funding for conservation of tropical forests and biological diversity in the region.

The Bureau, in recognition of the need to place even greater emphasis on environmental and natural resource management across the ecologically diverse region from Morocco to the South Pacific, is preparing a regional strategy that is examining the role of conservation and management of tropical forests and biological diversity in this extensive region. The strategy will underline the importance of natural resources to the region's economic growth and the need for policy reform to address the prevailing practices that undervalue forests, encourage or fail to regulate conversion to unsustainable agriculture, subsidize the extraction of timber and other forest products to the detriment of sustainable yields, and ignore the need for obtaining fair rents or royalties that could be reinvested in productive forest management.

The strategy will also recognize the need for obtaining better information on the status and trends of natural resources in every country as the basis for national and international planning. It will encourage greater awareness of the issues among the public and policy makers of the region as a critical factor in assuring that action occurs. Finally, it will note that the level of effort required and the resources available to USAID make coordination with other donors essential.

The Philippines Biological Diversity Survey and Action Plan

The tropical, mountainous, island geography of the Philippines presents a complex ecological picture, characterized by an extraordinary diversity of life forms. Unfortunately, most of the natural habitat containing the country's biological diversity has disappeared since 1945.

In early 1987, as the government led by President Corazon Aquino struggled to define policies that would reverse decades of environmental abuse, USAID provided a grant to assess the status of biological diversity in the Philippines and identify the conservation priorities.

Two of the world's most diverse ecosystems, the coral reefs and lowland dipterocarp forests, contain at least 12,000 species of flora, 850 species of birds, 225 species of mammals, and 2,100 commercial fish species in the Philippines. Rates of endemism (species found in the Philippines and nowhere else) are thought to be among the world's highest for some groups of organisms.

In 1987, information on species and their ecosystems was scattered, incomplete, or unrecognized. Nowhere was there an overview of biological resources in the Philippines. Yet, the country's

Mangroves, Philippines
World Wildlife Fund

biological diversity was under heavy pressure from one of the highest population growth rates in Asia and from the exploitation of natural resources to generate foreign exchange to repay the region's largest foreign debt.

The $78,000 grant to the Center for International Development and Environment of the World Resources Institute has provided modest but timely support to the local Haribon Foundation in its effort to characterize biological diversity in the Philippines, analyze its present and future values, and examine the numerous threats to its continued maintenance. Most importantly, the Philippines Biological Diversity Survey and Action Plan is identifying effective steps that can be taken to conserve biological diversity and is providing this information to the Philippine government, USAID, and the World Bank for natural resources programs.

A six-member team, including members from the University of the Philippines and Haribon staff, has conducted a scientific survey of biological resources using existing sources of information, assessed causes leading to the erosion of the country's biological diversity, and examined socio-economic issues which must be addressed if conservation measures are to be effective. In December 1988, the report served as the basis for a national conference to draft the Action Plan to Conserve Biological Diversity in the Philippines.

This information synthesis provides new insight into the magnitude of the conservation problems facing biological diversity in the Philippines. Since 1920, over 80 percent of all mangrove forest areas in the country have been destroyed, principally by fuelwood cutting or conversion to shrimp farms. Mangrove forest areas provide critical breeding and nursery habitat for many commercially important fish species in the Philippines. A recent assessment has indicated that Philippine coral reefs, perhaps second in biological diversity only to Indonesia, are among the most abused in the world. Only 6 percent of the coral examined could be described as being in "excellent" condition, whereas more than 70 percent was assigned to the categories "fair" and "poor." Sedimentation from deforested watersheds, blast fishing, muro ami fishing, and coral mining continue unabated. In a country where 60 percent of protein intake comes from fish products (a figure that is much higher among the poor in coastal and urban areas), these are serious causes for concern.

Other findings highlighted include a 90 percent reduction of the Philippines' most biologically diverse habitat, the lowland dipterocarp forests, since 1900. Eleven endemic tree species used by indigenous tribal people for a variety of medicinal purposes, including tumor-inhibiting and anti-malarial properties, are faced with imminent extinction. Despite the potential economic importance that the 12,000 species of plants (including 3,150 tree species) may have for pharmaceuticals, food crops, and natural pesticide compounds, very little is known about the economic botany of the Philippines. The project has made clear that deforestation and natural habitat fragmentation have pushed numerous species to the brink of extinction.

Work on the Philippines Biological Diversity Survey and Action Plan has raised interest within the country. High school teachers and college professors have asked for more information on biological diversity in the Philippines, based on accounts contained in Haribon's newsletter and reports in the mass media. The University of the Philippines at Los Banos plans to incorporate the survey and action plan into its undergraduate biology curriculum.

Public interest and concern about the country's valuable biological resources is growing, and better information is being provided to guide the development of natural resource management programs in the Philippines.

Philippines:
Left: Marine life, coral reefs.
World Wildlife Fund

Right: Soil conservation and watershed management—planting on steep slopes
U.S. Peace Corps

Nepal's Strategy to Conserve Through Better Parks and Forestry

Nepal, from the dense monsoon forests of the Terai to the temperate forests and snow-covered peaks of the Himalaya mountains, has diverse ecosystems and fascinating biological diversity.

While Nepal's unique natural heritage receives a measure of protection from an existing network of six national parks and five wildlife refuges, rapid population growth—expected to double in the next 25 years—internal migration, and immigration have led to unplanned settlement, often illegal occupation of land, that encroaches on forests and marginal lands. With few off-farm employment opportunities, the pressure on land and forest has grown. While tourism and trekking play a substantive role in the economy of Nepal, direct economic benefits are offset by their detrimental impact on the environment.

One example is the Sagarmatha National Park, home of Mt. Everest, internationally designated World Heritage Site, that suffers from the mixed blessings of tourism with more than 25,000 visitors to the park each year. Man-made comfort services have taxed the water supply. Increased use of fuelwood and trash disposal are serious problems. USAID is assisting in the development of a management plan for this park.

A FY 1988 USAID grant of $100,000 to the Woodlands Forest Institute, a U.S.-based non-profit organization, will provide technical assistance to design and implement a plan that addresses these issues within the park as well as the development needs of the surrounding communities such as forest management, improved agricultural practices, and village-based health services.

Another USAID-supported project linking conservation with the basic human needs of the people living in a fragile mountainous region of Nepal is based in Annapurna. The Annapurna area, like the Mt. Everest region, is subject to heavy stress on the natural environment, stemming in part from the large number of trekkers—some 25,000 a year—who have contributed to littering, and increased poaching of wildlife and timber causing a heavy toll on the environment.

The King Mahendra Trust for Nature Conservation, a non-governmental organization set up under the patronage of His Majesty the King, has operated the Annapurna Conservation Area Project as a pilot for biological conservation in the populated Himalayan system since 1986 with the assistance of the World Wildlife Fund.

The project increases local involvement with technical assistance through extension staff who enable local forest management committees to make their own decisions on resource utilization and management.

USAID is supporting the Annapurna Conservation Area Project with a FY 1989 grant to the World Wildlife Fund. It will support integrated forest and wildlife management, community projects including income generating activities, conservation education, and infrastructure development.

Royal Chitawan National Park is a world-class protected area that includes several endangered species such as the tiger and the greater one-horned rhino. In 1984, the USAID-supported Nepal Terai Ecology Project was initiated to broaden on-going research efforts conducted by the Smithsonian Institution to include studies of tall grasslands and critical populations of rhinos in the national park. More recently, USAID and World Wildlife Fund have provided funds for the improvement of a visitors' center at Sauraha, environmental education, and on-farm agroforestry projects in nearby communities.

Even as projects were directed toward communities around the parks, there was a need to develop an overall forestry program within the national context that involved local communities.

Since the late 1950s, the government of Nepal had followed a policy of centralized forest management, trying to prevent forest depletion by restricting and controlling resource utilization. Despite this policy, forest resources were subject to exploitation by over three million rural families.

Several USAID-supported studies contributed to the recent change to a decentralized, local management policy. Subsequent policy dialogues between the government, USAID, and other donors have led to the development of a Forestry Master Plan for the country. The recently adopted plan constitutes a significant shift in policy and administrative orientation on the part of the government. The plan is based on the premise that local communities, rather than the government, will manage the majority of the nation's 5.6 million hectares of remaining forest land.

With the shift in management of forests to local communities, USAID emphasized the need for

Left: Greater one-horned rhino.

M. Boulton
World Wildlife Fund

Right: Reforestation in Nepal.

D. Messerschmidt
Forestry Support Program
USDA/OICD Forest Service

change in forest regulations to provide appropriate financial incentives for the communities to take over management of forests. USAID supported an analytical study which demonstrated the degree to which state-owned parastatals were not effective or efficient in fuelwood and timber marketing. Another study provided the basis for a policy change that permits actual leasing of forest land by private forest product industries for growing their own raw materials. Current policy changes will also enable private forest owners to utilize their own trees without obtaining specific government permission.

As part of a multidonor effort to implement the Master Plan, USAID initiated the Forestry Development Project in FY 1989. This project will help to strengthen the capacity of the Ministry of Forests and Soil Conservation to implement the plan for sustainable increases in forest production. It will also introduce across the nation improved stoves that conserve fuelwood usage.

Implementation of the Master Plan is designed to meet and sustain the requirements for fuelwood, fodder, timber, and other forest products while conserving ecosystems and genetic resources. The effort will also contribute to the growth of local and national industries, thereby creating opportunities for income generation and employment.

A key effort in helping Nepal to see the broader environmental picture has been the publication of the National Conservation Strategy by the government in conjunction with the International Union for Conservation of Nature and Natural Resources (IUCN). The strategy, developed with the support of USAID and other donors, provides a framework for the sustainable management of Nepal's natural resources and was launched at a ceremony at Chitawan National Park in December, 1989.

India's National Social Forestry Project

Forested land in India has been reduced to only about 12 percent of its original total area, due largely to population growth and the increased demand for fuelwood and other forest products. Large scale social forestry projects in response to this situation commenced in India in the late 1970s and increased greatly during the past decade with support from both the government and outside donors.

The original objective of these projects was to provide poor rural populations with assured fuelwood supplies and to increase employment through farm forestry and plantations established on unused community and public lands.

The National Social Forestry Project (NSFP), when initiated in 1985, built upon these earlier efforts, but the primary goals are to generate sustainable forestry production and increase rural income, while at the same time reducing soil erosion and restoring degraded wastelands for productive purposes.

One of the largest USAID-supported forestry projects, the $330 million NSFP, is jointly sponsored by USAID, the World Bank (International Development Agency), and the government of India. USAID plans to use $67.6 million in loan funds for tree production and grant funds for building the technical capacity.

The seven-year project covers four states: Gujarat, Himachal Pradesh, Rajasthan, and Uttar Pradesh. These states have a population of more than 80 million and a broad range of natural resource conditions and problems.

The project supports a variety of tree-planting programs on private, community, and public land with an overall target of some 700,000 hectares or the equivalent of a little over one billion trees. As a result of field experience, the project has been increasingly directed toward farm forestry as the most cost-effective means of augmenting wood supplies and improving rural incomes.

The project also includes financing and technical assistance to strengthen the capacity of the states and central governments to implement planting programs, and build private capabilities and incentives

Villagers meeting with Hal Fisher, USAID forestry advisor, and State government forestry officials to discuss local participation in social forestry activities in Madhya Pradesh, India.

Hal Fisher
USAID India Mission

for continuing tree planting.

A comprehensive recent evaluation indicates high levels of achievement. Approximately half a billion seedlings have been sold or distributed for private farmer planting, representing 118 percent of the target set for the project as a whole. Over 325,000 hectares have been planted by farmers on their private lands—exceeding the target by 18 percent. Another 39,000 hectares of community wastelands and 39,000 hectares of forest wastelands have been planted, representing 68 and 88 percent of project targets respectively. Monitoring reports show reasonable survival rates (50-60 percent for private farm forestry and 60-70 percent for public forestry).

Among the key achievements of the NSFP has been the significant growth in private farm forestry. Despite recent droughts, many farmers have transformed their farms and cropping systems to include large numbers of trees grown largely for the commercial cash market. Total production from private planting resulting from the project is substantial. It is estimated that the approximately 167 million trees planted each year yield an annual production of 3.4 million cubic meters. This is equivalent to about one-tenth of the entire nation's current recorded demand for industrial wood products or one-quarter of its pulp wood requirements.

In regions of intensive tree planting, market rates for short rotation eucalyptus and other pole species have dropped from their initially high level to more competitive rates. At lower rates, wood is an economically viable substitute for coal and is increasingly being used for commercial fuelwood. Lower rates for wood have also resulted as more wood became available on the market when farmers increasingly prune lower branches to reduce shade and increase trunk value. Cheaper costs for construction timber and furniture have spawned new processing industries with a resulting growth of employment and greater product availability to the poor. There has also been spontaneous development of private nurseries serving farmers' needs.

Public forestry efforts, including community woodlots and wasteland plantations, have yielded an income benefit to the rural poor through massive employment—38 million person days of paid labor in 1987–88. The creation of employment near villages has also increased the opportunity for women to participate in planting.

Experimental field programs have shown promise in demonstrating alternative solutions to such objectives as equity (shifting resources toward the poor) as well as rehabilitating private land. The project components dealing with institutional development and technical support have been effective in that most states have made progress in staff recruitment, in-service and farmer training, monitoring, and evaluation.

In Tunisia, one of the largest local currency investments in a tree-planting, soil and water management program was made by the USAID mission through the PL 480 Title I program.

The Chantieres Regional Development Project, a rural public works effort, began to receive support under PL 480 Title I in October 1987. At that time, $19.1 million was provided to help the Tunisian government to expand a long-standing labor intensive program by 35,000 jobs each year. The program was designed to address an increase in rural unemployment, the result of a 1986 structural adjustment effort aimed at restoring the Tunisian economy through an austerity policy. The unemployment situation was also aggravated at the beginning of 1988 by an extremely severe drought.

Causarina on sand dunes, Tunisia.

U.S. Peace Corps

During the 1987–89 period, the equivalent of U.S. $57 million has been provided to the Chantieres project. Work on natural resources management increased from 64 percent in 1987 to almost 80 percent in 1989. More than a quarter of this effort occurred in the forestry sector, including planting trees in plantations, along contours, and along borders as windbreaks or hedgerows. The effort was directed at forest maintenance, reforestation, anti-desertification control measures, fodder plantations of cactus and acacias, and tree nursery activities.

There was also a wide range of soil and water conservation projects.

This program is closely related to Tunisia's other donor activities, including those of the World Food Programme, the Food and Agriculture Organization (FAO), and the World Bank. For example, a World Food Programme project provides technical oversight and food to supplement the cash-for-work program supported with the PL 480 funds.

Pakistan's Forestry Needs: Timber to Energy

Pakistan faces a two-pronged problem: a scarcity of forest resources is coupled with the heavy dependence of its large population on wood for fuel. Wood supplies more than half of the nation's heating and cooking fuel, particularly in rural areas. Wood is also used as an industrial fuel, for building materials, and in various manufactured products. Demand for wood regularly outstrips the supply of replacement trees and the price of fuelwood has more than doubled in real terms during the past decade.

Because usable timber is in such short supply, farmers often burn cow dung or crop residues for fuel, diverting these substances from their more cost-effective use as fertilizer and thereby reducing agricultural productivity

The Pakistan Forestry Planning and Development Project, initiated in 1983, was intended to expand tree planting and production in Pakistan to supply fuel, fodder, and timber. The USAID contribution to the project is $35 million.

The project underwent a change in mid-1988 reflecting a shift in emphasis on the part of Pakistan's Provincial Forest Departments from forestry management on public lands, with building timber being the product of choice, to promoting and developing farm forestry on private land, largely for domestic consumption.

The primary goal of the project is to help Pakistan achieve energy self-sufficiency by helping it to increase its supplies. Secondarily, the project is intended to reverse the deforestation process, at the same time strengthening the government's ability to carry out successful public and private forest management programs.

The need for greater forest resources on private lands to meet farmers' subsistence requirements and provide a cash crop has generated considerable interest on the part of the farmers. Over 13 million trees have been planted on nearly 20,000 farms. More than 250 private farmers earned over $1.5 million in local currency by raising and selling seedlings to the government for distribution to other private farmers.

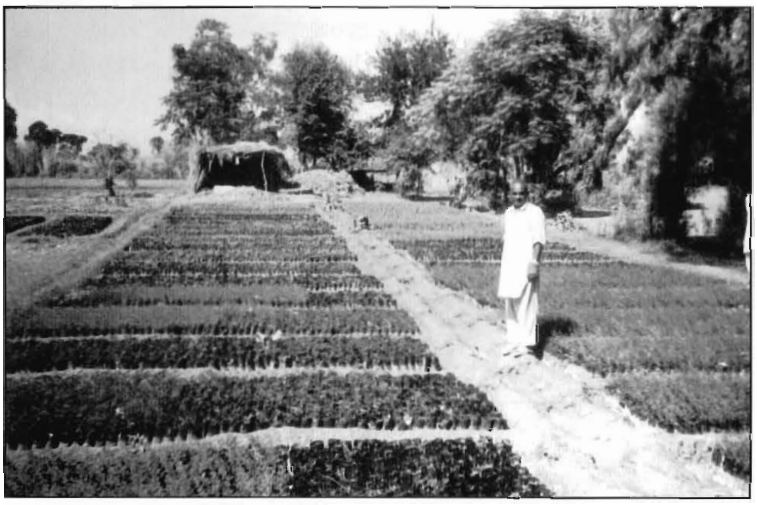
Information has reached many people as part of this project. An international seminar on forest policy formulation, sponsored by the project, brought together over 65 forestry experts. Publication of an English and Urdu-language newsletter aimed at stimulating interest among private farmers in tree cultivation began in FY 1988. Numerous technical manuals and research reports have also been prepared and distributed.

The Pakistan Forest Research Institute now has a curriculum for a master of science degree program in tree and energy forestry. A dozen provincial and federal forest officers are receiving long-term graduate training in universities throughout the U.S., while more than 80 forest officers have received short-term training. Various applied research activities have also been supported by the project, including field studies to improve growth rates and seedling survival after planting with cultivation methods best suited to Pakistan.

Socio-anthropological surveys of farmers' needs and constraints have also been conducted in over 100 villages. Research findings indicate that 66 percent of farmers are interested in planting trees on their farms, and 98 percent intended to use at least some of the trees for fuelwood.

Over the past two years, progress toward achieving project objectives has been seen. Private farmers are interested in both creating tree nurseries and in raising trees along with other crops. Tree farming is increasing private farm efficiency by making better labor utilization possible, since planting generally occurs between peak crop activities. Tree farming improves land utilization, since trees can be planted on land that is unfit for crops. On some sites northwest of Islamabad, for example, trees planted two years ago have grown to over 20 feet, and in some cases, saline lands are being restored for farming. Private farm forests are now providing an increasing amount of wood to supply Pakistan's private wood-consuming industries. The Forest Department officials are also more soundly convinced of the desirability of supporting private farmers and paying attention to harvesting and marketing issues.

These advantages have led Abeed Ullah Jan, Pakistan's Inspector General of Forests, to recently note that Pakistan's commitments to social forestry efforts such as the Forestry Planning and Development Project are demonstrating to the nation the importance of forestry benefits and the added opportunities they provide its rural citizens.



This farmer in the North-West Frontier Province of Pakistan has established a nursery to grow tree seedlings to sell to his neighbors. These private ventures are encouraged to help expand tree planting leading to farmers' increased income and greater self-sufficiency.

Winrock International

Preserving Jordan's Biodiversity

Working with the Royal Society for Conservation of Nature in Jordan, USAID is helping to establish the Zubiya Wildlife Reserve. The reserve is designed to preserve biological diversity and to help restore typical Jordanian fauna. The reserve may be able to prevent the extinction of the Persian Fallow Deer and develop self-sustaining populations of two deer species in their natural habitat.

Zubiya Reserve, consisting of more than 30 square kilometers covered with an open woodland, will be part of a system to promote establishment and management of protected areas in Jordan.

USAID has supported a number of programs aimed at the conservation of biological diversity in Jordan. Through work with the Royal Society, for example, USAID assisted in strengthening the educational outreach programs at the Shumari Reserve, an important wetland.

A National Environmental Strategy for Jordan is being prepared, with USAID support, by the International Union for Conservation of Nature and Natural Resources (IUCN) in cooperation with the Ministry of Municipal and Rural Affairs and the Environment. IUCN initiated work on the preparation of the strategy in early 1989. When completed, the strategy will provide a framework of principles and guidelines governing the future use of Jordan's natural resources for the long-term well-being of the nation.

APPENDIX

LISTING OF KEY DEVELOPMENT PROJECTS FROM WHICH EXAMPLES HAVE BEEN HIGHLIGHTED IN THIS FY1988—1989 REPORT TO CONGRESS

Project Title *Project Number*	USAID Country or Bureau	Primary Implementing Organization	Funding Years Beg. — End	Total Planned LOP* $ millions	Predominant Conservation Activity
WORLDWIDE PROJECTS					
Conservation of Biological Diversity *936-5554*	Science and Technology	World Wildlife Fund The Nature Conservancy World Resources Institute	88-97	28.4	Project builds the capacity of cooperating less developed country institutions and non-governmental organizations (NGOs) to recognize the critical need for and economic potential of biological resource conservation. Project components include: technical assistance, matching grants for research, training, pilot field demonstrations, and information networking.
Forest Resources Management *936-5519*	Science and Technology	U.S. Peace Corps USDA/OICD Forest Service	80-90	19.8	Project improves delivery of effective forestry assistance to USAID Missions and foreign governments by providing ready access to sound technical advice and quality professional field support in forest resources. Its two major components include the USDA/OICD/FS Forestry Support Program and a joint USAID/Peace Corps forestry and natural resources initiative.
Matching Grants to PVOs (Wildlands and Human Needs Component) *938-0158*	Food and Voluntary Assistance	(World Wildlife Fund)	Continuing (85-92)	(2.8)	Wildlands and Human Needs project will integrate natural resource management with human development needs via: income generation, land titling, better access to and management of wildland resources, and strengthening community conservation organizations.
Environmental Planning & Management *936-5517*	Science and Technology	World Resources Institute Center for International Development and Environment	82-92	19.5	Project helps developing countries to develop effective environmental and natural resource management institutions. Emphasis is upon linking natural resource management to agricultural programs, development of integrated planning methodologies, supporting host country non-governmental environmental organizations, and promoting the collection of resource assessments and data for use in national sectoral planning.
International Agricultural Research Centers (CGIAR) *936-4111*	Policy, Planning & Coordination	International Agricultural Research Centers	Continuing	N.A.	Supports research and extension work at the Centers for International Agricultural Research, such as the International Institute of Tropical Agriculture (IITA). Research includes agroforestry (especially alley-cropping) and some activities are carried out in cooperation with the International Council for Research in Agroforestry (ICRAF) and U.S. universities.
LATIN AMERICA & THE CARIBBEAN REGION					
Development of Environmental Management Systems *598-0605*	Latin America & The Caribbean	Various U.S. Institutions	Continuing	N.A.	Project improves the capability of Latin American and Caribbean countries to plan and manage their development activities in a manner consistent with sound environmental policies. Project finances surveys, assessments, feasibility studies, technical assistance, training, applied research, and pilot projects.
Regional Environmental and Natural Resources Management *596-0150*	ROCAP	Various local and U.S. Institutions	89-95	40.0	Project will address the issues identified in the USAID Strategy for Environmental and Natural Resource Management in Central America. These include: sustainable agriculture, production from natural forests, biological diversity, management of critical watersheds, policy formulation, institutional strengthening, and environmental education.
Forest Management *515-0243*	Costa Rica	Various local and U.S. Institutions	89-95	7.5	Project promotes forestry and agroforestry in buffer zones around the Braulio Carillo, Poas, and Irazu National Parks and supports the management of the parks themselves.
Agroforestry Outreach—PVO *521-0122*	Haiti	Pan American Development Foundation CARE International Resources Group Southeast Consortium for International Development	81-89	27.0	Project is planting and maintaining, with peasant support, fast-growing trees in deforested areas of rural Haiti, conducting agroforestry outreach activities and research. Additionally, agronomists and extension agents are being trained, tree nurseries developed, and an agroforestry resource center is being established.
Forestry Development *522-0246*	Honduras	USDA/OICD Forest Service	88-93	20.0	Project is designed to increase export of forest products through private sector involvement in production and marketing. The Honduran Forestry Development Corporation (CODEFOR) can then focus upon industry regulation and natural resource protection and management. Project components include: public and private sector institutional strengthening, training, and forest management.

* LOP refers to life-of-project funding amount.

APPENDIX continued

Project Title *Project Number*	USAID Country or Bureau	Primary Implementing Organization	Funding Years Beg. — End	Total Planned LOP $ millions	Predominant Conservation Activity
Central Selva Resource Management *527-0240*	Peru	Gov. of Peru Tropical Science Center Others	82-88	22.8	Project tests and institutionalizes a methodology for long-range management of the high jungle in Palcazu Valley, including agriculture, forestry, health, communication/transport, and land tilling. Forestry activities focus on a 30-year plan of systematic cutting for sustained yield, and forestry training is integrated with a research component.
AFRICA REGION					
Natural Resources Management Support *698-0467*	Africa Regional	Experiment in International Living Energy Development International	87-92	14.6	Project is designed as the Bureau's vehicle for systematic support to improve policies and programs, to restore and maintain environmental stability and the natural resource base in sub-Saharan Africa. Includes training, technical assistance, information support, research, PVO strengthening, and natural resource management program assessments.
Madagascar Debt-for-Nature Swap *687-0112*	Madagascar	World Wildlife Fund	89-89	1.0	This $1 million grant helps the World Wildlife Fund to acquire up to $2.1 million of Madagascar's commercial debt. The local currency generated will support conservation, education, and sustainable development activities concentrating on the Andringitra and Marojejy reserves, although six parks will also be targeted.
Masoala Conservation & Development *687-0104*	Madagascar	Government of Madagascar Missouri Botanical Garden	88-88	0.45	Project established a national park on the Masoala Peninsula in Madagascar which will protect the area's tremendous biodiversity. Includes conservation education, biological inventories and research, establishment of a national plant collection, and self-help activities aimed at ensuring food production and basic health care in communities surrounding the park.
Village Reforestation *688-0937*	Mali	Local Institutions	83-89	2.3	Project is developing a trial program of small scale village reforestation and supporting the government of Mali regional forestry service efforts. It introduces village intervention to increase fuelwood production and conservation and consists of tree nurseries, training, research, and demonstration woodlot plots.
Forestry and Land Use Planning *683-0230*	Niger	Government of Niger with Peace Corps Collaboration	80-88	4.4	Project provides assistance to the government of Niger to strengthen the planning and managerial capability of the Ministry of Water Resources and Environment. Includes the establishment of a Natural Resource Management Planning unit in the Forest and Wildlife Service, a natural resource inventory, four model sites, and the provision of training and extension programs.
ASIA & THE NEAR EAST REGION					
Regional Environmental Activities *398-0178*	Asia/Near East	World Wildlife Fund US Fish & Wildlife Various Universities National Governments Others	86-92	5.2	Provides support for Missions, non-governmental organizations, private voluntary organizations, universities, and national governments. Project priorities include: wildlife conservation, biological inventories, park establishment, natural resource management, conservation education, training, environmental assessments, and research.
National Social Forestry *386-0495*	India	Indian National and State Government Organizations	85-92	67.6	Project will help the Government of India develop the capacity to implement social forestry programs in four states: Uttar Pradesh, Rajasthan, Gujarat, and Himachal Pradesh. Goal is to raise the incomes and employment among rural poor by increasing production of small timber, fuelwood, fodder, and other forest products. Includes policy research, institutional strengthening, and tree planting programs.
Forestry Development *367-0158*	Nepal	Government of Nepal	89-94	8.0	Project will strengthen the institutional capacity of Nepal's Ministry of Forest and Soil Conservation (MFSC) to plan and implement a national community forestry program. Its three components include: 1) Forestry Policy/Planning to reorganize and strengthen MFSC's Planning Division, 2) Forest Management and Land Use Planning to improve the capabilities of the Forest Survey and Research Office, and 3) an Improved Stove Program to develop, design, and disseminate fuel-efficient cookstoves.
Forestry Planning and Development *391-0481*	Pakistan	Government of Pakistan Winrock International	83-93	35.0	Project will help the Government of Pakistan increase its indigenous energy supplies, reverse the process of deforestation, and to expand the extremely limited forest base. It will demonstrate the economic, technical, and social feasibility of producing tree crops on privately-owned farm and range lands. Includes institutional and manpower development, farm and energy forestry research, and farm and energy forestry field operational activities.
Natural Resources Management *493-0345*	Thailand	Government of Thailand World Wildlife Fund Others	88-95	44.0	Project will develop the capacities of Thai governmental and non-governmental institutions to define, analyze, and respond effectively to current and emerging natural resource and environmental management problems. The seven subprojects include: 1) natural resource plans for coastal areas, 2) a provincial rural resources management process, 3) human resource development, 4) policy analysis, 5) environmental awareness training, 6) biological resource management, and 7) industrial environmental management.