



Ashoka Trust for Research in Ecology and the Environment



Report 1999-2001



ATree

Ashoka Trust for Research in
Ecology and the Environment
www.atree.org

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Cover:



Forested landscape at BRT Wildlife Sanctuary with podus in the distance

Credit: R. Ganesan/ATREE



Soligas: Indigenous people of the Biligiri Rangan Hills

Credit: N. A. Aravind/ATREE



Bauhinia variegata, Western Ghats

Credit: N. A. Aravind/ATREE



Elephants in the Western Ghats

Credit: R. Ganesan/ATREE

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Mission Statement

Our planet is witnessing unprecedented changes in the quality of its environment. Forests are being lost at an unparalleled pace. Soil losses due to erosion are assuming massive proportions. The use of unsustainable and inappropriate technologies is polluting the air we breathe and the water we drink. Emissions of greenhouse gases are changing the climate at a rapid rate. These changes have grave consequences for the health of the earth as well as for the physical and economic well being of human societies. The changes are occurring so rapidly that the responses of public and private institutions are not adequate to meet the environmental and economic challenges that we are encountering today. Ashoka Trust for Research in Ecology and the Environment (ATREE) is a charitable trust dedicated to improving the response to these challenges through the application of new knowledge. The Trust combines public concern over the deteriorating economic and physical environment with a vigorous scientific approach to solving environmental problems. The Trust emphasizes the use of interdisciplinary approaches that will lead to the improvement of the human condition through economic development while conserving our environment and natural resources. The Trust also provides a training ground in applied conservation and policy work for young professionals who would eventually become tomorrow's leaders.

ATREE combines principles of ecology and economics to undertake and promote scientific, educational, and outreach activities that advance protection of the environment, conservation of biodiversity, and sustainable use of natural resources. The current areas of concentration are conservation and sustainable management of biodiversity, particularly the impact of land use change and deforestation on ecosystem services, including agricultural productivity, water, and climate; social and economic drivers of land use change; mapping of biodiversity; conservation planning; development of models of conservation that link ecosystem health with the economic well being of local communities; and policy analysis and action related to conservation and use of forests.

ATREE's environmental education and training programs are targeted towards students and teachers of schools from elementary school to high school; college and university level students and teachers; professionals ranging from forest guards to forest officials; and the staff of a wide array of government and non-government organizations.

The outreach programs at ATREE are based on research and expertise of its staff, and are designed to develop India's social and human capital to resolve environmental problems. ATREE provides its own facilities, training, and scholarship and grants to individuals and organizations advancing conservation and sustainable development.

ATREE fulfills its mandate through research and activities by its own core staff, by working with its partners, and by providing support to professionals of other organizations.

The geographical foci of ATREE's current work are India's two hot spots of biodiversity: the Western Ghats and the Eastern Himalayas.

Foreword

ATREE strives to fill a unique place in the institutional arena. First and foremost, ATREE is almost exclusively devoted to conservation of biological diversity in all its dimensions: biological, social, and economic. Second, it relies on interdisciplinary approaches to achieve its goals. Third, ATREE's educational and outreach programs draw strength from its research work, which in turn, is reinforced and enriched by its outreach activities and educational programs. Fourth, we make a concerted effort to bridge the gap between grass roots, community-based organizations and the policy-making agencies of the government. Finally, ATREE fosters collaboration with other like-minded individuals and organizations, and provides support to its partners to promote conservation, sustainable use of natural resources, and poverty alleviation.

ATREE has accomplished a great deal over the four years since its establishment. Some of these accomplishments are described in the next few pages. Of particular interest are our work on deforestation and land use change; the social and economic consequences of these changes; the impact of these changes on the livelihoods of local communities; and the mitigation of these changes. Our educational programs range from work with students and schoolteachers to workshops for university lecturers, and from training of forest guards to training of decision makers. Similarly expansive and ambitious, our outreach programs range from capacity building of small organizations to the initiation of *Conservation and Society*, an online journal for South Asian scientists, policy makers, and other professionals.

While we at ATREE pursue our present goals, we remain aware of tremendous challenges ahead. First, while continuing our basic and applied work in conservation and sustainable use of biological resources, we realize the need to expand these programs to address important issues in the conservation of land, water and soil. As part of these programs we will need to initiate work in the related areas of restoration, watershed management, and renewable sources of energy. Another major challenge will be to accelerate policy reforms, which will be able to take root only if we address certain crucial social issues, such as gender and social equity and community empowerment, in our core programs. Given the already extreme poverty and the risk of increasing poverty-linked environmental crises in much of India, ATREE needs to focus on the design and implementation of programs that will fight both poverty and environmental degradation. Finally, in association with academic organizations, we must train a new group of young professionals who do interdisciplinary work—combining research with action—on basic issues confronting society. Simultaneously, we need to put more emphasis on communicating new knowledge and information to policy- and decision-makers locally and nationwide.

In four years, ATREE has grown to be a vibrant and dynamic organization with a staff of more than 40. ATREE owes its growth and strength to its dedicated staff and the support from its partners, numerous friends, and donor agencies. Recent support from the Ford Foundation has allowed ATREE to strengthen its infrastructure, expand its forestry research program, and undertake new initiatives such as the establishment of the Center for Interdisciplinary Studies in the Environment and Development in collaboration with the Institute for Social and Economic Change. With continuous support from our constituents and partners, we look forward to meeting current and new challenges. We invite all readers of this report to work with us and to provide us the benefit of their wisdom and counsel.

Kamaljit S. Bawa
President, ATREE
Bangalore

An Introduction

ATREE's activities in research, education, outreach and policy are integrated to achieve its main goals. These main components draw on and reinforce each other. The research forms the basis of our action, policy and outreach programs, and insights gained from outreach activities contribute to the development of research and educational programs. Educational programs draw upon the strength of the research program and pedagogical approaches developed in the educational programs contribute to outreach activities.



M. A. Akavil

Research



A. Prasad

Outreach & Policy



A. Prasad

Education

1. Research: *Laying Strong Foundation for Relevant Interventions*

India is one of the top ten countries of the world in terms of the number of different species of organisms. This diversity of life contained in our wide array of natural ecosystems also sustains the economic well being of millions of people. Natural ecosystems provide goods and services that ultimately support most, if not all, human endeavors. Natural ecosystems, however, are under tremendous pressure. Human activities are causing large-scale degradation of ecosystems on land and water. Deforestation, silting, and pollution of rivers, and loss of wetlands, mangroves, and coral reefs have severe ecological and economic consequences.

The focus of ATREE's research efforts is conservation of natural ecosystems, and the diversity of living organisms in these ecosystems, for the benefit of present and future generations of our people. Effective conservation requires knowledge about the distribution of living organisms and ecosystems, the threats to species and ecosystems, and the dependence of local communities on goods and services provided by local ecosystems. Strong institutions, and policies based on consultation among all users of natural resources are also necessary for conservation measures to succeed. Thus the major emphasis of ATREE's research programs are to ascertain the magnitude, patterns, and causes of deforestation; to examine the spatial distribution of biological diversity and how it might be impacted by habitat changes; to undertake conservation planning based on the distribution of biodiversity, pressures on biological diversity, and economic, social and cultural uses of this diversity by local communities; to develop sustainable models of natural resource use that link conservation goals with economic well being of people dependent upon ecosystem goods for their livelihoods; and to build appropriate policy and institutional frameworks for conservation and alleviation of poverty among communities that subsist on biological resources.

The following sections highlight ATREE's research programs. ATREE's research provides the basis for action in conservation. The action may take the form of inputs to policy formulation, work with rural communities to not only conserve and manage resources but also to enhance their livelihoods, and educational as well as training programs.

1.1 *Conservation and Livelihoods: Working with Local Communities to Enhance Rural Income and Conserve Natural Resources*

The involvement of local communities in managing natural resources is the key to successful conservation. Among the many requirements of sustained involvement are provision of economic incentives, capacity building—including empowerment—and policy and institutional reform. Working with Vivekananda Girijana Kalyana Kendra (VGKK), ATREE has been helping *Soligas* conserve their natural resources through forest-based enterprises, capacity building, and institutional reform.

The *Soligas* have inhabited Biligiri Rangan Hills (hereafter, BR Hills) of South India for millennia. In the Biligiri Rangaswamy Temple (BRT) Wildlife Sanctuary, approximately 4,500 *Soligas* live in 57 settlements called podus. Traditionally, the *Soligas* engaged in shifting agriculture and hunting, and collected a wide range of non-timber forest products. When the BR Hills area was designated as a sanctuary, shifting agriculture and hunting were completely banned. The *Soligas* were allocated small pieces of land, typically 0.6 hectares per family, where they could practice settled agriculture. However, extraction of non-timber forest products (NTFPs) still remains the major source of income for the *Soligas*.

NTFPs account for approximately 35% of the cash income of *Soligas* living in the interior of the sanctuary and approximately 15% of the cash income of *Soligas* living close to the periphery. In

the interior, NTFPs may account for as much as 50% of the cash income in certain households, but the proportion of such household is low (less than 20% of total households).

A key element of ATREE's work, in conjunction with VGKK, has been the setting up of Soliga-run enterprises for the processing and value addition of NTFPs, especially of wild honey and fruits gathered from the forest. A second important feature of ATREE's work in the BR Hills has been the implementation of a sound biological resource-monitoring program, with the involvement of the Soliga community (described in greater detail in a later section). This resource monitoring includes monitoring and mapping resource availability annually, to guide decisions of how much to harvest, and which part of the forest to harvest from. ATREE has prepared simple resource-monitoring manuals for use by members of the community and the enterprise unit. The enterprise unit maintains records of production, extraction, and regeneration of NTFPs from year to year. In addition to strengthening participatory resource monitoring, and having it entirely run by the enterprise unit, work is now underway to assess the effects of other anthropogenic pressures such as fire, and non-indigenous weeds, on long-term forest structure, composition, and dynamics.

Another major element of ATREE's work in building capacity among the Soligas to manage natural resources at BR Hills has been the initiation of socioeconomic monitoring. The objective of the



R. Ganesan



R. Ganesan



R. Ganesan

Processed wild honey – Promoting good harvesting techniques.

socioeconomic monitoring has been to empower the local community to realize social and economic benefits from various government and non-government activities aimed at their welfare. A major achievement has been an increase in the proportion of returns to harvesters from the sale of NTFPs to the tribal cooperatives: for example, returns to harvesters from the sale of honey have increased from 54% to 81% over the last 5 years.

The BRT Wildlife Sanctuary is the only place in India where production, extraction, and regeneration of NTFPs are being monitored, and where the local community is involved in such monitoring. The results so far indicate that the current levels of extraction do not significantly affect population replacement rates. Although there is tremendous spatial variation in NTFP populations, with parts of the forest where they show a decline, and other parts where they are increasing, for the sanctuary as a whole NTFP availabilities have remained relatively stable over the past 5 years. We believe that the levels of harvests can be reduced provided economic returns from NTFPs are more equitably distributed. Greater economic returns can be used as an incentive to self-regulate harvest levels and to make participatory resource monitoring a truly voluntary effort.

1.2 *Changing Landscapes and their Ecological and Economic Consequences*

India's landscape is changing rapidly. Deforestation and other forms of habitat degradation, shifts in agricultural practices, developmental activities, and urbanization, are causing the changes. The changes in land use patterns, including changes in land cover, have important consequences for conservation of biodiversity, agricultural productivity, regulation of the water cycle, climate, retention of soil, and for the general well being of human societies. However, the magnitude of land-use change—including deforestation—as well as the drivers and consequences of change are poorly understood. Even less well understood are the effects of factors like climate change, and the potential consequences that it has for the distribution and conservation of biodiversity. ATREE is working on both the ecological and economic causes of our changing landscape.

1.2.1 *Deforestation and Land Use Change*

ATREE's program on land use change is currently concentrated in two regions: the Western Ghats and the Eastern Himalayas. The objectives of the program are to assess the extent of change in land cover, particularly deforestation and forest degradation, identify the causes of change, and examine their consequences.

Using remote sensing imagery, archival maps, and ground surveys, scientists associated with ATREE have examined land use change and deforestation in the Western Ghats and the Eastern Himalayas. In addition, land use change and deforestation are being studied in detail in four areas: Agasthyamalai Hills, Malai Mahadeshwara Hills, and Biligiri Rangan Hills in the Western Ghats, and Darjeeling Hills in the Eastern Himalayas. Detailed maps showing the nature and extent of change have been prepared, and statistics on deforestation, forest fragmentation, and conversion of forest land to other types of uses have been compiled.

The data on land use change and deforestation have been assembled into a Geographic Information System (GIS) format. Other layers of information that are being incorporated into GIS include spatial data on roads, population centers, land use, and a wide range of economic and developmental parameters to identify causes of change. Information on the distribution of biodiversity is being added to the GIS to determine the consequences of land use change for the conservation of biodiversity. The analyses based on land use change and the distribution of biodiversity are identifying gaps in the protection of biological diversity and should form the basis for further conservation planning as described in one of the following sections.

Working with the National Remote Sensing Agency (NRSA), Hyderabad, ATREE scientists have shown that the rate of deforestation in the Western Ghats remains high. In Arunachal Pradesh, we have modeled rates of future deforestation, and have shown that unless current trends are reversed, a large amount of biodiversity will be lost forever.

ATREE staff scientists have also examined deforestation in past and pre-independence periods from historical records. Although it appears that the deforestation rate has slowed in the post-independence period, the rates in regions that still have sizable areas under forests remain high as indicated by data for the Western Ghats and Arunachal Pradesh. Change in deforestation rates over time, particularly during the last few decades, remains to be documented and is a high priority area for ATREE. Information about the extent of land use change and causes and consequences of such changes are critical for inputs to new policies regarding land use and conservation.

1.2.2 Causes and Consequences of Biodiversity Loss: Examples from Interdisciplinary Research on Bamboos

Bamboo constitutes one of the most important extractable forest products in the state of Karnataka in the central Western Ghats; in 1995-96, the state earned a revenue of nearly Rs 4.5 crores from the supply of bamboo. Yet, the state is in a precarious position with regard to the availability of bamboo resources in the forest. Deforestation, extensive land use changes in the past 50 years, and an unending exploitation of natural populations of bamboo have taken their toll. But over the years there has been a steady decrease in the total extraction probably indicating an increasing scarcity of the resources. Compared with about 3,85,925 m tons extracted in the state in 1973-74, in 1997-98 the total extraction of bamboo was barely 18,034 m tons. Consequently, paper, pulp and cottage industries that were once almost completely dependent upon bamboo from the state have either been forced to close down or import bamboo if they cannot replace it with substitutes.

The consequences of the loss of bamboo resources are only now being realized and traditional artisans whose livelihoods are closely intertwined with the bamboo resource are perhaps the hardest hit. Unlike commercial industries, which can resort to other avenues to obtain resources, it is a do or die situation for the traditional artisans. In Karnataka a number of forest dwelling and fringe communities depend almost exclusively on bamboo. One such community is the Medars, who depend on bamboo to the extent that they revere and worship bamboo regularly (*Hosa-bidaru puje*). At the currently available levels of bamboo, an average Medar family is able to obtain gainful employment for only 3 to 5 months in a year. This barely meets the rudiments of their livelihood requirements and threatens their very survival. In Dharwad-Haliyal region, an area historically known for its bamboo, ATREE's studies indicate that in fact a large number of the Medar families are losing the traditional art and skill of working with bamboo. For example, in this region, compared to about 15 different handicrafts made from bamboo several decades ago, today the skill for making only about 5 exists. Disillusioned with the present state of affairs, increasing numbers of the Medar families are migrating to other sites in search of alternative non-traditional occupations. Further, among those who are currently dependent upon bamboo resources, a vast majority of families (84 per cent) do not wish their children to continue the hereditary occupation.

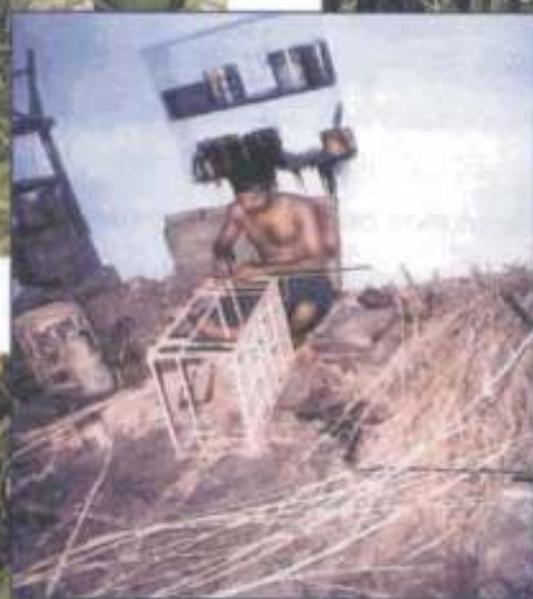
Similar consequences of the loss of bamboo are being experienced in other parts of the state as well. In BRT Wildlife Sanctuary, only 43 per cent of the *Soliga* (a word that means 'people emerging from the bamboo or the thicket') households interviewed in the core of the forest claimed knowledge of working with bamboo. Further, at the outskirts of the sanctuary where bamboo availability is scarcer, only 26 per cent of the households knew anything at all about working with bamboo. ATREE's study shows that along with the loss of the biological resources there has been a loss of the rich tapestry of traditional knowledge and crafts of the tribal communities that have been accumulated over several generations.



Bambusa wamin



Bambusa nutans



Ochlandra travencorica



Dendrocalamus membranaceus

Bamboo species. *Inset: A Medar at work.*

ATREE's studies have provided hard facts and valuable insights into the bamboo crisis in the Western Ghats of Karnataka, and have emphasized the need for some urgent and hard solutions to conserve and manage the remaining bamboo resources in the state. However, this is a challenging task and needs the complementary efforts of the state forest department, interested groups and stakeholders, and universities and NGOs. A three-pronged action in trying to meet this task has been proposed. First, there is an urgent need to map the existing distribution of bamboo in the state and identify on the perceived and anticipated threats to these resources at a landscape level. Second, it is proposed that maps of extraction plans incorporating both the spatial and temporal dimension be constructed to guide effective and sustained management of the resource over time. Implicit in this plan, it is proposed that a separate management action be initiated to uphold the welfare of the forest fringe communities whose livelihoods are completely dependent upon the bamboo resources. Finally, it is suggested that a biological monitoring program of the resource at periodical intervals be implemented to ensure that (a) the resource is sustainably managed and (b) the managers are forewarned against any contingent deficiencies.

1.2.3 *Climate Change and Future Biodiversity Loss: The Value of Long-Term Monitoring*

Long term biodiversity monitoring is becoming increasingly important in the context of today's rapidly changing world. Climate change can no longer be thought of as a vague, potential future scenario. We are in the midst of a large-scale global experiment, the outcome of which is as yet unknown. Monitoring this experiment can give us some insights into possible consequences, and means by which they may be mitigated.

ATREE is currently involved in a long-term program to monitor plant diversity and turnover in the Kalakad Mundanthurai Tiger Reserve (KMTR), in the Western Ghats of Tamil Nadu. This program was originally initiated by researchers from Pondicherry University, and is one of the few examples of its kind in the Indian subcontinent. A series of large, permanent plots were established in Kalakad in 1994–95, and all vegetation above a certain size was censused at the time the plots were established. We have since re-censused the plots in 2000, i.e., 5 years after they were established.

In the 5 years between inventories, overall, the species composition and structure of these forests has not changed markedly. Nonetheless, these forests show striking differences over small spatial scales, indicating much greater landscape heterogeneity that was previously assumed.

Another striking finding that is emerging from these plots is that these forests in the Southern Western Ghats have much lower tree turnover rates than similar forests in other parts of the tropics: It is likely that populations that turnover slowly probably also take longer to recover following disturbance, be it natural or anthropogenic. This finding may have important implications for stability in a changing world.

1.3 *Conservation Planning: Biodiversity Conservation and the Protected Area Network*

Protected areas are necessary to safeguard biological diversity in the face of the continuing onslaught on natural ecosystems. Ironically, the maintenance of biodiversity is essential for the long-term well being of humans, who are the major agents of change in natural ecosystems. A network of protected areas is viewed as an effective strategy to protect biological diversity. Although the role of protected areas in conserving biodiversity may seem to be obvious, the premise behind the establishment of most protected areas has been scenic value, tourism, recreation, or administrative convenience. Ideally, protected area networks must be representative of a country's eco-regions and biogeographical and endemic zones. Protected areas should

effectively conserve unique and threatened habitats or communities, rare and endangered species, as well as cultural and ethnic diversity.

ATREE's program seeks to examine the adequacy of the existing protected areas in conserving biodiversity, and the degree to which the representative ecosystems or eco-regions are protected. Additional aspects under consideration are the size, patchiness and connectivity of protected areas, vulnerability of various species and ecosystems, and policy and institutional mechanisms for conservation.

1.3.1 Gap Analysis and Conservation Priorities

Systematic conservation planning begins with mapping the distribution of biodiversity, biogeographical zones, ecoregions, areas rich in endemic species, and various biophysical parameters. These maps are overlaid on maps of existing protected areas. Gap analysis then identifies areas of interest, or gaps not covered by protected areas. Mapping of threats on the basis of socioeconomic pressures can also identify vulnerable areas. Conservation priorities can thus be determined by combining biological and socioeconomic data.



N. A. Aravind

Black veined Sargent, BRT Wildlife Sanctuary.

In the Western Ghats, after conducting a gap analysis for the Agastyamalai region, ATREE is now conducting such an analysis for the entire region based on the distribution of biodiversity and the existing protected areas: Protected areas in the Western Ghats have been selected largely based on geo-morphological or phytogeographic considerations, and due to the presence of charismatic large mammals like tigers and elephants. These charismatic mammals are looked upon as 'umbrella species' who by virtue of their large home ranges, cover a variety of ecological conditions and thereby help in the coincidental conservation of other organisms.

The Western Ghats region, though it is one of India's two biodiversity hotspot, has only 4 percent of its total area under protection. Forests in the Western Ghats are very vulnerable to degradation as they are fragmented and over-exploited by humans. There is very little scope to increase the area of forests under protection. An alternative approach is to identify patches that may be inadequate for large mammal conservation, but could still support 'lesser taxa' such as insects, amphibians etc. ATREE is currently undertaking an analysis of the Western Ghats region to determine whether the existing protected areas represent the butterfly fauna well. This work involves the development of a database with the species ranges, their distributions, and their habitat preferences. A gap analysis will be carried out to determine if the present protected area network can support the representative butterfly fauna of the area planned.

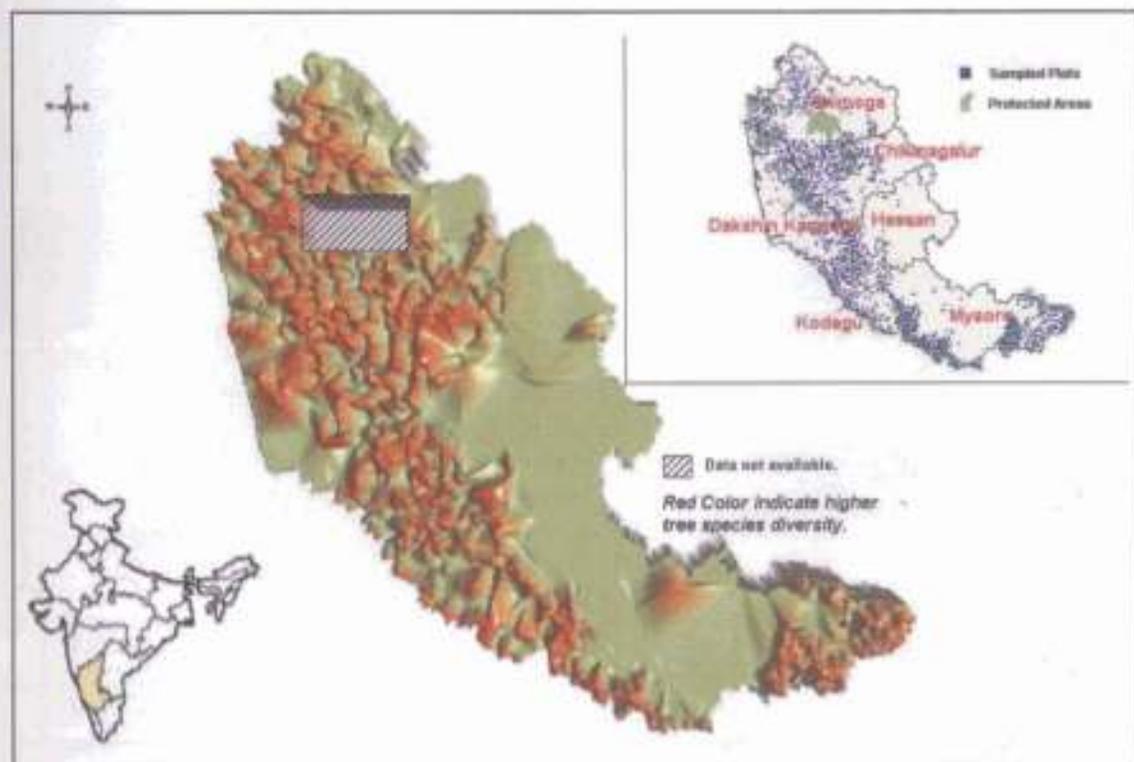
In Arunachal Pradesh, a biodiversity-rich region in the eastern Himalayas, we have used a method for identifying conservation-priority areas based on a predictive land-use change modeling approach. Unprotected natural areas most susceptible to land-use change by virtue of their geophysical and socioeconomic characteristics can be ranked as the highest-priority areas for in-depth field inventories of biodiversity distribution, using such an approach. Our objectives were to use a geographic information system (GIS) and spatially explicit modeling to: 1) examine patterns

of land-use change in Arunachal Pradesh, 2) examine the correlation of land-use patterns with biogeophysical characteristics, and 3) predict areas most susceptible to future deforestation and biodiversity loss based on geophysical and developmental variables. Our major tool was the spatially explicit model, GEOMOD2, which simulates future land-use change based on a statistical analysis of existing land-use patterns. GEOMOD2 is a computer program written in FORTRAN and developed to simulate human-induced deforestation. It reads raster maps and computes empirical relationships between human disturbance and geophysical attributes such as slope and proximity to rivers. Then, GEOMOD2 simulates land-use change from non-disturbed to disturbed by locating new disturbances according to empirical historical patterns. On the basis of these analyses, we identified 4 categories of areas based on their susceptibility to deforestation and protected status. We offered recommendations for setting priority areas for inventorying and conserving biodiversity, and the expansion of the protected area network in order to minimize future biodiversity loss. A manuscript describing the results of this analysis is in press in *Conservation Biology*.

Also in collaboration with the International Center for Integrated Mountain Development, ATREE staff evaluated the current land use and land cover; mapped distribution of rare, threatened, endangered, and endemic species of plants (orchids, rhododendrons, bamboos and other higher plants) and animals (mammals and birds) and the extent of protected area coverage in eastern Arunachal Pradesh. A Landscape Diversity Calculation was also undertaken based on the factors of fragmentation, patchiness, and relative richness. The synthesis finally resulted in a gap analysis and recommendations for appropriate extensions and creation of new conservation areas to enhance coverage and better protection to conservation-dependent species.

1.3.2 Biodiversity Assessments

Biodiversity assessment is a key element of conservation planning. The highlight of ATREE's work in this area is the development of new tools to assess biodiversity. In addition, ATREE is engaged

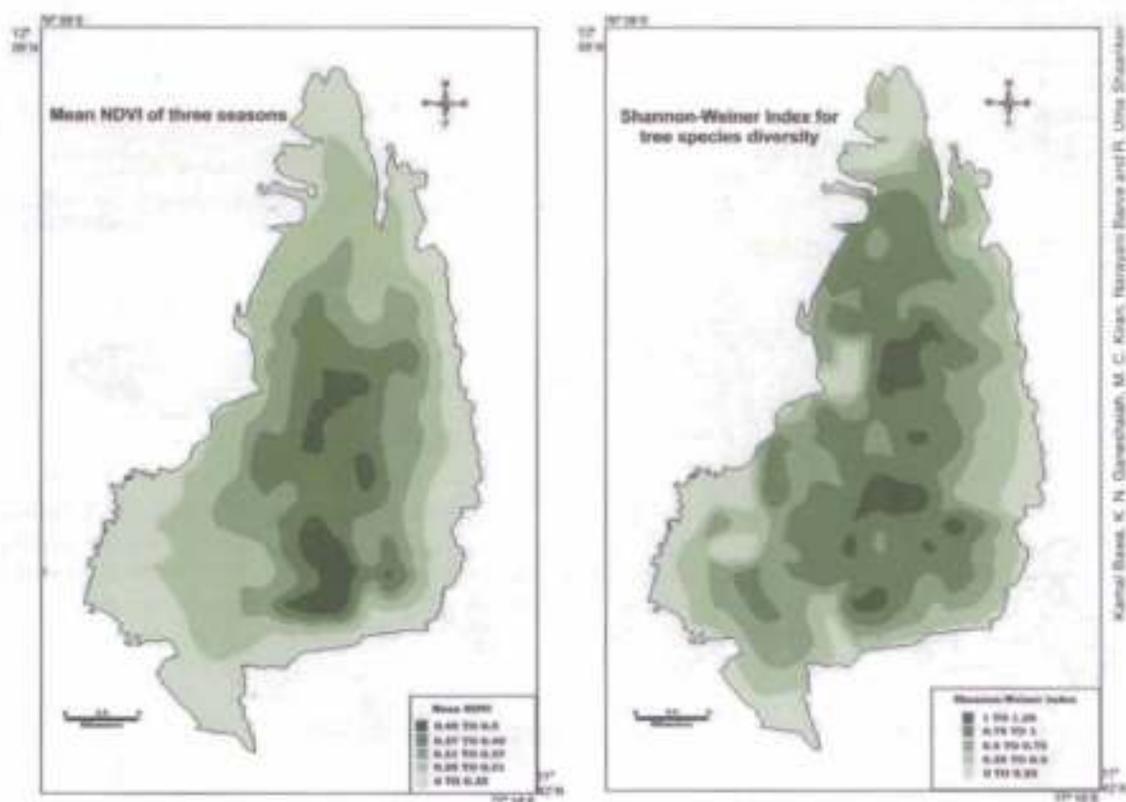


Tree diversity in the Western Ghats.

in inventorying lesser-known taxa. We have placed special emphasis on insect inventories and assessment because these groups have been grossly neglected, even though insects and other invertebrates may account for well over half of the diversity of life on earth.

New tools for assessing biodiversity: First, we have devised a new method of classifying forests, which will aid in rapid inventorying and monitoring of biodiversity. In earlier methods, only one vegetation layer, namely trees, was used to classify forest vegetation. In the new method we use spatial information on tree, shrub, and herb diversity in an area to classify forests. The three layers are combined using certain statistical methods and a spatial map of the vegetation is developed. This offers a comprehensive picture of spatial dynamics of forest vegetation in that area. Using suitable mapping software, the diversity values of the three layers are mapped to visualize peaks and troughs of diversity in an area. This method was successfully tried out in the Biligiri Rangaswamy Temple (BRT) Wildlife Sanctuary, of Mysore District in Karnataka.

To apply the above method to a larger spatial scale, ground level information on vegetation for Karnataka was obtained from the Forest Survey of India. The Forest Survey of India had established numerous small 0.1 ha plots in the Karnataka region of the Western Ghats to gather data on density, species composition and level of regeneration of tree species. Based on these, a conservation value map of the Udupi and the South Kanara region (8228 km²) of Karnataka was developed. This map depicts the spatial distribution of biological diversity in the area and can be used to identify patches that need to be declared as protected forests because of their biological richness.



Kamal Bask, K. N. Dineshbabu, M. C. Kisan, Hanumanthappa and R. Uma Shankar

Mean NDVI and tree species diversity of BR Hills.

Yet another method of classifying forests, based on satellite imageries, that can have wide implication in identifying forests types with varying levels of richness on a very large-scale, has been attempted for the Biligiri Rangaswamy Temple (BRT) wildlife sanctuary. Forests are not mosaics of discrete categories of vegetation types but are a continuously changing terrain of biological diversity. Earlier methods of mapping did not reflect such a picture of continuum. A new method is being developed to generate a continuous mosaic of vegetation change using NDVI values. The mean and CV of NDVI were calculated for imageries acquired from two different seasons. Areas of high NDVI and minimal CV can be considered to correspond to evergreen forests while those with low mean and high CV would represent scrub forests. Such classification allows for identifying a gradual change in forest type across a large area and once this method is standardized it can be applied to areas where no information on forest types is available. Efforts are on to similarly map other areas in the Western Ghats.

Inventoried insect biodiversity: Insects and other invertebrates represent more than 80 percent of all biodiversity and are vital to ecosystem functioning. Potentially the greatest number of extinctions will come from this order. Unfortunately insects are very often overlooked in management decisions, mainly due to lack of information. Biosystematics and inventoring are the core reference systems and knowledge bases upon which all discussion of biodiversity rests. Our entomology team is helping the Karnataka Forest Department in inventoring the diversity and assessing the threat status of lesser-known insect groups in different protected areas (e.g., Nagarhole National Park, and Biligiri Rangaswamy Temple Wildlife Sanctuary).



D. R. Priyadarshani

Long horned beetle from Nagarhole National Park.

Furthermore, with the intention of making future research on insect conservation easier we are building up a reference collection of insects. At present we are giving priority to indicator taxa that show clear responses to environmental stresses and reflect their potential impacts on biodiversity. ATREE's museum currently has more than 25,000 specimens, comprising 130 species of dung beetles and 60 species of ants, in its collection. Efforts to make a reference collection of all families of insects from the Western Ghats are ongoing. A reference collection of Carabids is expected to be ready by the end of this year. ATREE also provides a limited insect identification service for other organizations and amateurs working on insect conservation.

Overall, ATREE is compiling data and developing new tools for systematic conservation planning that takes into account not only the distribution of biological diversity, but also threats to biodiversity from changes in land use and social and economic drivers underlying these changes.

1.4 Forest Genetic Resources

One of the major areas of focus of ATREE's research mandate is to develop a comprehensive approach to conservation of forest genetic resources in the Western Ghats, South India. The forest genetic resources are under tremendous pressure from the high rates of deforestation, habitat alteration, and indiscriminate extraction of forest products. A wide variety of non-wood or non-timber forest product species are utilized by millions of people. The threats have endangered a

large number of species and have already driven some to extinction. The populations of many economically important forest species are highly fragmented, with very few individuals remaining. It is likely that continued extraction of species from natural populations will irrevocably affect the genetic diversity of these populations. Yet, there are few concerted efforts being made to address the conservation concerns in respect of forest trees.

At ATREE, attempts have been made to examine the patterns of genetic variation of important plant species (such as bamboo, rattans, sandal and medicinal plants) in the Western Ghats, and to identify hot-spots of genetic diversity, based on which appropriate conservation protocols can be formulated. Such attempts are necessarily species-centric. Nonetheless, we have also started to explore the possibilities of an ecosystem-centric approach to address the conservation concerns of a larger set of species.

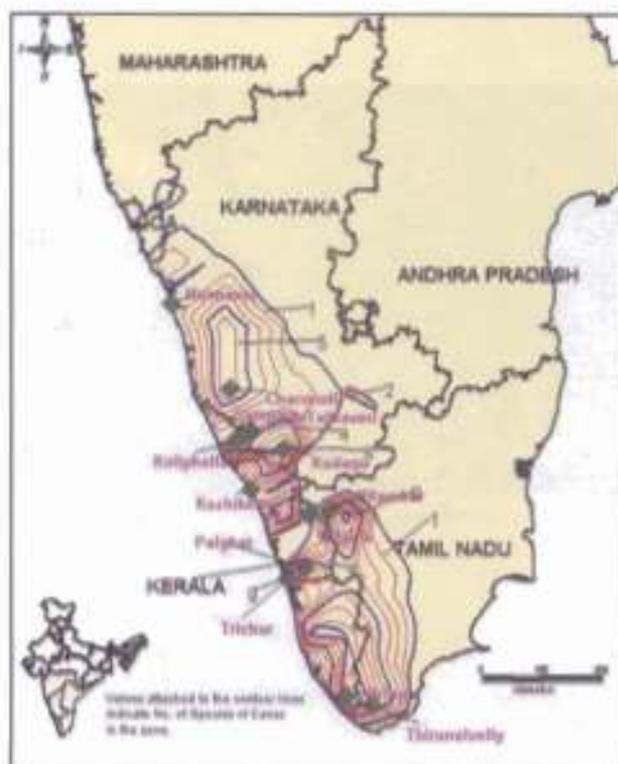
1.4.1 Conservation of Rattan and Bamboo Genetic Resources

Bamboo and rattans are relied upon by millions of people for their livelihoods, in addition to being used as a raw material in the pulp and paper industry. In India, almost all the requirements of bamboo and cane are met from natural forests. At the current rates of utilization, it is estimated the demand from both the industrial and cottage industries sector may soon outrun the stock of bamboo and rattan in the central Western Ghats. While these demands impose a direct threat to bamboo and cane resources, the resources are also under pressure due to forest loss and land degradation.

At ATREE we have assessed the distribution of bamboo and rattan resources in the country and have also assessed the genetic variability of a few economically important species of bamboo and rattan in the central Western Ghats. We have developed contour maps indicating bamboo and rattan species richness and have highlighted regions of high diversity that could serve as sites for *in situ* conservation of these species. We hope that the findings of our study at ATREE would be useful to forest managers in arriving at informed decisions on the management and conservation of bamboo and rattans in the Western Ghats.

1.4.2 Conservation of Sandal Genetic Resources

Among the various tropical tree species, sandal (*Santalum album* L.) forms one of the most commercially important tree species in the deciduous forests of South India, contributing substantially to the foreign exchange earned through the export of forest products. However, due to extensive changes in patterns of land use, and due to rapid deforestation and the indiscriminate exploitation of the sandal resource, natural stocks of sandal have been dwindling rapidly.



Contours of canes diversity in Southern India.

ATREE's work indicates a substantial decline in the total quantity of sandal extracted from Karnataka in recent years. The decrease in extractable sandal very likely reflects the dwindling resource base of sandal in the state. Moreover, the reduction in quantities of sandal available has been accompanied by a reduction in the quality of sandal supplied to sandal-based industries also. This has had an adverse affect on the industries and the on livelihoods of the traditional craftsmen. In addition, because of the reduced supply of the resource, traditional craftsmen have been losing the skills of working with sandal and are constrained to seek alternative sources of livelihood.

Loss of the natural populations of sandal may also have an adverse effect on genetic diversity of the species. Unless these losses are checked, it could lead to an irreparable loss of the genetic resources of sandal from the state. At ATREE we have mapped the genetic diversity of 19 sandal populations in peninsular India, involving more than 800 individuals. Populations of sandal from the deciduous forests of the Deccan plateau were found to be genetically the most diverse and represent the hotspot of sandal genetic resources in peninsular India. These studies offer the possibility of developing a rational basis for the conservation of sandal genetic resources, thus guaranteeing the continued livelihoods of skilled artisans and the much-treasured trade dominance that the country enjoys.

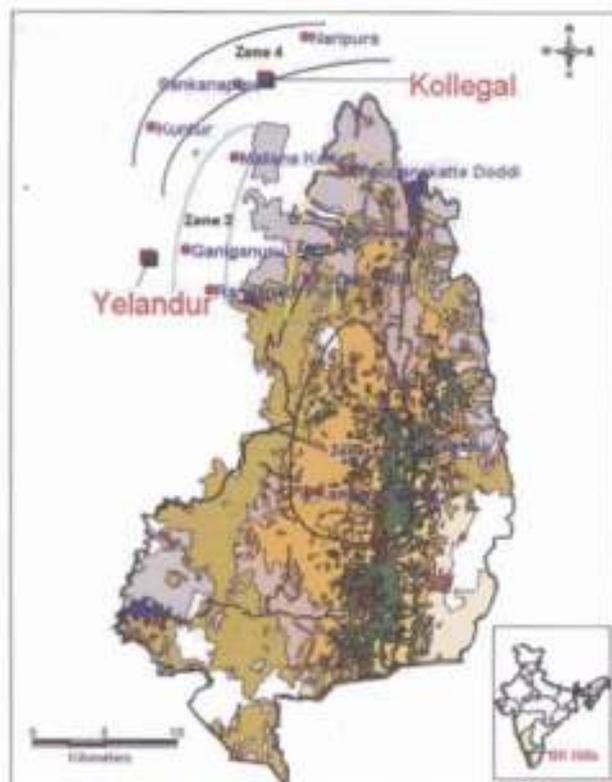
1.4.3 Conservation of Forest Genetic Resources of a Region: Combining Species-Centered and Ecosystem Based Approaches

Most of our programs of conserving forest genetic resources *in situ* are prescriptive rather than preventive. They target the conservation needs of a few species that require immediate attention, but do not address the conservation of the genetic diversity of other species with unknown potential importance. There is a need to move away from the present, species-centered approach, to a regional approach for conserving genetic resources. Conservation programs of forest genetic resources should not be stand-alone programs; they need to amalgamate with other major conservation efforts. Accordingly ATREE has proposed complementary top-down and bottom-up approaches, which can address the immediate needs to conserve single species and also target the long-term conservation of the entire genetic resources of a region.

The top-down approach suggests that we identify the major landscape types that harbor the greatest species and genetic diversity. The bottom-up approach suggests a pyramiding of a species-based approach for a set of economically or taxonomically important species. These top-down and bottom-up approaches enable identification of areas of high inter- and intra-specific diversity, respectively. The areas thus identified are combined to set complementary targets for conservation. We argue that such a strategy is efficient and cost effective in conserving the forest genetic resources of a large areas, especially in the tropics, where the reproductive ecology and the genetic structure of most forest species is not known. ATREE is currently developing top-down and bottom-up approaches toward conservation of forest genetic resources of the central Western Ghats.

1.5 Agrobiodiversity

The unprecedented increase in the erosion of biological diversity of our planet in the last two decades is a matter of grave concern. The causes of this loss of biodiversity are numerous, and encompass all human activities. Ironically, agriculture, an enterprise that involves cultivating nature, also contributes to the loss of biological diversity in several ways. Conversion of forest areas for cultivation, overgrazing, the spread of mono-specific and mono-genotypic cropping systems, and the intensive use of hazardous inorganic inputs, are but some of the ways in which farming activities impact biological diversity. And this loss of biological diversity has, either directly or indirectly, begun to take its toll on agricultural productivity.



Moving from high to low on-farm biodiversity: A gradient from the core to the periphery of BRT sanctuary in Chamaraajanagar District of Karnataka, India.

The study area represents a wide spectrum of farming systems. These range from input-intensive, low-diversity farming systems on the periphery of the BRT sanctuary, to zero-input, traditional farming systems in the core of the sanctuary. The agro-ecosystems studied are all in close proximity to natural forests.

1.5.1 Patterns of Input Use and Farm Productivity

In general, the agro-ecosystems outside the sanctuary received higher inputs than those inside. Farmyard manure constitutes the bulk of the organic inputs used by farmers. Interestingly, use of even this organic input increased from the inside to the outside of the sanctuary. This is not necessarily surprising because the natural fertility of the soil inside the forest may be higher than outside. The intensive farming practices in the periphery may demand high inputs to sustain economically viable yields. This is also reflected in the higher use of inorganic inputs such as pesticides on farms outside the forest.

These findings need to be examined critically before any firm conclusions can be drawn about the relationship between biodiversity and input use on the one hand, and productivity per unit of inputs used, on the other. The next phase of work will involve investigation of input use in a more comprehensive manner along with developing a measure of productivity per unit of inputs used.

The loss of biodiversity on and around farming systems has adversely affected several ecosystem functions (e.g., moisture retention, nutrient turnover, pollination services, natural enemies of insect pests and diseases, etc.). Doubts are now being raised about the productivity, stability, and sustainability of such input-intensive, diversity-poor agriculture. What are the implications of declining biodiversity for the sustainability and productivity of agro-ecosystems, which form the most important and dominant component of our landscape?

ATREE has initiated a long-term research program to investigate (a) the role of biological and genetic diversity in and around agro-ecosystems in affecting productivity and sustainability of farming system, (b) the role of biological diversity in shaping the pattern of resource use, and the intensity of external inputs used in farming systems and (c) the spatial and temporal patterns of exchange of biological resources in the interface zone between agro- and natural ecosystems.

ATREE has conducted studies on agrobiodiversity in and around the Biligiri Rangaswamy Temple (BRT) Wildlife Sanctuary in Chamaraajanagar District of Karnataka, India.

2. Education: *Building a Better and Stronger Future*

ATREE's educational programs are based on its staff's expertise in biodiversity conservation and natural resources management. Although India is rich in biodiversity and faces serious environmental problems, there are few opportunities outside the formal degree programs for college and university level students and teachers to acquire knowledge about the environment. Such opportunities are also limited for professionals at all levels in government and non-government agencies. Moreover, schoolteachers—particularly those in remote areas that are rich in biodiversity—often do not have sufficient skills and curriculum materials to adequately expose students to environmental issues. Thus ATREE offers educational programs for school, college, and university students and teachers as well as for a wide array of professionals.

2.1 *Conservation Biology Course for Students*

ATREE, along with the Department of Science and Technology, Government of India, organized a contact program in conservation biology for graduate and post-graduate students from 2 to 16 Jan 2001. The need for such a program had been felt for a long time, to meet the increasing demand for more trained hands to tackle the biodiversity crises that the country is facing. The objective of the program was therefore to give interested students an exposure to conservation biology that would help them pursue a career in conservation biology. The students were chosen based on their aptitude and demonstrated interest in the field of conservation biology, and came from universities and colleges in the four southern states of Kerala, Karnataka, Andhra Pradesh, and Tamil Nadu, and from the union territory of Pondicherry. Fourteen students participated in the course.



A. Pasting

Students learning field techniques in conservation biology.

The first 4 days of the course were devoted to lectures on various topics in conservation biology and were followed by 7 days of fieldwork in the Biligiri Rangan Hills (BR Hills). The lectures were by leading conservation biologists from India and abroad. The lecturers came from various institutes such as the University of Agricultural Sciences, the Indian Institute of Science, the Institute of Social and Economic Change, Kalpavriksh, Zoo Outreach Organization, Wildlife First, the Karnataka Forest Department, in India, and from the Missouri Botanical Garden, the University of Massachusetts, and The Nature Conservancy in the United States.

The major topics covered in the lectures included (a) a general introduction to conservation biology, (b) the distribution of biodiversity at global and regional levels, (c) ecological communities and their conservation, (d) conserving small populations at the species level, (e) threats to biodiversity, (f) conservation genetics, (g) *ex situ* conservation and red listed species, and (h) protected areas. In addition, there were also several lectures on the role of local communities in protection of biodiversity as this forms an important aspect of conservation in India. Students were also introduced to the application of Geographical Information Systems (GIS) in conservation planning, with case studies used as examples.



R. Ganesan

Student project at Biligiri Rangan Hills.

The fieldwork complemented the theoretical lectures and gave the participants a feel for conservation science as practiced in the field. The field component of the course largely pertained to forest ecology and threats to forest ecosystems. At the outset the participants were given a brief orientation to BR Hills, its biodiversity, its indigenous inhabitants, and the role of local organizations in conservation in the BR Hills. They were then asked to choose a problem that could address issues relating to invasive species, fire, fragmentation, or the distribution of biodiversity. Faculty at ATREE reviewed the student projects before collection of data. The data collected were then analyzed by the students with the help of participating faculty and presented at a mini-symposium in Bangalore.

Feedback on the course and lectures was obtained through evaluation forms given to the participants at the end of the course. All participants felt the course was useful and that they had learnt much more in a short time in the course than they would have elsewhere. They also felt the informal atmosphere at ATREE was conducive to learning. They mentioned, however, that some lectures could have been more basic and greater time could have been given for analysis and presentation of data.

ATREE has now been invited to submit a proposal for a national level course by the Department of Science and Technology.

2.2 Conservation Biology Course for University Lecturers

A second course on conservation biology was held in India's second biodiversity hot spot, Arunachal Pradesh, from 15 to 21 March 2001. This course was aimed at both working professionals and students from various fields of science and arts. The Eastern Himalayan unit of ATREE, in collaboration with Arunachal University, organized the course, which was held at the Arunachal University campus in Itanagar. Twenty-six participants representing Arunachal University, the North Eastern Institute of Science and Technology (NERIST), the Zoological Survey of India (ZSI), WWF-India and others participated in the course. The focus of the course was to demonstrate how conservation biology

A. Hattori



Conservation biology course at Arunachal Pradesh.

could be undertaken using simple yet effective tools that are locally available. There were 3 days of intensive lectures by people working in the Eastern Himalayas and by ATREE staff from Bangalore. The lectures were followed by a 3-day field trip to Sessa, an orchid-sanctuary in Arunachal Pradesh. Field sampling techniques were demonstrated to students and they were later asked to collect data on their own. Data from vegetation and bird sampling were analyzed on the last day using simple calculators. Participant response was favorable and many were keen to learn more about techniques in conservation biology that they could use to promote applied conservation biology research and action in Arunachal Pradesh.

As a result of the overwhelmingly positive feedback from participants, ATREE will now regularly offer courses in conservation biology and natural resource management for university and college level students and lecturers.

2.3 Environmental Education at the School Level

In addition to its recently initiated educational programs at the graduate and post-graduate level, ATREE has been involved in environmental education at the school level for the past several years. ATREE's work on environmental education at this level includes a range of activities: creating awareness among administrators of schools about the importance of environmental education, enhancing the skills of school teachers in environmental education, developing curriculum materials based on local biodiversity and environmental issues, and providing support for field based activities, nature camps, and workshops.

Building awareness: With the help of the School for Vocational Studies and Languages (SVSL), a local partner agency, ATREE held a workshop for 20 principals of schools in Kalimpong to make them aware of the important challenges and opportunities in environmental education. This meeting was followed by a 2-day orientation for principals of 22 high schools, which resulted in the formation of a forum of schools called the People for Environment Awareness Kalimpong (PEAK). During this orientation, the principals were familiarized with the different approaches being followed in the field of conservation and environment education in various parts of the country. The gravity of the local and global environmental problems and their societal implications was also highlighted. The principals agreed to place emphasis on environmental education and ATREE provided support for a coordinator who would work with teachers of the 22 schools involved, in developing educational resources and training programs in environmental education.

Training for school teachers: ATREE set up two Environment Education Resource Centers (EERC) in Kalimpong—one for the English-medium schools and the other for primary level Nepali-medium schools. The EERCs were inaugurated on 5 June 1999, World Environment Day. These EERCs contain books, and other education aids such as videotapes, audiocassettes, posters, slides and transparency presentation sets. Since the inception of the EERCs, a number of training workshops for schoolteachers have been held. More recently local expertise has been developed and trained to work with school and college teachers and students.

In addition, ATREE's Eastern Himalayan Program is also working with the Basic Training Government (B.T.) College in Kalimpong to link environmental education with small-scale enterprises oriented toward conservation. ATREE is assisting B.T. College to include vocational training as part of the curriculum for their 1-year residential teacher-training course. Some of the areas identified for training are: mushroom growing, organic vegetable and fruit growing, tea and shade tree nursery management, fruit preservation, recycled paper making, etc. Most of the trainees, who are from the rural areas of District Darjeeling and Jalpaiguri, are unable to find jobs as teachers and remain unemployed. Consequently, these cadres of unemployed youth quite often pose pressure on the forests.

In the Western Ghats, in Biligiri Rangan Hills, ATREE has supported schoolteachers' participation in programs at the Center for Environmental Education, Bangalore, to enhance their skills in environmental education. ATREE's staff has also directly worked with schoolteachers to help them develop field exercises and activities, and has trained teachers in the use of computers for educational purposes.

Development of curriculum materials: Lack of curriculum materials that are locale-specific, and based on local ecology, biodiversity, and other environmental issues, is one of the major hurdles in imparting environmental education. ATREE's Eastern Himalayan Program has developed activity-oriented modules with locally relevant examples based on six different themes: environmental concepts, nature study, alternate energy, pollution, waste management, and green consumerism. This effort has been compiled into a manual entitled *Green Minds*, for the use of teachers. The manual is currently being revised and enlarged.

In the Western Ghats, in the Biligiri Rangan Hills, again, ATREE's staff has worked with schoolteachers in developing instructional modules. ATREE has also provided a computer to the local school in this remote area, with databases on local biodiversity, much of it organized in the Geographical Information System (GIS) format. The teachers have received some basic training in operating GIS software.

Nature camps and educational workshops: A range of workshops and other activities were organised and supported by ATREE to further enhance the skills of teachers and students.

- A workshop entitled *Media and Environment*, was organized with the Center for Science & Environment, Delhi, for students of Kalimpong and Kurseong in District Darjeeling, from 25 to 29 September 2000. Forty children from 17 schools participated in the workshop and these young investigative journalists produced a special issue of *Gobar Times*, a children's supplement to India's leading Science and Environment fortnightly magazine, *Down to Earth*. The theme of the workshop was the environmental issues of Kalimpong town. The students investigated, reported, edited, designed, illustrated and produced the entire news magazine in this 4-day workshop and released it at a public function.
- ATREE assisted the Kendriya Vidyalaya Sangathan in their refresher program on environmental education for primary level teachers from all Kendriya Vidyalays of North Bengal and Sikkim, held in Bagdogra.
- Two Nature Camps were organized in Kalimpong, in which more than 300 elementary school students and their guardians participated.
- ATREE assisted the Bhartiya Vidyapeeth Institute for Environment Education and Research, a Pune based centre of the Pune University, in undertaking the content analysis of Bengali-medium text books for standards I to XII.



A. Hasting

Media and environment workshop for school children in Darjeeling district.

- At the invitation of the World Wildlife Fund, Sikkim, ATREE organized a 3-day teacher-training program for the schoolteachers in Gangtok, Sikkim.

2.4 Biodiversity Conservation and Natural Resource Management Training Workshop for Forest Guards

A 2-day training workshop on forests and conservation was conducted by ATREE on 9 and 10 December 2000 in Biligiri Rangaswamy Temple Wildlife Sanctuary. Twenty-three forest guards participated in the workshop. The workshop emphasized the importance of research and the application of such knowledge for conservation and management, to complement the wealth of knowledge about the forest that forest staff have. ATREE's staff exposed the forest guards to modern concepts of biodiversity conservation and management and to the use of geographical information systems (GIS). Exercises in the field emphasized simple protocols for sampling plants, vertebrates and invertebrates. At the end of the workshop the participants were enthusiastic in their feedback. They were impressed by the research activities carried out in BRT Wildlife Sanctuary, and were able to appreciate the relevance of research to management issues. They felt that information gained in the workshop would be useful for them in their conservation activities, and that workshops of this nature should be conducted periodically, both for the forest department and for the local communities living in and around the sanctuary.

R. Ganesan



Junior forest department staff training at BR Hills.

3. Outreach: *Building Capacity and Fostering Networks*

ATREE's outreach activities, just like its educational programs, draw upon the research and expertise of its staff in the field of conservation. The outreach activities have three broad objectives. First is capacity building of government and non-government organizations. Second is to create awareness about conservation and environmental issues for students, teachers, professionals and the lay public. Furthermore, ATREE seeks to provide forums for discussion, debate and the exchange of information about the environment. Third, ATREE participates in and fosters networks of like-minded institutions to take advantage of complementary strengths in resolving significant issues and to promote the cause of conservation.

3.1 *Capacity Building*

The long-term success of any conservation and development endeavor depends upon adequate capacity to sustain work beyond the limited lifetime of funded projects. The role of external interventions, though important, is limited. External interventions can provide conceptual clarity, help catalyze activities, and assist in strengthening a cause. But in the end, it is only by strengthening the capacity of partners and organizations capable of community mobilization and bringing about social change that the cause is sustained. Following are some examples of ATREE's activities that are intended to build institutional, financial, and technical capacity of its partners.

Participatory resource monitoring: The participatory resource-monitoring (PRM) program in Biligiri Rangan Hills in Karnataka is part of a larger effort in enterprise-based conservation and integrated forest management. The objectives are (a) to help the *Soligas* derive better economic returns through on-site processing and value addition of non timber forest products (NTFP) they harvest, and (b) to enable the *Soligas* to attain harvest sustainability.

There are several components of the PRM program. Pre-harvest meetings are held to discuss methods to estimate the amount of the resource available for harvest, and to review non-destructive harvest techniques to be followed. Post-harvest meetings are held to estimate the amount harvested and to evaluate the harvesting techniques used. In addition, awareness campaigns, in the form of dramas and folk art by the *Soligas*, are held to highlight conservation and natural resource management issues, and workshops are conducted to share the outcome of the PRM program with the remainder of the *Soliga* community and the state forest department.



Resource mapping of Amla by *Soligas*.

As part of the pre-and post-harvest monitoring process, the *Soligas* prepare resource maps on production, extraction and regeneration, annually. The information collected is documented in the *Soliga*-run enterprise unit and is used to guide harvest decisions. ATREE has prepared training manuals on participatory resource monitoring for use by the community and the

enterprise unit. In addition, PRM includes monitoring of such socioeconomic parameters as income generated from non-timber forest products and the disposition of such income.

There have been notable achievements that have resulted from the PRM program both in an increase in the proportion of returns to harvesters from the sale of products harvested, and in a growing adoption of non-destructive harvest techniques. The continuing success of participatory monitoring will depend on the incentives *Soliga* receive and the extent to which they are empowered to manage resources in collaboration with the state's forest department.

The state-level congress of tribal youth: A congress of tribal youth was organized jointly with ATREE's partner organization, the Vivekananda Girijana Kalyana Kendra (VGKK), and was held at the VGKK campus in the Biligiri Rangaswamy Temple (BRT) wildlife sanctuary. The conference was planned and executed by several dynamic young *Soliga* leaders and attracted over 300 participants from all over Karnataka. The goal of the conference was to bring together youth from diverse tribal communities in Karnataka and to expose them to opportunities in education, the challenges of public health, the need for community organization, the urgency of biodiversity conservation, and to relevant agricultural technologies. Participants also learned of each other's distinct cultures through dance, drama and music sessions.

Resource persons from VGKK, ATREE, Jana Shikshna Trust and other organizations participated in the presentations and interactions that followed. The youth actively participated in all sessions and made ambitious plans for the future, including the promotion of education among tribals, and the empowerment of women folk. The newly formed state-level Rajya Budakattu Girijana Yuva Jagrutha Vedike plans to continue the momentum generated through village level youth committees and prioritized programs. There was unanimous consent to make this an annual event.

Moorti Ecosystem Conservation Action Programme: A long-term water quality-monitoring program to test the effects of agrochemical (pesticides, herbicides, and fertilizers) run off from tea gardens on water quality in the Gorumara National Park, West Bengal, is being undertaken by ATREE in collaboration with the People's Science Institute, Dehradun, the West Bengal Forest Department, and Green Guard, a local NGO. The forest staff of the Gorumara National Park and members of Green Guard have been trained in bio-monitoring protocols and the measurement of simple physico-chemical parameters. After detecting very high levels of run-off in the river, ATREE organized a stakeholders meeting on 15 December 2000 to discuss the results and plan follow-up action. Nine important stakeholders, including the Forest Directorate (Wildlife as well as Territorial wings), Tea Estates (Kilkott and Chalsa), the Docars branch of the Indian Tea Association (DBITA), the West Bengal Tea Development Corporation, the Central Pollution Control Board (CPCB), the State Pollution Control Board (SPCB), the Peoples Science Institute, and Green Guards, deliberated on the follow-up action. It has been decided that DBITA will volunteer some gardens for another year of monitoring, the Forest Department will pursue the issue with the district administration and the government, and CPCB will propose to bring Moorti river under a long term monitoring program. ATREE has spearheaded this issue and is providing overall direction and help to all stakeholders.

Biodiversity monitoring in Singhalila National Park: Singhalila National Park in Darjeeling Hills in the Eastern Himalayas is home to endangered pheasants such as the Satyr Tragopan and mammals such as the Red Panda. In an effort to sustain monitoring of biodiversity in this high altitude park, ATREE organized a monitoring training workshop in partnership with the Centre for Resources and Conservation Studies (CRCS), Darjeeling, from 29 March to 2 April 2001. The objective of the workshop was to provide training for an effective and low cost monitoring program that would involve residents and the staff of the forest department. The standard protocols for monitoring calls and other signs of animal presence, and for documenting important habitat parameters, were transferred to the target group comprising field staff of the wildlife division, and residents, students, and teachers from neighboring villages.

Eco-development committee of Rampuria forest village: The Rampuria forest village is situated on the fringes of the Senchal Wildlife Sanctuary in Darjeeling Hills in the Eastern Himalayas. The villagers rely heavily on the forest resources of the sanctuary for their subsistence needs. In collaboration with the Darjeeling Earth Group, ATREE has provided technical, managerial, and financial inputs to the village eco-development committee to enable the villagers to develop alternate sources of livelihoods so that their dependence on forest resources can be reduced. ATREE's program is part of a larger effort to develop models that would enhance rural incomes, reduce the use of forest resources by the villagers, and promote conservation. Interventions to enhance economic returns were made in agriculture and plantation crops, and livestock management, and options for enhanced productivity and efficient utilisation of fuel wood and fodder resources were created. Several micro-enterprises, such as bee keeping, were also successfully introduced. Efforts are underway to further strengthen the eco-development committee.

3.2 Forums for Exchange of Ideas and Information

There is a lack of awareness among professionals as well as the public about the causes and consequences of the loss of biodiversity and degradation of natural ecosystems. Apart from its educational programs, ATREE is involved in creating this awareness by a wide variety of mechanisms. Researchers associated with ATREE write articles in newspapers and popular journals. ATREE also sponsors public lectures on important environmental issues. Beginning this month (July 2001), ATREE, in collaboration with a wide array of professionals in the field of the environment, will launch an online journal, as described below.

E-Journal: A critical input for informed decision-making in conservation and natural resource management is access to scientifically rigorous research. This research is increasingly interdisciplinary in nature and comprehensive in its coverage of issues. Apart from ecologists, social scientists, geographers and information technology specialists—to name a few—contribute to this research. Nonetheless, a large part of this work is scattered in various journals, each catering to its own discipline, and is not accessible to others who could benefit from it. It is also necessary that this work, and the various current pressing issues, be debated and discussed. Such open forums for debate serve to keep the public informed about relevant issues in this field. Thus, there is a need for a forum where scientists can publish their work quickly and where their work can be discussed and debated. The present journals on the subject have limited reach, are expensive to publish and distribute, and hence are not accessible to a vast majority of potential users. They also do not bring together the various stakeholders such as academics, policy makers, and activists, on a common platform. Meanwhile, there has been a growing worldwide movement for the free dissemination of research results: there have been significant advances in electronic publishing, and access to the internet is rapidly spreading.

Conservation and Society

An interdisciplinary peer-reviewed journal

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Conservation and Society is published by the Ashoka Trust for Research in Ecology and the Environment (ATREE)

Inspired by the philosophy of making research free and accessible, and taking advantage of the low cost and wide reach of the Internet, ATREE decided to publish an electronic journal. Fortuitously, at the same time another group was working together to bring out a print journal on the same subject. ATREE joined hands with the group. The result is *Conservation and Society*. This journal promotes the publication of research on conservation and natural resource management, and provides a forum to exchange ideas, to debate and discuss pressing issues, and to disseminate information and knowledge on the subject of biodiversity conservation. *Conservation and Society* is peer reviewed, with an interdisciplinary focus drawing on both the natural and social sciences, and covers basic and applied research. While the initial focus is on South and Southeast Asia, the journal publishes material that is of general interest to all, particularly to those in the developing world.

The electronic version of *Conservation and Society* is free. Work on bringing out a hard copy edition is in progress. The electronic format permits speedy publishing of manuscripts, and reaches a global readership; the print journal will cater to those who do not have access to the Internet, or prefer a hard copy. The target readership for the journal includes researchers, academicians, teachers, naturalists, resource managers, and policy makers and planners.

For more information on *Conservation and Society* visit the web site for the journal, www.conservationandsociety.org.

Other Initiatives: *Conservation and Society* is part of a larger ATREE initiative to promote information dissemination and awareness building about conservation biology. Future plans include a popular journal on conservation, a web course in conservation biology, and provision of

textual, audio, and video resources on biodiversity conservation and natural resource management in an electronic form.

3.3 *Networking*

The resolution of the enormous problems we face in conservation requires collaboration among organizations with similar goals. ATREE's networking efforts are designed to exchange ideas, views, and information on a regular basis among like-minded institutions. The centerpiece of this activity is the support of the Conservation and Livelihoods Network. This network sponsored two workshops, one in the Western Ghats, and the other in The Eastern Himalayas, as described below.

The 4th National Consultation on Wildlife Conservation and People's Livelihood Rights: This workshop was held from 15 to 17 April 2000 in the Biligiri Rangaswamy Temple (BRT) Wildlife Sanctuary, Karnataka. The Consultation was jointly organized by the Vivekananda Girijana Kalyan Kendra (VGKK), ATREE, and Kalpavriksh, a Pune based environmental organization.

This Consultation was part of an ongoing effort to bring together people who represent the cause of wildlife conservation on one hand, and activists working with natural resource dependent communities on the other. In the past these constituencies have often been in conflict over issues of biodiversity conservation and people's livelihood rights, including those in protected areas such as national parks and sanctuaries.

The objective of these consultations has been to provide a forum for constructive interaction among forest officers, NGOs, social activists, local community representatives, conservation researchers, academics, and others. Such dialogues are a part of a larger attempt to build bridges, and to work towards joint strategies against threats to the habitats that support both wildlife and local communities, including protected areas. Previous consultations in this series, which was started in 1997, were held in Rajasthan and Madhya Pradesh, in Western and Central India, respectively.

About 50 participants from various fields and sectors participated in the 4th Consultation. Its main outcome was a consensus that the integration of wildlife conservation and people's livelihood rights was necessary. Such integration would benefit both, by creating a stake and specifying responsibilities amongst local communities in the conservation of wildlife habitats. Strategies to this end, including those for protected areas, were discussed extensively.

The 5th National Consultation On Wildlife Conservation And People's Livelihood Rights: The workshop was held from 8 to 10 April 2001 at Makalbari Tea Estate, Kurseong, and Shilpanchal Bhawan, Siliguri, in West Bengal. The Consultation was jointly organized by ATREE, the North East Society for Protection of Nature and Wildlife (NESPON), and Kalpavriksh. The Society for Environment Education and Development (SEED) members assisted as local co-organizers. About 100 participants from various fields and sectors, from within the government and civil society, and from various parts of India, participated in the Consultation.

As in the 4 previous Consultations, the objectives of the 5th Consultation remained (a) to facilitate widespread dialog, (b) to sensitize wildlife conservationists to social issues and social activists to conservation issues, and (c) to arouse interest in national level policy and legal mechanisms that influence wildlife and local communities. This was the first time that a national meeting of this nature had taken place in the north-east—previous meetings having been held in the west, central and southern parts of the country—and it provided a valuable opportunity for participants from the rest of the country to acquaint themselves with issues related to conservation and livelihoods in

the north-east, just as it did participants from the north-east an opportunity to acquaint themselves with issues in the rest of the country.

The Consultation, in its conclusion, noted that there was an urgent need to move toward a framework of conservation that involves local people in the planning and implementation of wildlife conservation programs, including in protected areas. It was also noted that it was necessary for there to be widespread political mobilization and networking amongst various sectors of society, which included those struggling for the rights of socially disabled groups as well as those struggling for the rights of wildlife.

4. Policy: Improving the Prospects for Lasting Change

ATREE's policy related work has three objectives. The first is to analyze policies regarding land use, conservation planning, and management of forest resources. The second is to bring about a change in the policies. And the third is to provide a forum for discussion and exchange of ideas and information that pertain to revisions or changes in policies.

4.1 Policy Analysis

Policy analysis is based on the review of existing policies and new information generated by ATREE's programs. In management of forest resources, ATREE's policy work is focused on extraction of non-timber forest products. There are several issues of interest.

Millions of people in India rely on extraction of non-timber forest products. The impact of such extractions on the harvested populations and on ecosystem structure and function is not known, as the states have no programs or policies to monitor harvest levels or the impact of harvests. Similarly there are no programs to monitor the effects of fire and invasive species that are of almost universal occurrence and may affect regeneration of non-timber forest products. Although the local communities harvest substantial amounts of non-timber forest products they have unclear tenure over these resources and play no role in management of non-timber forest product species. Marketing of non-timber forest products in Karnataka State is accomplished through cooperative societies, the LAMPS (Large Scale Adivasi Multipurpose Societies). The LAMPS are controlled by government officials, are often inefficient, and rarely distribute profits. ATREE's research is aimed at analysis of policies concerning harvest levels of non-timber forest products, functioning of LAMPS, and development of models for management of non-timber forest products that incorporate principles of adaptive management in which monitoring and local communities play a key role.

In the Eastern Himalayas, ATREE, in collaboration with other local organizations has collected and analyzed field level information on the implementation of the Joint Forest Management Program in North Bengal, and was invited to present the findings to all the concerned forest officials in a meeting convened by the Principal Chief Conservator of Forests.

In the conservation planning arena, the existing conservation policies are not based on the spatial distribution of biodiversity, threats to biodiversity, or the involvement of various stakeholders in conservation. ATREE's efforts are focused on the analysis of policy constraints on systematic conservation planning that takes into account the three factors mentioned above. The basis of such analysis is again ATREE's own research in these areas.

ATREE has also been invited to contribute to the development of a National Biodiversity Strategy Action Plan (NBSAP) by the Coordinator of the Technical and Policy Core Group. ATREE is preparing a paper on policy related to community-based conservation. A second thematic paper for the NBSAP process is based on customary laws and practices to ascertain the existence and recognition of customary and community laws. Other inputs will include review of policies related to other aspects of conservation.

4.2 Policy Impact

ATREE's programs are slowly resulting in changes in policies at the local and national levels. At the local level, as described elsewhere in this report, ATREE's efforts in the eastern Himalayas

have resulted in revision of policies concerning the role of environmental education in schools in the Darjeeling Hills in the Eastern Himalayas. After a year of sustained campaigning with principals, teachers, and the members of the school management committees, many schools in Darjeeling Hills have introduced regular curriculum developed by ATREE for standard V to VIII.

In the Western Ghats, working with one of our partners, Vivekananda Girijana Kalyana Kendra (VGKK), efforts to change policies concerning fees that the indigenous people have to pay to harvest non-timber products have also been successful. At the national level, ATREE's work on mapping biodiversity has helped in the development of national programs to build species databases for a wide variety of organisms.

4.3 Policy Dialogues

There are a wide variety of mechanisms for analysis, review, and formulation of policies. One of these mechanisms is the exchange of ideas and information in conferences and workshops. ATREE has organized several workshops to facilitate formal and informal discussions about policies related to conservation among major organizations.

One of the major workshops was on conservation of forest genetic resources. The objective of the workshop was to address the growing danger of species loss, and to discuss strategies for conserving forest genetic resources. The workshop was sponsored by the International Plant Genetics Resources Institute (IPGRI), Rome, and ATREE, and was attended by 50 participants from academia, and from government and non-government organizations.

The primary cause of species loss is continuing deforestation and habitat alterations. Other growing causes of species loss, and the loss of genetic variation within species, are forest degradation due to extraction for a wide variety of products, invasive species, which are displacing locally adapted species, and global warming, which threatens to alter species composition of forests and also to reduce genetic diversity within and among populations. The specific questions considered by the participants were:

- What type of biological information do we need to design effective conservation strategies?
- What should be the balance between ecosystem and species-population level approaches to conserve forest genetic resources?
- What ought to be the balance between *ex situ* and *in situ* conservation?
- What are the improvements needed to enhance the policy framework for conservation of forest genetic resources?
- How can the conservation of forest genetic resources be integrated with conservation of biodiversity.

The major conclusions of this workshop were that our policies should emphasize *in situ* conservation of forest trees, an appropriate balance between ecosystem-level and species-oriented approaches, and changes in institutional arrangements for conservation and sustained use of forest resources. Policies and programs for conservation of forest genetic resources should be integrated with conservation of biological diversity.

The output of the forest genetics resources workshop is a book published by IBH Publishing Co. Pvt. Ltd., New Delhi in association with ATREE. This is the first volume on forest genetics resources to be published in India.

Other workshops on livelihoods and wildlife conservation, described in the outreach section have facilitated discussions on policies on a wide range of issues concerned with the rights of indigenous peoples and conservation of biological resources. In the eastern Himalayas, ATREE participated in the National Forest Workers Forum and contributed to the national consultation on land rights being granted to forest villagers in the process of conversion of forest villages to revenue villages.

5. A New Institutional Initiative: *ISEC-ATREE Centre for Interdisciplinary Studies in Environment and Development*

On March 24, 2001, ATREE signed a Memorandum of Understanding (MoU) with the Institute for Social and Economic Change (ISEC), Bangalore for the commencement of a new activity, viz., the ISEC-ATREE Center for Interdisciplinary Studies in Environment and Development (CISED). The MoU was a culmination of almost two years of efforts by a group of scholars from within ATREE, ISEC and elsewhere who conceived of the idea of creating 'an institutional space for conducting interdisciplinary research and training on problems at the interface of environment and development in ways that ensure relevance for action and policy without sacrificing academic rigor'.

While ATREE's mandate includes work on sustainable development in the broadest possible sense, the starting point for ATREE has been conservation of biological diversity. Addressing other environmental issues in their fullest form would require a substantial broadening of the disciplinary base within ATREE, which ATREE hopes to accomplish within the organization as well as by exploiting complementary strengths of its partner organizations. The initiation of CISED in collaboration with ISEC, a well-established autonomous institute of research and training in the social sciences in Bangalore, will help ATREE accelerate integration of social and natural sciences. At the same time ISEC will greatly benefit from ATREE's expertise in a range of environmental fields.

CISED is located on the sylvan ISEC campus and will consist of several core, affiliated, and visiting faculty. They will initially develop research programs on three focal areas: forests, water resources, and urban environment. CISED is governed by an executive committee containing representatives from ISEC, ATREE and the other founders of the concept. CISED will also be guided by an Advisory Committee of internationally renowned scholars, activists and policy-makers in the field of environment and development. Financial support for initiating the Center has been received from the Ford Foundation and from IDRC-Canada.

At the time of writing this report, CISED had begun functioning with two Senior Fellows: Dr. Sharachandra Lele (also Coordinator of CISED) and Dr. K. V. Raju. They will be responsible for the focal areas of forests and water resources respectively. Several studies have already been initiated in these focal areas. In the forestry area, CISED is involved in studies of land-cover change in Chickmagalur district, impact of the conversion of forests to coffee in Koppa taluka of Chickmagalur district on litter insect diversity (in collaboration with the Wildlife Institute of India), a similar study on the impact of heavy pruning, degradation and forest plantations in Sringeri taluka (in collaboration with ATREE), and an ex-post benefit-cost analysis of the conversion of BRT forests from Reserve Forests to Wildlife Sanctuary (also in collaboration with ATREE). In the water resources area, an exploratory study of conflicts between urban, industrial and agricultural use of water in Karnataka has begun, and CISED is also collaborating with the International Water Management Institute, Colombo, in a multi-country comparison of irrigation management transfer.

In addition, as a part of its core mission to think about interdisciplinarity, CISED is hosting a workshop on 'Methodological Issues in Interdisciplinary Research on the Environment' for the Indian Society for Ecological Economics (INSEE) in July, 2001.

Further information on CISED can be obtained from its website: www.cised-india.org that will be activated by the end of July 2001.

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Books

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Meetings Attended and Papers Presented

Ajay Rastogi participated in the Organic Farming Inspection and Certification Training Course organized by IFOAM, October 2000, New Delhi and also in the Forest Stewardship Council (FSC) Certification Program for India, March 2001.

Ajay Rastogi participated in, and made a presentation on 'Indiscriminate Pesticide Use and Occupational Health Hazards: An Enviro-legal Perspective' at an orientation workshop on environmental law organised by North Bengal University for Panchayat Samiti members.

Ankita Hiremath participated in the 5th Consultation on Wildlife Conservation and Livelihood Rights organized by Kalpavriksh and ATREE in Kurseong and Siliguri, April 2001.

Ankita Hiremath participated in a workshop on Joint Forest Management organized by the Society for Promotion of Wasteland Development in Hyderabad, November 2000.

Aravind N. A., Dinesh Rao, Narayani Barve, R. Uma Shaanker, and K. N. Ganeshaiah made a presentation on 'Mapping bird and butterfly diversity in Biligiri Rangaswamy Temple Wildlife Sanctuary' at a national symposium on Problems and Prospects of Environment in the New Millennium, held at Mangalore University.

Bipin Charles, Narayani Barve, Soubadra Devy and M. C. Kiran attended a 2-day workshop on the Use of Remote Sensing and GIS in Environmental Management conducted by the Centre for Environmental Management Training, Bangalore, June 2000.

Ganesan, R., R. Siddappa Shetty, Aditi Sinha and K. S. Bawa, presented a paper titled 'Biological Monitoring and Regeneration of a NTFP species, Nelli (*Phyllanthus emblica* L.), in BRT Wildlife Sanctuary, Western Ghats, India', at a conference on 'Exploring Forest Diversity and Change: Science Results from the Network of Forest Dynamics Plots,' Nanyang Technological University, Singapore, organized by the Smithsonian Institute, June 2000.

Ganesh, T. participated in 'Elephant Conservation in the Nilgiris and the Eastern Ghats, The stakeholders Work Shop' organized by WWF India AREAS Programme, Bangalore, November 2000.

Ganesh, T. presented 'Recruitment and mortality among adult trees in a wet forests of Agasthyamalai in the southern Western Ghats, India' at a conference on 'Exploring Forest Diversity and Change: Science Results from the Network of Forest Dynamics Plots,' Nanyang Technological University, Singapore, organized by the Smithsonian Institute, June 2000.

Gladwin Joseph presented a paper titled 'Seedling quality and Reforestation: More than meets the eye' at the International Symposium on 'Tropical Forestry Research: Challenges in the new Millennium' held at Kerala Forest Research Institute, Peechi, from 2-4 August 2000.

Nakul Chettri participated in the 4th regional awareness workshop on Global Environmental Facility (GEF) held at Centre for Development and Environment Policy, Indian Institute of Management, Calcutta, January 2001.

Nakul Chettri, member of Rathong Chu Valley Local Area Project for NBSAP, participated in meetings held in January 2001, the public hearings process during May 2001, and the Mid-Term Workshop in Delhi, June 2001

Nakul Chettri made a presentation entitled 'Importance of Yuksam-Basecamp corridor and the role of the Himalayan Mountaineering Institute (HMI) in conservation of bio-resources' at an orientation workshop organized by HMI to discuss how the impact of fuelwood utilization and waste disposal can be mitigated by the use of alternative resources and better management.

Narayani Barve participated in a workshop on Use of GIS in Biodiversity Mapping. A Methodology Workshop on Mapping Bio-resources at the Jawaharlal Nehru Center for Advanced Scientific Research, Bangalore, January 2001.

Priyadarsanan, D. R presented 'Insect conservation: An Introduction' at a workshop on 'Research Priorities in Tropical Rainforests in India' at the State Forestry College, Coimbatore, February 2001.

Ruchi Pant, Nakul Chettri and Priyadarshane Shrestha attended a 4-day workshop on 'Orientation and Training of Teachers in People's Biodiversity Register for Conservation of Local Biodiversity Involving Students,' in Haripal, near Calcutta, October 2000.

Ruchi Pant was an invited participant at a workshop entitled 'Public Service Lawyering: Scope and Space for Environmental Advocacy' at the National Law School University of India, Bangalore. She made a presentation on ATREE – Eastern Himalayan Program's work in this arena and discussed the possibility of law students pursuing their short-term internship training with ATREE, November 2000.

Ruchi Pant and Ajay Rastogi, members of the state NBSAP committee, participated in the first NBSAP planning meeting for Arunachal Pradesh, April 2001.

Ruchi Pant, member of the North East Ecoregion Working Group, attended a meeting to discuss the progress of the group in Shillong, May 2001.

Ruchi Pant was invited as a resource person to a training program organized by the Environmental Law Center of North Bengal University, for Forest Officers of Sikkim and North Bengal. She made a presentation on 'New Approaches in Forest and Wildlife Management: Emerging Legislation and Policies in India.' This program was executed under the environment management capacity building project (law component) on behalf of the Government of India and supported by the World Bank. December 2000.

Siddappa Setty, R. and K. S. Bawa presented 'Participatory resource monitoring for NTFPs in BRT wildlife sanctuary, Karnataka' at a seminar on 'Sustainable Management of NTFPs' in Thiruvananthapuram, Kerala, May 2000.

Siddappa Shetty, R. and K. S. Bawa presented 'Participatory resource monitoring in BRT wildlife sanctuary, Karnataka, India' at an international conference on 'Indigenous Indic Traditions in Forestry: Lessons for Contemporary Sustainable Forest Management' at the Indian Institute of Forest Management, Bhopal, February 2001.

Smitha, K. and R. Ramya, presented 'Patterns of productivity and extraction of productivity at MM Hills, Karnataka' at a seminar on Sustainable Management of NTFPs, Thiruvananthapuram, Kerala, May, 2000.

Uma Shaanker, R., K. N. Ganeshiah and M. Nageswara Rao, presented 'Conservation of sandal genetic resources in India: Problems and Prospects,' at an international conference on Science and Technology for Managing Plant Genetic Diversity in the 21st Century, Kuala Lumpur, Malaysia, 2001.

Staff and Associates

Administration and Finance

Dr. Gladwin Joseph	Director/Fellow
Ms. Ruchi Parth	Director/Program Advisor – Eastern Himalayan Program
Ms. Sindhu. K	Senior Accountant
Ms. Kavitha. M	Program Executive
Mr. Ramesh. N	Office Executive
Mr. Anand. S	Senior Administrative Assistant (CISED)
Ms. Sindhu Bhaskar	Librarian
Mr. Bhogaiah	Office Executive
Ms. Nishat Rehman	Office Assistant – Eastern Himalayan Program

Research

Dr. Kamaljit S. Bawa	Senior Fellow (Honorary)
Dr. K. N. Ganeshiah	Senior Fellow (Honorary)
Dr. Sharachandra Lele	Senior Fellow (CISED)
Dr. R. Uma Shaanker	Senior Fellow (Honorary)
Dr. K. V. Raju	Senior Fellow (CISED)
Dr. Nakul Chettri	Fellow – Eastern Himalayan Program
Dr. T. Ganesh	Fellow
Dr. Ankila Hiremath	Fellow
Dr. Jagdish Krishnaswamy	Fellow (Honorary)
Dr. D. R. Priyadarsanan	Fellow
Mr. Aravind. N. A	Research Associate
Mr. Bipin Charles	Research Associate
Mr. C. Made Gowda	Research Associate
Mr. Dinesh. Rao. V	Research Associate
Mr. Kiran. M. C	Research Associate
Ms. Narayani Barve	Research Associate
Mr. R. Ganesan	Research Associate
Mr. Ramachandra. J	Research Associate
Mr. Siddappa Setty	Research Associate
Mr. Sinu. P. A.	Research Associate
Ms. Smitha Krishnan	Research Associate
Mr. Vanaraj. G	Research Associate

Programs

Ms. Toolika Ojha	Database Manager/Program Associate
Mr. Bommaiah	Social Worker – BR hills

Consultants

Mr. Ajay Rastogi	Program Advisor
Mr. Manoj Dabbas	Program Advisor

Ms. Joyeeta Das	Program Advisor
Dr. Soubadra Devy	Fellow
Ms. Seema. S	ATB Conference Coordinator
Ms. Veena Srinivasan	Research Associate

Honorary Associate

Mr. Gopakumar Menon Business Manager CDC Advisors Private Limited, Bangalore Guest Lecturer, St. Joseph's College, Bangalore	Program Advisor
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Summer Interns

Mr. Ramesh Kannan, Madurai Kamaraj University
Ms. S. V. Tejaswinee, Pune University

Support Staff

Mr. Jadeswamy	Driver – BR Hills
Mr. Jadeya	Field Assistant – BR Hills
Mr. Kethe Gowda	Field Assistant – BR Hills
Mr. Kethe Gowda. D	Field Assistant – BR Hills
Mr. Kumbha	Field Assistant – BR Hills
Mr. Laxmikanth	Driver
Mr. Laxmikanthaiah. N	Office Assistant
Mr. Madeva. R	Driver – BR Hills
Mr. Madha	Office Assistant – BR Hills
Mr. Narayanamma	Office Assistant
Mr. Puttaranga. M	Field Assistant – BR Hills
Mr. Rajanna. D	Caretaker – BR Hills
Mr. Nanje Gowda. S	Field Assistant – BR Hills
Mr. Sidda	Cook – BR Hills
Mr. Sunil	Driver

Donors and Partner Organizations

Funding Organizations

- Center for International Forestry Research,
Jakarta, Indonesia
- The Indian Society for Ecological Economics,
New Delhi, India
- Foundation for Revitalization of Local Health Traditions,
Bangalore, India
- The Karnataka Forest Department,
Bangalore, India
- International Development Research Center,
New Delhi, India
- International Plant Genetics Resources Institute,
Rome, Italy; Kuala Lumpur, Malaysia
- John D. and Catherine T. MacArthur Foundation,
Chicago, USA
- Ministry of Human Resources Development,
New Delhi, India
- Department of Science and Technology,
New Delhi, India
- National Geographic Society,
Washington, USA
- The Ford Foundation,
New Delhi, India
- Winrock International,
New Delhi, India
- Wye College, University of London,
Ashford, UK

Collaborators

- Foundation for Revitalization of Local Health Traditions,
Bangalore, India
- The Karnataka Forest Department,
Bangalore, India
- Sri Biligiri Soliga Kiru Aranya Utpadana Samskara Sangha,
BR Hills, India
- Soliga Abhivrudhi Sangha,
Chamrajanagar District, India
- Institute for Social and Economic Change, Bangalore, India
- University of Agricultural Sciences, Bangalore
- University of Massachusetts, Boston, USA
- Vivekananda Girijana Kalyana Kendra,
BR Hills, India
- West Bengal Forest Development Corporation,
Kalimpong, India

Financial Statement



Ashoka Trust for Research in Ecology and the Environment
www.atree.org

Ashoka Trust for Research in Ecology and the Environment

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Hebbal, Bangalore - 560 024.
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E-mail : info@atree.org

Receipts and Payments Account for the year ended 31st March 2001

Receipts	Amount (Rs)	Payments	Amount (Rs)
To Opening Balance of cash and bank	77299.00		
Fixed Deposits	2250000.00		
<u>Receipts from Projects</u>		<u>By Project Payments</u>	
ATB	37148.00	ATB	114796.50
Cifor	970421.00	Cifor	788440.40
DST	125000.00	DST	128225.50
FRLHT	150000.00	FRLHT	246551.25
IDRC	513400.00	IDRC	61.40
IPGRI-Agro	110936.00	IPGRI-Agro	183222.50
IPGRI-FGR	1159013.00	IPGRI-FGR	420513.25
MAC-EH	1034578.00	MAC-EH	1922234.79
MAC-WG	902892.00	MAC-WG	1705355.94
New Ford	14526140.00	New Ford	2009787.78
WYE	1666602.00	WYE	1266949.85
Jagdish IIM	74242.00	Jagdish IIM	46797.40
		Ford	350308.53
Interest	197954.00	IPGRI-Socin Bamboo	273621.20
Sale of asset	40000.00	<u>ATREE Payments</u>	
		Electricity & Water	4244.00
		Office Expenses	5023.50
		Rent	20220.00
		Salaries	22993.00
		Telephones	2519.00
		Vehicle Maintenance	40206.38
		Staff Advances	55394.88
		Other Advances	156665.33
		Deposit(Kotak Mahindra)	73400.00
		House Deposit	400000.00
		<u>Fixed Assets</u>	
		Aquaguard	6340.00
		Furniture	6685.50
		Office Equipment	13770.00
		Jeep (Kotak Mahindra)	177300.00
		<u>Fixed Deposits</u>	12655144.00
		Closing Balance of Cash and Bank	733853.02
Total	23835625.00	Total	23835625.00

Note: Compiled from the information furnished

for G. Anantha & Co.
Chartered Accountants

Gladwin Joseph

Gladwin Joseph
Director

Sindhu K

Sindhu K
Senior Accountant

Rekha K.R

Rekha K.R
Partner



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Hebbal, Bangalore-560 024



<p>Bangalore Office No. 659, 5th A Main, Hebbal Bangalore 560 024, India Tel: (91) (80) 3533942, 3530069, 3638771 Fax: (91) (80) 3530070 email: info@atree.org</p> <p>Mailing Address PO Box 2402, HA Farm Post, Hebbal, Bangalore 560 024, India</p>	<p>Eastern Himalayas Office Bungalow No. 2, Bhujapari, Bagdogra District Darjeeling, West Bengal 734 422, India Tel: (91) (353) 550093 Tel: (91) (353) 551110 e-mail: atree@dtc.vsnl.net.in</p>	<p>Field Research Station BR Hills, Chamarajanagar District Karnataka 571 441, India Tel: (91) (8226) 44076</p>
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Back Cover: Sunrise at Male Mahadeshwara Hills
 Credit: N. A. Aravind/ATREE