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CONSERVATION OF BIODIVERSITY IN MOUNTAIN ECOSYSTEMS — AT A *GLANCE*

The World Bank



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Cover photo: John Hone, the Maloti-Drakensberg mountains, Lesotho and the Republic of South Africa

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CONSERVATION OF BIODIVERSITY IN MOUNTAIN ECOSYSTEMS

Mountains are especially important for biodiversity conservation since many harbor unique assemblages of plants and animals, including high levels of endemic species. Mountain biodiversity and natural habitats bestow multiple ecosystem, soil conservation, and watershed benefits. Mountains are often centers of endemism—where species are prevalent in or peculiar to a particular region—and Pleistocene refuges, which are hypothesized to have high levels of diversity where patches of tropical rainforest persisted during periods of climate change 1.6 million years ago. Mountains are also sources for repopulating more low-lying habitats. Mountain ecosystems play a role in influencing rainfall regimes and climate at local and regional levels, helping to

contain global warming through carbon sequestration and storage in soils and plant biomass.

Conservation and sustainable use in mountain ecosystems present special challenges because of the harsh climatic conditions, the fragility of mountain soils and the increasing threat of habitat fragmentation and degradation. At the same time, mountain systems present special conservation opportunities as understanding increases of the inter-linkages between mountain development and neighboring lowlands. Better conservation and management of mountain habitats can help to secure river sheds, migratory pathways and other critical ecosystem services which provide substantial downstream benefits.



The World Bank and Mountain Biodiversity

Sustainable development in mountain ecosystems, including conservation of mountain biodiversity, are key elements of the World Bank's mission to promote poverty alleviation. Over the last decade, a number of World Bank projects have been making explicit linkages between conservation and sustainable use of mountain ecosystems, biodiversity conservation, carbon sequestration and watershed values associated with erosion control, clean water supplies and flood control.

Between 1992 and 2002, the World Bank has invested more than US\$1.3 billion globally in more than 90 projects that partially or wholly support biodiversity conservation and sustainable use in mountain ecosystems. These projects include the establishment and strengthening of new protected areas and biological corridors (e.g., Central America, Colombia, Georgia,

Laos); improved management of 'paper parks' and existing protected areas (e.g., Ecuador, Indonesia, Madagascar, Mexico, Uganda, Venezuela); conservation of medicinal plants (Ethiopia); and promoting community management of mountain protected areas and indigenous reserves (Colombia, Ecuador, Peru).

Bank watershed projects in the Middle East and North Africa incorporate natural forests and endemic riparian woodlands as part of micro-catchment vegetation management with local communities, including the Lakhdar watershed in Morocco, the northern Yemeni wadis, and Turkey's Eastern Anatolia Basin. In Ecuador, an integrated watershed management project is being prepared with a specific component to capture payment for environmental services provided by Andean forests. In China, mountain forests are being increasingly recognized for their role in clean water supply, water regulation, and flood control. The new China Natural Forest Protection project is focusing on mountain and upper watershed forests and re-allocating forests for their watershed and biodiversity protection functions as well as more sustainably managed production.

Bank projects and programs promote sustainable use of biodiversity in mountain ecosystems through institutional strengthening and capacity building for more sustainable management, establishment of



biological corridors and monitoring of harvests in mountain forests (Cambodia, Georgia, Papua New Guinea); integrated livestock and pasture management of mountain grasslands (China); improved land use planning in watershed forests and other natural habitats (China); reforestation of mountain watersheds and programs to promote natural forest regeneration of logged areas and degraded pastures (Colombia, Morocco, Turkey); promotion of agroforestry systems such as shade coffee (El Salvador, Mexico); and sustainable harvesting of non-timber forest products, including medicinal plants (Ethiopia, Peru, Uganda). Several projects provide innovative new financing mechanisms for mountain conservation (Bhutan, Bolivia, Mexico, Uganda) and financial incentives to encourage forest regeneration and strengthen forest protection (Colombia, Costa Rica, Nicaragua).

Many of the Bank's mountain programs involve local producers or community organizations in implementation, providing communities with a key stake in sustainable resource management and biodiversity conservation. Moreover, since international borders often lie along mountain ranges, the Bank is increasingly supporting transborder initiatives and cooperation to strengthen biodiversity protection and ensure more effective land management. These trans-national projects encourage mutual understanding, cooperation and exchange of information and expertise.



Bank Support for a Mountain Peace Park

At the World Summit for Sustainable Development (WSSD), the World Bank and the governments of Lesotho and South Africa signed GEF grant agreements for support to a long-term collaborative initiative between South Africa and the Kingdom of Lesotho, which will protect the exceptional biodiversity of the Drakensberg and Maloti mountains. The project will focus on conservation, sustainable use and land-use and development planning in the Maloti

range, between the eastern boundary of the Kingdom of Lesotho and the Republic of South Africa. The area is a World Heritage Site and proposed Peace Park, which extends over some 5,000 km² and provides the opportunity for transboundary collaboration to strengthen ecosystem management and promote cooperation between two neighbors whose economic and development backgrounds are very different.

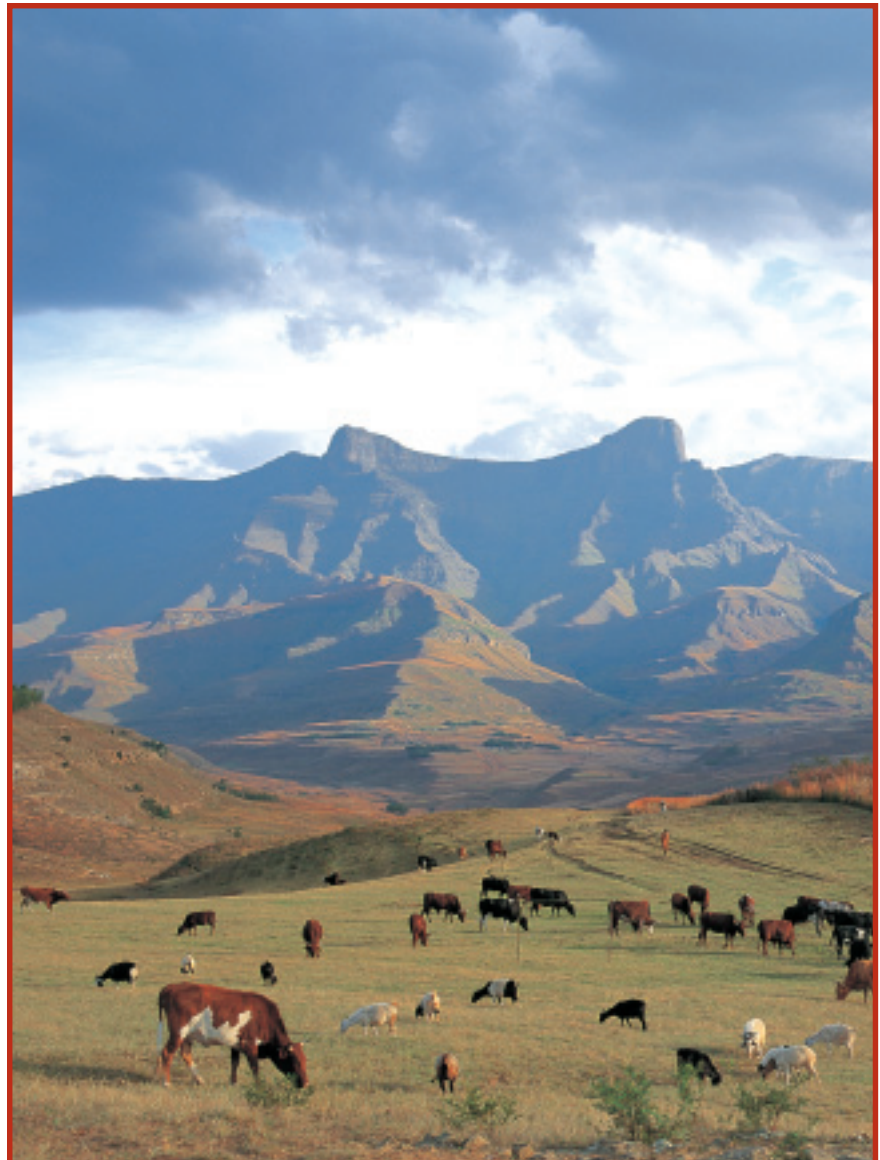
South Africa already has a high level of expertise in park and conservation manage-



ment and a prosperous tourism industry that is based upon its successful network of parks. Lesotho is expected to benefit from the partnership through better access to expertise, experience and capacity building from its more advanced neighbor and the development of a tourism destination that encompasses the whole Maloti-Drakensberg region.

The Maloti-Drakensberg transfrontier is a spectacular mountain wilderness area, but biodiversity is threatened by excessive livestock grazing, human encroachment, and invasive alien species. This area, with its interesting wildlife, alpine flora, rock art, and scenic beauty, is also a potential recreational asset, but tourism is poorly developed in Lesotho. South Africa, on the other hand, has a well-developed and mature tourism industry centered on its protected area network. The transboundary project represents a regional approach to biodiversity conservation through strengthening of existing and proposed protected areas. The approach also promotes community development across the whole ecosystem through nature-based tourism and capacity building for sustainable utilization of the natural and cultural heritage of the project area. In particular, Lesotho will benefit from improved collaboration with its more prosperous neighbor through better access

to the large number of visitors attracted to adjacent conservation areas in KwaZulu Natal. By encouraging creation of community conservation areas next to parks in both Lesotho and South Africa, and



providing training, awareness and business opportunities to local communities, the project will create alternative livelihoods and enable some of the region's poorer communities to also participate in, and benefit from, nature-based tourism.

New Secretariat to Coordinate Global Efforts to Contain Invading Alien Species

Invading alien organisms are widely regarded as the second greatest threat to biodiversity after direct habitat destruction. This is a biodiversity problem that affects all countries, developing and developed, rich and poor. Invasive species (plant and animal) are not only a serious threat to biodiversity but also threaten ecosystem services and sustainable development, with serious economic and environmental costs. To combat this threat, the World Bank announced at Johannesburg that it would be providing seed funding of US\$400,000 through a grant from the World Bank-Netherlands Partnership Program, to establish a new

Secretariat in South Africa (at Kirstenbosch, Cape Town) to coordinate the second phase of the Global Invasive Species Program (GISP) endorsed by the Convention on Biological Diversity at the 6th meeting of the Parties in April, 2002.

South Africa is an acknowledged world leader in efforts to combat the threat of invasive alien species (IAS), especially in mountain regions and catchments where invasive exotic trees have been shown to reduce water flow and smother native vegetation. The threat is especially serious in the Cape Floral Region, the world's smallest and richest floral kingdom with almost 9,000 known plant species, many of them endemic. Across the whole country, invasive alien plants now affect almost 10 million hectares (8.28 percent) of South Africa and are spreading rapidly at a considerable cost to the economy and the environment. They convert species-rich vegetation to single-species stands of trees, increasing biomass and decreasing stream flow dramatically. It has been estimated, for example, that invasion of the catchment areas surrounding Cape Town, if left to spread at current rates, could reduce water resources for this rapidly growing city by 30 percent. Invasions on a national scale are estimated to be using almost 7 percent of the country's runoff. These losses could mean that more (and expensive) dams have to be built much earlier to meet water demands, with serious economic impacts. Additionally, invasive plants in indigenous grasslands and shrublands increase fuel



loads and fire risk which leads to increased soil erosion and degradation of mountain catchments. To address these threats, the post-apartheid government in South Africa has established a remarkable *Working for Water* Program, with the dual function of controlling invasive alien plants and providing social improvement and employment opportunities for disadvantaged ethnic groups. In this way, it maximizes an ecosystem service (the delivery of water), protects biodiversity, enhances sustainability by eliminating invading alien plants, and promotes social equity through jobs and training for economically marginalized people.

The World Bank is already supporting efforts to combat invasives on Table Mountain, and along the mountain ridges of the Cape peninsula and the Drakensberg mountains. The new GISP secretariat will work with the *Working for Water* Program in South Africa and other concerned partners and governments around the world, to ensure that lessons learned, and tools and methodologies for containing and combating invasive alien species, can be applied more widely, especially in developing countries where biodiversity loss and environmental degradation undermine efforts to attain sustainable development.

Economic Costs of Invasive Alien Plants in South Africa

Arriving at a comprehensive figure for the total costs of invasive plants is extremely difficult but studies from South Africa indicate that the total economic costs are substantial:

- One detailed study calculated the value of a hypothetical 4 km² (400 ha) mountain fynbos ecosystem at between US\$3 million (with no management of alien plants), and US\$50 million (with effective management of alien plants), based on six components: water production, wild flower harvest, hiker visitation, ecotourist visitation, endemic species and genetic storage. Given that there are over one million hectares of protected fynbos areas in South Africa, the potential reduction in value due to invasives could amount to over US\$11.75 billion.
- The economic value of stream flow lost to invasions of black wattle in South Africa has been calculated using the opportunity-cost approach. First calculated is the value added by water over the different demand sectors (irrigation, domestic and urban use, mining and industry, the environment and afforestation). Second is the estimation of the value added by additional water where black wattles were eradicated. These estimates were adjusted to allow for evaporation and spillage of flood water (33 percent of additional water was assumed to be unusable), changes in the numbers of downstream water-users over the next 20 years, and the degree to which water would contribute to the economic value added in each sector (assumed to be 10 percent of predicted growth in economic value added). This study revealed a “net present cost” of US\$1.4 billion attributed to black wattle invasions (it should be noted that this study considered only black wattles, and not the many other invasive trees in the country).
- The cost to clear the alien plant invasions in South Africa is estimated to be around US\$1.2 billion, or roughly US\$60 million per year for the estimated 20 years that it will take to deal with the problem. It should be emphasized that, should the program not be funded, the costs will grow as invasive plants spread to occupy the full extent of invulnerable habitats. The country is therefore forced to incur these expenses or face the worse prospect of growing impacts.

Source: Pierce et al. (eds.) 2002.

Transboundary Cooperation in the West Tien Shan, Central Asia

Situated at a biological crossroads, the West Tien Shan, the westernmost range of the great Himalayan chain, is species rich with some 3,000 recorded species of flora and fauna. The region covers a range of climatic conditions from sub-tropical to tundra and glaciers, from semi-arid steppe to snow-covered peaks. The mountains harbor unique stands of walnut (*Juglans regia*) forest, wild ancestors of cultivated fruit-bearing species such as apple, pear, pistachio, and almond, as well as medicinal plants and endemic flowers and bulbs such as tulips and crocus. Rare and threatened animals include the snow leopard (*Uncia uncia*), Central Asian mountain goat (*Capra sibirica*), argali (*Ovis ammon*), and Himalayan griffon vulture (*Gyps himalayensis*).

The Central Asia Transboundary Biodiversity Project (WB/GEF, US\$10.15 million) is a three-country project to improve the protection and management of the unique and sensitive West Tien-Shan ecosystem and promote sustainable land use management in the transborder region. Kazakhstan, Uzbekistan, and the Kyrgyz Republic are working together to achieve these goals. The new republics inherited a protected system of zapovedniks, zakazniks, natural reserves, and nature monuments that was common to the whole of the Former Soviet Union, and was once one of the best in the world. Now in Central Asia, as in Russia, economic difficulties and the strains of the

transitional period have seriously undermined financing for nature conservation. At the same time, communities living adjacent to, or within, protected areas have increased their reliance on those areas' resources, especially through additional demands for pasture, fuelwood, arable land, and game for immediate consumption or sale.

Support is being provided to four key protected areas, Besh-Aralskiy, Sary-Chelek, Akus-Dzhabagly and Chatkalsky, through a mix of investments in capacity building (including training, transport, communications, and infrastructure), community awareness and education, and research and monitoring. The project has established new technical standards for protected area management and methods for involving local communities. New standards developed at the project sites will



Improving Rangeland Management in Mountain Ecosystems

The Kyrgyz Republic covers about 200,000 km², over 90 percent of which is mountainous. The mountains are characterized by high peaks (up to 7,000 meters), extensive and rich summer pastures, high levels of biodiversity, and considerable potential for mountain-related tourism. Mountain communities are affected by natural disasters such as mudflows, floods, avalanches and landslides which have a devastating impact on security and livelihoods. The impacts of these problems are also felt downstream, with siltation of aquatic habitats, reservoirs and irrigation infrastructure.

To address the problems of environmental degradation and improved livelihoods the Sheep Development Project (IDA, US\$11.6 m) is piloting new models of rangeland tenure, management, and monitoring. The resulting improvements in pasture use also reverse biodiversity degradation that resulted from decades of severe overgrazing during the Soviet period. Under the project's pilot program in sustainable pasture management, pilot leasing rights are defined for local communities groups and households; rangeland management plans are drawn up which identify grazing loads and protection zones, and technical assistance is provided to farmers on rangeland management and forage improvement. The project has developed a GIS compatible database for the country's rangelands, including degraded ranges that require protection from further overgrazing.



be adopted and expanded to a broader national scale. A Small Grants Program provides financial and technical assistance to buffer zone communities and community-based organizations to finance demand-driven activities in sustainable agriculture, alternative livelihoods (e.g., honey and medicinal plants, tourism), and alternative energy systems. All these activities are designed to reduce pressures in, and around, the protected areas.

In addition to national level activities, the project will support a strong regional cooperative component, including development of framework laws on protected areas; and an interstate agreement for a West Tien Shan transboundary conservation area. The three countries will collaborate in joint planning efforts to

designate wildlife corridors and appropriate land use to maintain the reserves as a linked protected area network, as well as joint training, joint research and monitoring of key wildlife species, especially those predators and ungulates known to require large home ranges in these mountain habitats. The project is promoting regional cooperation in the management of the West Tien Shan to strengthen protected area and corridor management, natural resources management, and incentives to local communities. Good progress has been made through collaborative approaches to adopting new technical and social standards for protected areas management, improvements to biodiversity laws and regulations, establishment of a transborder protected area, and organization and marketing of ecotourism in the

West Tien Shan. The entire project is being implemented under the guidance of the Transnational Steering Committee. A bioregional plan for conservation in the greater West Tien Shan ecosystem will integrate activities within the protected areas, their buffer zones, and corridors that connect them. The plan is being developed using an integrated GIS platform for the

three countries. While regional projects are generally more complex to implement than national initiatives, transboundary cooperation in Central Asia is facilitated by the fact that all three countries share a common language (Russian) and have inherited a common protected area framework as a legacy from the Former Soviet Union.



Forest and Biodiversity Management in the Georgian Caucasus Ecoregion

In Georgia a forest management project, financed by IDA, and a protected area project, partially funded by GEF, will work collaboratively to promote sustainable use and biodiversity conservation in Georgia's Caucasus region, a recognized global biodiversity hotspot. The two projects will work together to develop a plan for forest conservation and sustainable use in the Central Caucasus planning region, including identification of new protected areas, wildlife corridors, and land use and forest management consistent with biodiversity conservation. Special measures will be identified for the conservation of threatened flora and fauna.

In eastern Georgia, management plans or management guidelines have been prepared for three key protected areas in the Caucasus mountains: Tusheti (115,800 ha) and Vashlovani National Parks (44,796 ha) and Lagodekhi Nature Reserve; the latter will be expanded under the project (from 17,932 to 25,400 ha). These protected areas cover an altitudinal gradient from 100 to 4000 meters elevation comprising alpine, montane, and lowland forest, and grasslands. The sites contain some of Georgia's most important and threatened biodiversity, including critical habitat for unique large mammal fauna such as the Caucasian tur.

The projects will place a particular emphasis on ecosystem management and corridor conservation. Corridor plans that link management activities within protected areas and those on adjacent state forest lands under individual forest management

units will be piloted in high priority areas, including a riparian corridor to conserve the last remaining stands of alluvial floodplain forest in eastern Georgia. The plans will focus on conserving biodiversity values in the production landscape by implementing habitat management practices (including no-hunting zones) consistent with the needs of key threatened fauna such as Caucasian and Dagestan tur (mountain goats), lynx, and wolf. The plans will integrate recommendations for range management in specific alpine habitats and provide detailed performance indicators to gauge the effectiveness of management efforts. These will serve as models for replication in other forest management units under the Forestry Project. In the ecosystems of the central and eastern Caucasus both the wildlife and the threats they face are transboundary in nature. Therefore, responsible agencies from Russia will be invited to participate in development of the habitat plans.

These projects have benefited from supplementary activities under the World Bank / WWF Forest Alliance to promote sustainable forest management (SFM) and strengthening of protected areas, two major objectives of the Alliance partnership. The Alliance promotion of sustainable forest management in Georgia contributed to improved design of the Bank project. WWF also led an ecoregional planning process in the Caucasus, which involved multiple stakeholders and led to identification of priority areas for conservation and donor support.

Watershed Rehabilitation through Community-Based Approaches in Turkey



The Turkey Eastern Anatolia Watershed Rehabilitation Project (US\$115 million) has two objectives: restoring sustainable land-use management of degraded watersheds in three provinces of the Upper Euphrates River Basin, and increasing the incomes of the local population living in these areas, among the poorest in Turkey. This project provides a good example of community-based natural resources projects that empower local communities in managing their use of natural resources (forest, pastures, soils and agriculture, water, and wildlife).

Villagers participate in the design of investments for their specific micro-catchment. Based on their specific problems and opportunities, they select the most appropriate investments from a menu of interventions, and contribute to implementation through provision of labor, working in an integrated fashion with sectoral agencies (agriculture and forestry).

To date investments include: rehabilitation of degraded slopes by planting trees, especially fruit and nut trees; conversion of marginal croplands to pasture or hayfields; and reduction of grazing intensity through prohibition (e.g., fencing) and positive incentives; small-scale irrigation works for mountain agriculture; conversion of rain-fed croplands to irrigated orchards using indigenous fruit and nut trees; and bee-keeping.

Social and economic benefits of the project include improved rural employment, income, and living standards; enhanced skills and confidence of communities and government agencies in natural resources management; strengthened interagency collaboration and new opportunities for women. Environmental benefits include improved land use and soil conservation, and flood prevention as well as ecological balance and restoration of degraded habitats and biodiversity.

GEF Supports Conservation Initiatives in Cambodian Highlands

Now in its third year of implementation, a biodiversity project in the highlands of northeastern Cambodia is supporting the protection and management of Virachey National Park (VNP) in the province of Ratankiri. VNP encompasses close to 350,000 ha of forest and mountain habitats and is one of the most important expanses of intact forest left in the country. In addition to its national importance, Virachey is of regional and global importance as it borders important protected areas designated within the neighboring countries of Laos and Vietnam.

Like many parks in the region, Virachey is facing growing threats from a variety of sources. While human population densities are still relatively low they are growing steadily, creating an ever increasing demand for agricultural land. The park faces hunting pressures both for subsistence needs as well as to fuel the rapidly chang-

ing demand for wildlife through illegal black markets. Logging, while having slowed in recent months, will continue to be a major medium- to long-term threat, as is the pressure for major development initiatives such as national road construction and hydro-power development projects.

The remote mountain landscape of VNP is home to numerous ethnic minorities who have lived in the project area for several generations. In addition to conventional park protection and management planning measures such as patrolling and biological surveys, the project is supporting extensive work with ethnic minorities such as the Brou, Kravet, and Krueng. Many of these people live outside of Virachey National Park but rely on the sustained productivity of the non-timber forest products gathered from within the current park boundaries. The project is striving to help these communities establish long-term security of





land tenure as well as to explore alternative livelihoods.

One of the goals of the project is to help communities to articulate and implement long-term community resource management plans. To this end the project has helped establish nearly 20 community resource management committees who are

now in the process of working closely with park management staff to develop long-term goals for park protection and sustainable resource use. In addition, the project is promoting extensive community awareness raising and education programs both for local communities as well as for government counterparts at the provincial and national levels.

Long-Term Funding for Conservation in Mountain Ecosystems

With GEF resources, the Bank has helped to establish several trust funds to support protected area management and other conservation activities in mountain and other ecosystems.

Uganda: Bwindi Impenetrable National Park & Mgahinga Gorilla National Park Conservation Project. The Bwindi Trust was the first conservation Trust established in Africa with GEF funding. The Trust, established in 1995, provides long-term funding for the conservation of the Mgahinga Gorilla National Park and Bwindi Impenetrable Forest National Park, home to one-third of the remaining mountain gorillas. The trust fund provides resources for park management to strengthen protection of the gorilla populations and for research to better understand the ecology and social behavior of the gorillas and other native wildlife. The majority of the income (60 percent), however, is used to support community development for local people to provide sustainable livelihoods as an alternative to agricultural encroachment into the park. The Trust is recognized internationally as an example of innovative conservation finance.

Malawi: Mulanje Mountain Biodiversity Conservation Trust. The Mulanje Mountain Conservation Trust (MMCT) was established through funding from the GEF in 2001. The aim of the project is to establish an endowment aimed at providing long-term conservation finance for the conservation and management of the

Mulanje Mountain ecosystem. The project and long-term funding from the Trust will focus on three main activities: (1) biodiversity conservation, research and monitoring; (2) environmental education; and (3) forest co-management and sustainable livelihoods. The objective of the MMCT is to provide support to the government of Malawi, the Forest Department and the local communities, conserve the globally significant biodiversity and the unique ecosystems of the Mulanje massif.

Tanzania: Eastern Arc Forests Conservation and Management Project: The mountain rain forests of eastern Tanzania, stretching in an arc from the Pare and Usmabara mountains to the Southern Highlands, are one of the most important sites for forest biodiversity in continental



Africa. These eastern arc forests lie on ancient hills and are recognized as a biodiversity hotspot and center of endemism, especially for plants, birds, amphibians and primates. The Bank is supporting a major forest management and conservation project in Tanzania and an associated GEF-funded project specifically designed to provide a long-term conservation trust fund for biodiversity conservation activities in the Eastern Arc Mountains. A partnership between the World Bank and UNDP, the project will develop an integrated conservation strategy for the Eastern Arc Mountain Forests that will be implemented through funds generated under the endowment.

Peru: National Trust Fund for Protected Areas Financing through the Peruvian fund for protected areas (PROFONANPE) has strengthened and extended the protected area network, especially in the Peruvian Andes, and improved the policy framework and financial sustainability. A new project will provide additional resources to PROFONANPE to encourage greater stakeholder participation by mountain communities in park management, to promote social sustainability of the protected area system.

Bolivia: Achieving the Sustainability of the Bolivian Protected Area System

The World Bank's Bolivia GEF II project supports six of the thirteen protected areas in the Bolivian Andes. The six areas cover 17,830 square kilometers with an altitudinal gradient from 500 to 5,000 meters above sea level. The protected areas were established for their rich biodiversity and high levels of flora and fauna endemism.

Cultural factors were also important considering that there is an abundant ethnic diversity represented by Quechua, Tacana, Chimanes and Aymara people. The subsistence of these indigenous peoples comes from the sustainable use of the protected areas resources.

Initiated in 2001, the five year GEF II project strengthens the protected areas management with an important US\$15 million contribution. The funds are mainly being used for protecting biodiversity, establishing a trust fund for the long-term sustainability of the protected areas system and building infrastructure.

The *Bhutan Trust Fund for Environmental Conservation*, now in effect for 10 years, was the first conservation trust fund supported by the GEF, which contributed US\$10 million. The fund has used net income to help the mountain kingdom of Bhutan more than double its trained protected area management staff, and to support a range of small local conservation initiatives. The Board was successful in attracting additional endowments and the Fund has been able to conserve all its capital, which now totals more than US\$27 million. Bhutan thus has a substantial and reliable source of long-term, sustainable funding for a significant proportion of the local costs associated with its protected area system operations.



Regional Integrated Silvopastoral Approaches to Ecosystem Management (Colombia, Nicaragua, and Costa Rica)

In July 2002, a regional project was launched in Colombia, Nicaragua, and Costa Rica to promote and measure the effects of the introduction of payment systems for environmental services to farmers in degraded pasture systems. This innovative pilot project will work with about 300 farmers in six watersheds, who will be paid on the basis of environment-friendly changes in land use resulting from the silvo-pastoral approaches that they implement on their farms. Silvo-pastoral approaches focus on the promotion of multiple species vegetations (trees, shrubs, grasses and leguminous plants) and multiple use (grazing, cutting for fodder, soil fertility improvement, wood production) replacing the mono-culture grass vegetation of the degraded pastures of the region.

The changes in the land use, resulting from introduction of these silvo-pastoral technologies will produce significant incremental global environmental benefits in improved biodiversity and carbon sequestration services, which justifies the involvement of the GEF. A baseline study has determined a current “land use index” against which future changes on the 300 ranches will be assessed. Thus a ranch which converts 5 hectares of degraded pasture (value 0) to intensive silvo-pastoral systems (value 1.6) would score 8 points for improved land use. Farmers are paid on a sliding scale and each incremental land use point has an annual value of \$50. Under current assumptions of carbon fixation of different land use types, this value equals US\$5 per ton of carbon sequestered. Values are also allocated for improved biodiversity benefits. Since the shift in vegetation will provide local environmental benefits, such as the reduction in erosion, improvement in soil and water

quality, increased production, income and employment in rural areas, the payment for environmental services is only “to tip the balance.” The objective is to provide incentives to induce farmers to shift from expanding ranching into tropical forests to the restoration and intensification of degraded pasture to woodlands and improved pasture under the silvo-pastoral system.

As a pilot operation, the project will gain valuable information on farmers’ reactions to the payment of environmental services, on the management of incentive schemes required to produce global environmental benefits; and provide guidelines for sustainable financing mechanisms for the promotion of silvo-pastoral systems to rehabilitate degraded pastures. This experience will be directly relevant to an estimated 40 million hectares of degraded pasture land in the three countries, as well as degraded lands elsewhere in Central and South America. The project has been prepared with support of the multi-donor LEAD (Livestock, Environment and Development) Initiative, implemented by FAO, and will be fully implemented by NGOs in all three countries of the project who will take responsibility for introducing new agricultural technologies and monitoring. Initially, payments will come from an Ecoservices Fund established under the project, but in the long-term, governments are looking to establish more formal domestic and international markets for these ecosystem services. At the project launch, the Costa Rica Minister of Environment (current chair of the Central American Committee of Ministers of Environment) pledged that he would actively promote a shift in emphasis from conservation to rehabilitation of degraded pastures in Central America.

Protecting Biodiversity in the Colombian Andes

The Andean paramos ecoregion in Colombia stretches across an altitude range from 500–5000 m, covering three parallel mountain chains and two main internal river valleys. Climate and habitat ranges from hot and cold deserts to dry and wet high cold mountains. Soils are

mainly young in evolution but are derived from almost all kinds of material. As a result the paramos hosts a great variety of ecosystems: paramos, wet and dry mountainous forests, wetlands and xerofitic and subxerofitic environments. A new GEF project will increase conservation, knowledge, and sustainable use of globally important biodiversity of the Colombian Andes by testing various conservation strategies: regional systems of protected areas, biodiversity

conservation in rural landscapes, inventory and establishment of Andean biodiversity baseline and monitoring, educational programs and intersectoral coordination. The project has been designed as an

umbrella project for all other projects in the Andes.

The project includes the Los Nevados national park, regional reserves and private reserves as well as agroecosystems including shade and sun-grown coffee, mountain livestock systems, agroforestry, potato fields, and orchards of Andean fruit trees. The project is being executed by the Institute Alexander von Humboldt, working with smallholders and farmers, campesinos, indigenous groups, research communities (universities), and environmental NGOs. The project is expected to lead to natural regeneration of mountainous ecosystems and improved connectivity between fragments of natural habitats in agricultural areas, thereby creating corridors for wildlife and gene flow.

The Colombian Andes project will:

- Support the development of a more representative, effective, and viable Andean protected area system
- Identify conservation opportunities in rural landscapes, develop and promote management tools for biodiversity conservation
- Expand, organize, and disseminate the knowledge base on biodiversity in the Andes to a wide audience of stakeholders and policy makers, and implement monitoring tools
- Promote inter-sectoral coordination to address some root causes of biodiversity loss in the Andes.



Protected Areas and Environmental Services in Mexico

Part of a GEF grant to the Mexican Government to support the basic operation of ten priority protected areas in Mexico was used to establish a \$16.5 million endowment fund in a private institution, the Mexican Nature Conservation Fund. The interest generated by this fund has since been channeled to the ten protected areas, which are part of the National Commission for Protected Areas. The funds are used to pay trained personnel and cover the basic costs that enable the core staff hired by the National Commission for Protected Areas (CONANP) to ensure the basic conservation of these priority sites in Mexico. After five years of support, this private-public arrangement has proved successful. Particularly, the interaction of CONANP with other agencies has triggered partnerships for innovative projects, such as the Monarch Butterfly Conservation Fund and the El Triunfo Biosphere Reserve.

The Monarch Butterfly Biosphere Reserve

The migration pattern of the monarch butterfly poses one of the most puzzling phenomena in biology. Millions of butterflies engage in a yearly journey that can cover the distance from the Great Lakes in Canada to the highlands of central Mexico where they gather to hibernate. Amazingly, the round trip encompasses up to five generations and it remains a mystery how the migration route information is passed from parent to offspring. The sight of these orange creatures clinging to fir trees

captured the attention of scientists and the public alike. A series of sanctuaries to protect the monarch butterfly were created in 1986. As time passed, it became evident that the hibernating area is not only a unique migration site but also an important watershed that ensures the water supply for one of the largest cities in the world, Mexico City.

A study conducted by the National Autonomous University of Mexico determined that 44 percent of the forest in the Monarch Butterfly sanctuaries area had been severely damaged between 1984 and 1999. WWF and the Mexican authorities proposed an expanded protected area to accommodate the butterflies' habitat needs, a 56,259 ha Biosphere Reserve, with no extraction activities allowed in the 13,551 ha core area. The core area includes a biological corridor along a watershed with most of the registered monarch butterfly colonies, but this meant that the 38 owners of the core area lost their logging rights. Clearly, a compensating mechanism was needed before the establishment of the new Biosphere Reserve.

A partnership was formed between WWF, the Mexican Government and the Mexican Nature Conservation Fund who worked together to establish a US\$6.25 million endowment fund. The donors include a private foundation, the federal government and the state of Mexico. Interest from this Monarch Butterfly Conservation Fund is



used to compensate the owners of the core area with 18 dollars for every cubic meter of wood included in the logging permits but not felled. Payments take place every June after the annual expiration of yearly logging rights. In addition, every December, the communities that own the core area receive 8 dollars per ha if they hold logging rights, or 12 dollars per ha if they lack these rights, in exchange for having performed conservation activities in their properties, such as restoration, watershed and pest management. Representatives of the communities participate in the committee that decides on the payments and in a monitoring scheme. Since the funds channeled to the communities are below the commercial value obtained from

logging, the Monarch Butterfly Conservation Fund will have to grow. A particularly important incentive for donors is that GEF will match every dollar with an equal contribution for the basic conservation of other priority protected areas in Mexico. It is expected that this system will trigger the origin of other innovative and effective conservation projects in Mexico.

Payments for Ecological Services in the Biosphere Reserve El Triunfo

In the highlands of the Sierra Madre in the state of Chiapas, Mexico, mountain peaks can reach 2,000 m in altitude. An extraordinarily rich cloud forest dominates the landscape and harbors 10 percent of the

country's biodiversity in less than 1 percent of the territory. The Bank is providing GEF funding to support the conservation of the 120,000 ha Biosphere Reserve El Triunfo, whose cloud forests are one of the most threatened ecosystems in the country. In addition to its biological importance, El Triunfo stands out due to the importance of its ecosystem services. Its forests capture water, feeding rivers which supply important agricultural areas in the valleys, coffee plantations and four dams that produce 40 percent of the hydroelectric energy in Mexico. The conservation of El Triunfo forests is a local and international priority.

El Triunfo is the Mexican reserve that has gone the furthest in ensuring a local endowment. With support from the Mexican Nature Conservation Fund, the David and Lucile Packard Foundation and the Gonzalo Río Arronte Foundation each provided US\$1 million dollars to establish an endowment for El Triunfo. A particularly important factor to obtain these donations was the 1:1 match the GEF established for a second donation for protected areas in Mexico. The interest of this endowment will be channeled to activities that support the ecosystem services provided by the reserve, especially the water captured by



the forests. This endowment sets a precedent in the payment for ecosystem services in protected areas in Mexico. It symbolizes the recognition of forests by society as critical for maintenance of water and biodiversity.

Linking Biodiversity and Climate Change — Permafrost Melt and Biodiversity Loss in Hövsgöl National Park, Mongolia

Hövsgöl National Park is centered on Lake Hövsgöl, one of the least known of the world's ancient lakes located about 200 km southwest of its sister lake, Lake Baikal, in mountainous northern Mongolia. It is 135 km long, about 20-30 km wide, with a depth of 262 m, and it lies at an altitude of 1700 m. The winters are long and vicious, with temperatures dropping to below -40°C. Primary production in the lake is quite low, more similar to that of the oceans than of lakes, and the deep penetration of light down to 30 m gives it a blue hue, thus the name, “the blue pearl of Mongolia.”

Uncontrolled or badly managed grazing on the mountain slopes around the lake is an issue which is shared with many countries in Eurasia where the extensive management of various domestic animals (sheep, goats, cattle) and the gathering of fuelwood has caused the forest edge to retreat. The loss of forest causes the ground to be exposed to sunlight, the permafrost (layer of frozen soil) to melt more than normal, aerobic decomposition to occur, and thus carbon dioxide to be produced. Lake Hövsgöl lies at the southern edge of the taiga forest, and is underlain by permafrost so this region should experience major changes in the future. The region has already had an average temperature increase of about 1.4°C over the last 35 years. While little can be done to alter the immediate course of climate change, protecting vegetation cover by promoting certain land-use practices can slow the rate of permafrost melt by retaining the insulating capacity of vegetation. The protection of land cover vegetation is fundamental to maintenance of permafrost, and to the protection of Mongolia's water resources, biodiversity and natural ecosystems. Identifying precisely what factors and in what combinations, are most important in the conservation-orientated management of such ecotones has rarely been attempted.

In 2001, the Mongolian Academy of Sciences received a five-year grant from the World Bank for a study entitled, “Dynamics of Biodiversity Loss and Permafrost



Melt in Hövsgöl National Park, Mongolia.” The objectives of this study are:

- To identify the impacts of pasture use and forest cutting on the dynamics of forest, steppe, riparian zones, and streams in tributary valleys of Lake Hövsgöl.
- To define how those impacts interact and are affecting the melting of permafrost (and thus release of carbon dioxide), soil characteristics, and plant and animal biodiversity.
- To inventory climate change effects in the Hövsgöl National Park.
- To determine sustainable resource use patterns that will also protect biodiversity, permafrost and soil sequestration of carbon.
- Calculation of costs and benefits of alternative land use practices, especially as related to pastoral nomads.

The project is capitalizing upon a national commitment to ensuring science-based sustainable management of an important national park, in order to derive lessons and models to apply elsewhere within the great band of temperate forest-grassland mosaic in the mountains between eastern Europe and eastern Russia/northern China.

The summer of 2002 saw the first full field season for the 23 young researchers and their Mongolian and foreign mentors along the transects in the valleys and forested slopes of the different study areas. Masses of data are now being analyzed, and as the data are shared among teams the team hopes to identify sustainable land use practices that will protect biodiversity, ecosystem function, and permafrost.

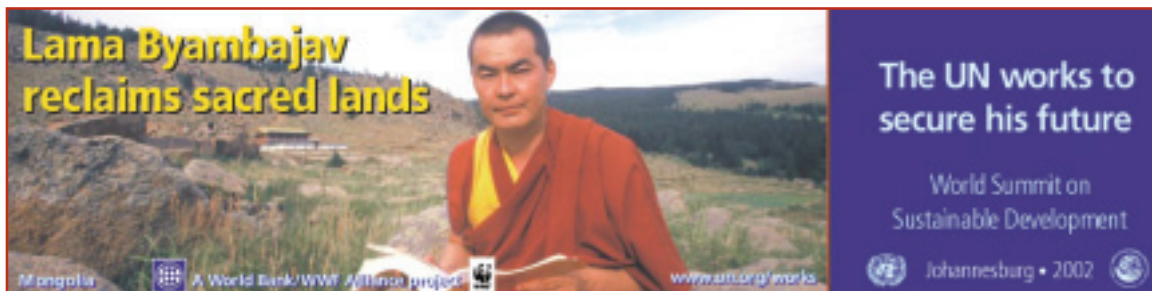


Mountains Have Deities and Water a Spirit — Faith, Values, and Environmental Protection in Mongolia

Until recently, the World's major religions have been relatively voiceless in the environmental debate, and marginalized in the decision-making processes concerning developmental impacts on the environment. Recognizing that religions can represent a powerful voice for environmental stewardship, the World Bank in partnership with the Alliance for Religions and Conservation (ARC) initiated a program in 2000 that seeks to incorporate faiths in forest/biodiversity conservation in six countries across East Asia. This work is possible through a grant from the World Bank-Netherlands Partnership Program (BNPP) and more recently from the President's Contingency Fund and the East Asia and Pacific Region.

In Mongolia, ARC is working with WWF and the Abbot and staff of Gandan Monastery on the intersection between religious and cultural values. Excavating the wealth of religious and cultural traditions within Mongolia has provided a unique avenue for communicating development goals to training monks and other adherents. Mongolian culture has a profound rela-

tionship with nature as revealed in the over 600 venerated mountains and other natural sites. Throughout history, nearly 280 legends about these holy sites were codified in holy Buddhist texts known as Sutras, which today provide a connection to the culture, history, language and religion that pre-dated the communist era in Mongolia. The project has undertaken to preserve the beliefs captured within the Sutras by reaffirming their place within the Mongolian identity and concurrently creating a greater respect for the environment and traditions of ecological conservation as part of a larger framework of sustainable development. The resulting collaboration resulted in ceremonies of rededication of Mongolian sacred sites and two publications. The first book explored Mongolian legends of the land and their significance as a means for ensuring the stability and evolution of nature. The second, and more ambitious, book describes the cultural and religious traditions behind many of Mongolia's sacred sites, and includes translations of Tibetan sutras into Mongolian in order to better convey their meaning and their relevance to the sacred sites.





The final product is a collection of hundreds of parchments describing the cultural significance of natural wonders throughout Mongolia. One example is the sacred mountain of Bogd Khan just outside the Mongolian capital, Ulaanbaatar, which is a nature reserve and part of the UNESCO Man and Biosphere program. Among the most treasured and legendary sites in Mongolia, Bogd Khan is represented by a deity who rides thirty-three gray horses and has the mantra “um ma hum”. This image reflects the evolution from Shamanic style to Buddhist sacred rituals, with the horses originating from Shamanism while the mantra is distinctly Buddhist. For the first time, many of these uniquely Mongolian tales are recorded for the edification of all people. The key importance of such texts is that they give a detailed, sacred and ecological map of the essential fragility of these sites and thus the concomitant care that is needed in developing them. These

insights were translated into action in the ritual rededication of five sacred sites, and concurrent conservation projects implemented throughout Mongolia. The chosen sites represent a diversity of natural zones and regions, and the ceremonies were carried out with the active involvement of local monasteries and support of the local communities. With the installment of stone tablets, the partners hope to revive a centuries long tradition respecting, and even venerating nature. Further, the project was complimented by environmental education sessions conducted in local monasteries, addressing critical environmental issues and identifying efficient and effective ways of dealing with these challenges at a local level. The result was significant local support. At every sacred site the communities expressed their gratitude for efforts to combine conservation with tradition. In this way the rededication of the sacred sites and the

publication of Buddhist Sutras of the environment have brought the traditional ideas of environmental protection to the fore of development discussions within Mongolia.

Ultimately, the greatest lesson of the Mongolian Sacred Sites Initiative lies in the rediscovery of the mountain deities and water spirits, and the insights such traditions have about the fragility of sites. It brings religious and cultural contributions to the development process itself. The rededication of Buddhist Sacred Sites and the introduction of environmental education into monasteries and communities throughout Mongolia will create strong moral and religious support for the protec-

tion of natural resources and the environment. As the book's author Dr Sukhbaatar states, "In Mongolia venerating, fearing and obeying the deities of the mountains, waters, and land was a very important form of environmental protection—the religious ritual both protected nature and instilled overall respect into the people. As such, these stories and the traditions behind the names may yet turn out to be one of the greatest gifts of Mongolia's past to her present." Led by Prime Minister Dr. Enkhbayar who continues to champion the reintegration of faith and culture into the Mongolian way of life, the future development of Mongolia appears to be on a path toward sustainability.

References

- MacKinnon, K., et al. 2000. *Transboundary Reserves : World Bank Implementation of the Ecosystem Approach*. The World Bank, Washington, D.C.
- Pagiola, S., and Platais, G. 2002. "Payments for Environmental Services." *Environment Strategy Notes* No. 3. The World Bank, Washington, D.C.
- Pierce, S. M., R. M. Cowling, T. Sandwith, and K. MacKinnon (eds.). 2002. *Mainstreaming Biodiversity in Development: Case studies from South Africa*. The World Bank, Washington, D.C.
- Sukhbaatar, O. 2002. *The Sacred Sites of Mongolia*. World Wide Fund for Nature, Ulanbaatar.
- World Bank. 2000. *Supporting the Web of Life: The World Bank and Biodiversity – A Portfolio Update 1988–99*. The World Bank, Washington, D.C.
- World Bank. 2002. *Biodiversity Conservation in Forest Ecosystems. World Bank Assistance 1992-2002*. The World Bank, Washington, D.C.
- World Bank biodiversity web site: <<<http://www.worldbank.org/biodiversity>>>.

