A Conservation Assessment and Management Plan (C.A.M.P.) and a Global Amphibian Assessment (G.A.A.) for Amphibians of South Asia -- Executive Summary

A Conservation Assessment and Management Plan (C.A.M.P.) and a Global Amphibian Assessment (G.A.A.) for Amphibians of South Asia were held simultaneously from 1 – 5 July 2002 at the State Forest Service College, Government of India in Coimbatore, Tamil Nadu, India. Forty-seven Participants from five countries of South Asia (India, Sri Lanka, Bhutan, Bangladesh, Nepal) as well as from Great Britain USA and France attended the workshop. Participants consisted primarily of amphibian field biologists and taxonomists, who worked assiduously from morning well into all nights of the workshop to assess 310 species and 9 populations of amphibians of the South Asian region. Five working groups were formed: Sri Lanka (2 groups), North Eastern part of South Asia, and Western Ghats (2 groups). A set of 5 criteria developed over several years by the Species Survival Commission, IUCN were used to assess and then categorise the species. The five criteria are 1. Population reduction, 2. Restricted distribution and fluctuation, 3. Restricted population and fluctuation, 4. Very small or restricted population and 5. Quantative analysis. Species were categorized as given below. Although minor changes in these numbers may be made when some information has been checked, it will not alter the fact that most amphibian species in South Asia are in deep trouble.

The Earth is suffering from a serious extinction crisis that could compete with any other of the last billion years. Tropical rainforests and freshwater habitats are at the center of this crisis with species of animals and plants nearing extinction and actually becoming extinct at an unprecedented rate, for the most part due to human actions.

One of the groups of animals to be most affected by this crisis are amphibians – frogs, toads, caecilians. In South Asia itself, with 18 species having been assessed as Extinct and 134 as Threatened by the region's formost amphibian biologists at the recent CAMP workshop, it is clear that the crisis is very serious indeed. The high rate of decline of amphibians provides an indicator for the state of the natural world in all regions and even niches where it is known. It is possible that such advance warning for both species and ecosystems could lead to protection measures which would save highly threatened species and habitats. Therefore, field studies followed by status assessments of such fauna as amphibians are crucial for all fauna and flora. This is particularly true for Data Deficient species which could become Extinct before we even know they are in trouble !

Fewer that 1000 of the 5000 known amphibian species have been assessed for their conservation status, although many more have been studied. Experts fear that more than 50 amphibian species have become extinct over the last 15 years alone, a conservative estimate considering the result of 18 Extinctions from South Asia alone. Following a meeting of the Global Amphibian Specialist Group in January 2001, it was decided to implement a Global Amphibian Assessment (GAA) over a two-year period which will provide a blueprint for amphibian conservation in the world over the next 10 years.

Table: Draft Summary – Categories of Species assessed in 2002 S.Asian Amphibian CAMP

	Category	Meaning (abbreviated)	# Spp
EX	Extinct	(no reasonable doubt that the last individual has died)	18
CR	Critically Endangered	(facing an extremely high risk of extinction in the wild in immediate future)	32
EN	Endangered	(facing a very high risk of extinction in the wild in the near future)	58
VU	Vulnerable	(facing a high risk of extinction in the wild in the medium -term future)	44
NT	Near threatened	(close to qualifying for a category of threat)	14
LC	Least Concern	(does not quality for a category of threat; widespread and abundant)	82
DD	Data Deficient	(having insufficient information to make a risk assessment)	63
NE	Not Evaluated	(not yet been assessed against the criteria)	8
			319

Global Amphibian Assessment or GAA, a collaborative project between Conservation International and the IUCN Species Survival Commission, is a comprehensive, strategic review of the overall conservation status of every species of amphibian, with an analysis of their conservation needs. It is being carried out regionally with experts from the region collecting initial data and entering it to a special GAA data base. For regions where meetings of experts were already scheduled, GAA asks them to review this output, and for species-rich regions, specific workshops are being organized.

In South Asia Dr. Sushil Dutta, Co-Chair, Declining Amphibian Population Task Force, South Asia (DAPTF-SA) was responsible for the initial compilation. In addition, as a follow-up for an earlier workshop called a Conservation Assessment and Management Plan (C.A.M.P.) for Indian Amphibians held in 1997, which provided much of the information for the initial data entry, a similar workshop was planned for 2002 for all South Asia. This workshop was spearheaded by Sanjay Molur, also Co-Chair of DAPTF-SA.

The Conservation Assessment and Management Plan (C.A.M.P.) Workshop was developed by the IUCN SSC Conservation Breeding Specialist Group which is one of the 100+ specialist groups of IUCN. The CAMP process combines several elements – scientific expertise, human social dynamics, participatory methodology and careful, systematic planning with the IUCN SSC Red List methodology of assessing species by applying objective, scientific criteria and assigning species to a category of threat.

The two activities furnished a convenient and useful forum as most of the GAA and CAMP information needs are the same. Combining CAMP and GAA enhanced both methods.
The assessments provide a means of making incisive, practical recommendations for further studies, for direct conservation action, for legislation, for public awareness, and other steps towards conserving species and their habitats.

The Draft Report was printed and distributed to participants at the workshop itself so they could make corrections, add items of information not available at the workshop and review their work. The corrected version will be published as a Report and distributed to all South Asian professional wildlife biologists, foresters, policy makers, and politicians. An education programme to disseminate the information in the Report to all levels of people using zoos, NGOs, participants, and a variety of methods is under plan.

The information produced through the GAA will be drawn together and analysed to prepare a comprehensive assessment of the status and conservation needs of amphibians, including information on geographic patterns of diversity, levels and types of threat, overall trends, habitat requirements, and conservation priorities.
The output will be fully integrated into the official IUCN Red List of Threatened Species. It will be submitted to the national wildlife agencies of each South Asian country for consideration with reference to their legislation, wildlife policy and CBD strategic plans. The results will be directly linked to Conservation International's 'hotspot' conservation work.

The Amphibian CAMP and GAA Workshop was sponsored by Conservation International (Center for Applied Biodiversity Science and Critical Ecosystems Partnership Fund), Chicago Zoological Society, Columbus Zoo and others contributing in kind. The workshops were organized and facilitated by DAPTF, South Asia, Wildlife Information Liaison Development (WILD), Zoo Outreach Organisation (ZOO), CBSG, South Asia.

The Global Amphibian Assessment
Neil Cox*

The world is entering an extinction crisis that is potentially more serious than anything that has taken place over the last billion years. This extinction crisis is particularly serious for species that occur in tropical rainforests and freshwater habitats. Amphibian are one group for which extinctions seem to outstrip even the worst predictions.

Until now, fewer than 1,000 of the 5,000 known amphibian species have ever been assessed for their conservation status and needs. It is feared however that over the past 15 years, some 40-50 amphibian species have become extinct, including well-documented extinctions occurring in Central America, Puerto Rico and Australia.

Following the first meeting of the Global Amphibian Specialist Group (Washington DC, January 2001), Conservation International (CI) immediately started to implement a Global Amphibian Assessment (GAA), over a 24-month period, in collaboration with the IUCN Species Survival Commission. In essence, the GAA is a comprehensive, strategic review of the overall conservation status of every species of amphibian, with an analysis of their conservation needs. It will become the blueprint for amphibian conservation worldwide over the next decade. This blueprint is needed in order to ensure that future investments in amphibian conservation are spent wisely and directed towards activities that will stem the tide of amphibian extinctions.

Currently the following activities are being undertaken in close collaboration with leading amphibian experts around the world: assessment of the risk of extinction for each described amphibian species according to the accepted global standard (the IUCN Red List Categories and Criteria), with an examination of the type of threats the species is experiencing, such as habitat loss, disease or over-harvesting. Distribution maps are being drawn for every amphibian species, with the habitat preferences of the species being described and recorded. The types of conservation actions (both those that are currently in place as well as those that need to be implemented), and population trends for each species will also be documented.

The GAA is being conducted on a regional approach. Regional Coordinators are responsible for the initial data collection, and entry of these data in the GAA database. For those regions in which expert meetings of herpetologists are already scheduled, the Assessment intends to take advantage of the opportunity to ask those present to carry out reviews of the results. In some larger and species-rich regions, specific GAA expert review workshop will be organised.

Neil Cox of CI CABS Biodiversity Assessment inputs data into the special GAA data base. Later the information will be digitised for GAA.

Simon Stuart, Senior Director of CI CABS, seconded from his IUCN SSC position, awards certificates to participants of the CAMP GAA.

The information produced through the GAA will be drawn together and analysed to prepare a comprehensive assessment of the status and conservation needs amphibians, including information on geographic patterns of diversity, levels and types of threat, overall trends, habitat requirements, and conservation priorities. The results will be fully integrated into the official IUCN Red List of Threatened Species, and will be directly linked to CI's 'hotspot' conservation work.

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Center for Applied Biodiversity Science at Conservation International

Introduction

Conservation International's (CI) mission is to conserve our planet's biodiversity and to demonstrate that human societies can live harmoniously with nature. With a major grant from the co-founder and chairman emeritus of Intel Corporation, Gordon E. Moore, and his wife Betty, CI launched the Center for Applied Biodiversity Science (CABS) in 1998 to generate and disseminate science-based information in support of CI's broader goals.

The mission of CABS is to strengthen the ability of CI and other institutions to accurately identify and quickly respond to the emerging threats to Earth's biological diversity. CABS brings together leading experts in science and technology to collect and interpret data about biodiversity, to develop strategic plans for conservation, to forge key partnerships in all sectors to achieve conservation goals, and to promote public awareness of and involvement in the challenges of saving the planet's living resources.

Science in Conservation

Conservation of our planet's diversity of species and ecosystems is imperative for a multitude of reasons. We know that human populations and consumption now dominate most ecosystems. In turn, we know that this encroachment is dramatically accelerating rates of species extinction. We also have increasing evidence that biodiversity leads to ecosystem stability. Nevertheless, we still have much to learn about why the world contains such enormous natural diversity, the role of species diversity in ecosystem stability, and the impacts resulting from the loss of this biodiversity.

To address these unknowns, conservation must turn to science. As in the practice of medicine, conservation needs highly skilled scientists who can provide early and accurate diagnoses, prescriptions for urgent actions, and long-term research. The 1992 Convention on Biological Diversity, signed by 175 countries, reflects a growing global consensus on the importance of biodiversity in maintaining the planet's life-support systems. Politicians and economists are now aware that there is an unequivocal deadline for saving the planet. Hence, conservation scientists are rapidly collecting and compiling information to help decisionmakers conserve the most precious and endangered areas on the planet, our global biodiversity hotspots. The Center for Applied Biodiversity Science (CABS), a division of Conservation International (CI), provides this guidance.

CABS tackles the urgent, global-scale questions of conservation science through collaborations with universities, research centers, and multilateral governmental and nongovernmental organizations (NGOs). CABS researchers use state-of-the-art technology to collect data, consult with other experts around the world, and disseminate results. In this way, CABS research acts as an early warning system by identifying the most threatened areas before they are destroyed. CABS also provides scientists and decisionmakers with tools and recommendations for protecting the hotspots. By providing the scientific underpinnings for conservation solutions, CABS guides CI's larger efforts to demonstrate that human societies can live harmoniously with nature.

Collaboration and Partnerships

CABS believes that conservation solutions will be most effective when they have been constructed by experts drawn from a wide array of disciplines and experiences and scrutinized by local users. Therefore, CABS actively works to foster formal partnerships with a diverse set of organizations to advance the goal of biodiversity conservation. Our collaborations with international development agencies such as USAID and the World Bank Research Group, for example, work to funnel resources into biodiversity hotspots and wilderness areas for onsite research and capacity building. To leverage the results of our work in the hotspots, CABS is hosting the Secretariat of Biodiversity Conservation Information System (BCIS), which is a consortium of 12 conservation organizations that brings the global conservation community together to share information and identify areas for cooperation.

Among CABS' scientific resources are resident experts in museums and research institutions around the world, including collaborators from the Smithsonian Institution's National Museum of Natural History in Washington, DC, and the Zoological Museum at the University of Copenhagen in Denmark. We also work extensively with other leading NGOs in biodiversity research, monitoring, and priority-setting efforts. For example, CABS is working in the Amazon with the Woods Hole Research Center, Instituto Pesquisa Ambiental da Amazonia (IIPAM), and others to produce scientifically-based information about present and future trends of land use in the Amazon basin and evaluate the costs and benefits of such trajectories. This knowledge will be used to better aid and influence government development strategies in order to benefit local communities, and maintain biodiversity and ecological resources.

Key to our collaborative strategy is CABS' annual funding of Research Fellows, investigators from a variety of disciplines. CABS' sponsorship enables these scientists to generate data, refine techniques, and develop approaches in applied biodiversity science, as well as publish the results of their work. Currently, CABS supports 22 Fellows, including Drs. Thomas T. Struhsaker and John Oates, who are investigating forest-protected areas across the African continent; and Dr. Carlos Peres, professor of ecology at the University of East Anglia in the United Kingdom, who is examining the effects of hunting in Amazonian habitats.

Understanding the Nature and Scale of Threats

The threat of species extinction poses significant challenges to biodiversity conservation in the hotspots. Monitoring

trends in species diversity and distribution is one way to track these threats across the planet. CABS researchers are partnering with other researchers and institutions around the world, sharing databases, species lists, and other information in a massive effort to inventory biodiversity and analyze species loss on the planet. These data will allow History in the United States and at the Open University in England to organize and employ databases developed by the Declining Amphibian Populations Task Force. As part of this global collaboration, CABS has formed an exciting new partnership with the IUCN Species Survival Commission (IUCN/SSC) to expand the scope and impact of the IUCN Red List of Threatened Species- the world's official listing of threatened species. The Red List is being expanded into a new biodiversity assessment initiative, which involves evaluating the status of more than 100,000 species over the next six years and mapping their distributions. The first project of this new initiative is the Global Amphibian Assessment, through which the status of all 5,000 species of amphibians is being reviewed by experts throughout the world. As part of this initiative, CABS is also developing partnerships with BirdLife International, the Association for Biodiversity Information, and the Ocean Conservancy.

To successfully confront conservation challenges, CABS is also spearheading the first worldwide effort to establish a network of biodiversity monitoring stations. These field stations will be located in every region important to tropical biodiversity and, for the first time, will collect data on key indicators in a standardized format. This is the only way to guarantee the kind of consistent, long-term data required to effectively conserve biodiversity. The information gathered from these field stations will provide the raw data needed to create the first fully operational Early Warning System for Global Biodiversity.

Several of CABS' projects address threats to biodiversity at regional and local levels. For example, CABS researchers are working with specialists in South Africa to model the impact of climate change on the Succulent Karoo and Cape Floristic Province biodiversity hotspots.

With a consortium of partners, including the American Zoo and Aquarium Association, the Jane Goodall Institute, World Wildlife Fund (U.S.), and the Wildlife conservation Society, CABS has also helped launch the Bush-meat Crisis Task Force to address the most significant immediate threat to wildlife populations in West and Central Africa today.

In West Africa, CABS and our partners are engaging local and regional decisionmakers in devising strategies to curb the growing commercial trade of bushmeat and other wildlife products. Activities include funding pilot initiatives to investigate some of the possible solutions to the crisis. In Brazil, CABS, PROBIO (an initiative on biodiversity by the government of Brazil), and the World Bank funded a multidisciplinary research team to study conservation of the Atlantic Forest of Southern Bahia.

Over the past year, CABS has been building a conservation strategy for the World's freshwater turtles and tortoises. This effort focuses on Asia, which contains one-third of the world's turtle species. Human consumption of turtles for food and traditional medicine has caused many species in Asia to become endangered. CABS is collaboration with private turtle hobbyists, zoos and aquariums, university researchers, and other conservation organizations to prevent the extinction of these species.

CABS is also actively involved in the Tropical Andes, which is arguably the world's richest biodiversity hotspot, as well as the home of 165 different traditional ethnic groups. CABS and other CI researchers are studying the biological, economic, political, and cultural systems in this region. They are also constructing methods to assist indigenous communities in implementing sound natural resource management plans that support biodiversity conservation goals. In addition, CABS is evaluating the effectiveness of forest protection initiatives in Africa, as well as examining how reforestation can play a role in a conservation strategy in the Philippines and other hotspots.

CABS Departments

Drawing on a diverse array of in-house and outside experts, CABS has consolidated the scientific and technical resources within CI. Five departments and programs form the core of CABS: Conservation Biology, Geographic Information Systems, Strategic Planning, Conservation Economics, and Regional Analysis.

Conservation Biology

Researchers from CABS' Conservation Biology Department gather and analyze data on the distribution of species in biodiversity hotspots and major tropical wilderness areas. This biogeographic information is used, in turn, to guide and support CI's regional conservation activities by helping other scientists, planners, and policymakers identify key areas for conservation and focus on the particular actions that should be taken.

The department has four research programs: three Rapid Assessment Programs (RAP) in terrestrial, freshwater, and marine ecosystems, and the Biodiversity Assessment Program. The RAP teams conduct field surveys in critical areas to obtain information vital for conservation efforts at the regional level, in many cases specifically associated with the work of CI's country programs. The surveys focus on compiling inventories of fauna and flora in terrestrial, freshwater, or marine ecosystems.

Rap Programs

Each RAP expedition mobilizes teams of expert and host-country scientists, whose combined knowledge of tropical biodiversity allows them to assess the uniqueness and conservation value of an area quickly. RAP teams also provide training in inventory techniques and analysis, as well as in monitoring methods for local, CI, and other scientists and NGO staff.

Since 1990, RAP surveys have been carried out in 36 terrestrial, freshwater, and marine sites throughout the world, and future surveys are planned for Indonesia, West-Africa, Papua New Guinea, Madagascar, Peru, and Suriname. The main focus of marine RAP surveys is the "coral triangle," the region containing the richest coastal and marine biodiversity in the world, encompassing Indonesia, the Philippines, Malaysia, Papua New Guinea, southern Japan, and northern Australia. The results of terrestrial,

freshwater, and marine surveys are published and widely distributed in the RAP Bulletin of Biological Assessment.

Biodiversity Assessment Program

The fourth research component in the Conservation Biology Department is the Biodiversity Assessment Program, which includes research on the distribution patterns of species on regional, continental, and global scales. Global projects include analyses of extinction and threats to plants and major vertebrate groups, especially in collaboration with BirdLife International and the Species Survival Commission of the World Conservation Union. Regional and continental-scale projects include mapping terrestrial vertebrates in the hotspots and major tropical wilderness areas, identifying the threatened species where they occur, and examining means for their protection, especially through protected areas such as national parks.

Geographic Information Systems

We recognize that biodiversity information is a key requirement for the success of any conservation initiative. Field research projects both require and produce enormous amounts of information that must be managed, analyzed, and presented in cost-effective ways. More than 80 percent of all conservation-related data have associated geographic attributes and are most usefully analyzed with geographic information systems. The Geographic Information Systems and Mapping Laboratory (GIS lab) of CABS supports two major goals of CI and its partners. First, the lab provides conservation mapping and database support for staff and researchers in all regions where CI has an on-the-ground presence. Second, the lab carries out special projects specifically for the research and development needs of CABS. The GIS lab has a broad array of advanced hardware and software resources that serve as the backbone of its operations. By developing and using advanced tools for mapping and data analysis, the GIS lab allows researchers, policymakers, land-use planners, and local stakeholders to visually monitor ecological changes and human impacts in global biodiversity hotspots and in major tropical wilderness areas.

Strategic Planning

Three programs within the Strategic Planning Department focus on facilitating and enhancing conservation planning processes at local, regional, and global levels: the Conservation Priorities Program, the State of the Hotspots Program, and the Conservation Information Tools Program.

Conservation Priorities Program

The Conservation Priorities Program identifies critical areas and actions for conservation in the biodiversity hotspots and major tropical wilderness areas. The goal of this program is to orchestrate highly participatory processes that bring together local and international conservationists and scientific teams to collect, synthesize, and evaluate information on species diversity and conservation status in specific regions. These processes culminate in Conservation Priority-Setting Workshops, in which experts build consensus about what and where conservation priorities should be.

Conservation Priority-Setting Workshops have been conducted in many areas, including the Amazon Basin, Papua New Guinea, northeastern Brazil, Madagascar, the Maya Forest, Papua Province, and West Africa, among others. The Brazilian government, for example, has officially adopted the workshop approach and has conducted workshops for each of its five major biomes as a basis for developing its National Biodiversity Conservation Strategy, one of the country's obligations under the 1992 Convention on Biological Diversity. These workshops result in reports, maps, and other products that form the first integrated conservation information system for the region and act as an important resource for improving conservation decisions. Most important, the workshop approach forges relationships among partners, both formal and informal, that are critical to turning conservation priorities into conservation action.

State Of The Hotspots Program

In 1999, CI produced the landmark publication *Hotspots: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions,* the most current status report on Earth's highest conservation priorities. Following up on this work, CABS' State of the Hotspots Program is monitoring these hotspots and disseminating information about them to the conservation community and the public. The program builds networks among institutions that share the responsibility of evaluating and monitoring each hotspot. As the critical importance of conserving biodiversity becomes more widely understood, the State of the Hotspots Program will provide researchers, institutions, and individuals with regular updates about the state of biological diversity, the dynamics of threat, and the capacity for conservation response within the hotspots.

Conservation Information Tools Program

The Conservation Information Tools Program (CIT) develops information and support systems for improving decisionmaking about biodiversity conservation. These tools range from Web-based knowledge management systems to decision tools and information CD-ROMS. For example, CIT has developed Condor, a CD-ROM-based system for analyzing the environmental impact of infrastructure development, and Prisma, a tool for organizing, documenting, and distributing information about a particular region. Using Prisma, CIT publishes and widely distributes databases containing the results of Conservation PrioritySetting Workshops and planning processes.

CIT is also developing Internet-related methods that will allow CI researchers around the world to share information with each other, as well as with other scientists and the public. CIT has been leading CI's effort to improve public access to information about biodiversity through the development of Investigate Biodiversity, a Web site for those interested in conservation and research.

Conservation Economics

The Conservation Economics Program (CEP) conducts economic research and analysis that contribute to CABS' mission of identifying emerging threats to biodiversity and developing strategies to address those threats. CEP's projects include examining trends in the production of important tropical commodities, analyzing the effectiveness of existing conservation tools, investigating the opportunity

cost of conservation, and using this information to develop and field-test new conservation strategies. In its projects around the world, CEP collaborates with dozens of experts from a wide range of disciplines to derive a robust range of models and methods.

All CEP projects address the difficult question of what conservation costs-in terms of both ensuring effective protection and understanding what is given up (or gained) when land is devoted to conservation. One example of a recent CEP study is an analysis of the economic value of natural areas around the tropics, using data on land purchase prices, agricultural production, and subsistence uses. The goal of this study was to understand better the value of current practices, such as sustenance farming, logging, and small-scale agriculture, versus the costs of devoting land to conservation.

A central finding of this analysis is that in much of the tropics, many current and planned land uses cause irreversible loss of biodiversity, yet are only marginally profitable. In this context, the economic opportunity cost of conservation is quite low. Slowing the expansion of these land uses will have limited impact on regional economies. To take advantage of low Opportunity costs, CEP is developing a tool called “conservation concessions,” a financial mechanism to directly compensate resource users for conserving natural resources instead of depleting them. A multidisciplinary team has been testing this approach in a variety of contexts throughout the tropics, with promising results.

CEP is also involved in researching supply, demand, and technological developments in the production of a number of major tropical commodities, including coffee, cocoa, palm oil, cattle, petroleum, and wood. The development of these commodities in hotspot areas has concrete implications for biodiversity. CABS research in this area can help to predict which activities will pose the greatest threat to biodiversity and recommend how to address these threats before they become too costly to overcome.

CEP researchers have also finalized a study of the effectiveness of parks for protecting biodiversity in the tropics. This study was aimed at providing decisionmakers with useful data about the optimal role of parks in conservation strategies. CEP researchers have also looked at the viability of consumer boycotts, certification, and other standard approaches to conserving species threatened by international trade.

Regional Analysis

One of the major knowledge gaps facing both conservationists and policymakers is the lack of reliable information about ecosystem health and landscape change in terrestrial and marine environments. The mission of CABS’ Regional Analysis Program is to use satellite, aerial, and field-based observation to characterize and monitor the impacts of human activities on biodiversity in the hotspots. This monitoring system is based on the new generation of space- and airborne remote sensing instruments. Together with more comprehensive databases on social, economic, political, and legal factors, it is enabling us to better understand the relationships between the biophysical environment and patterns of human use.

Archiving and processing 20 to 30 years of satellite data have made it possible to research temporal trends in land cover and vegetation conditions. As part of CABS’ Biodiversity Early Warning System, Regional Analysis is systematically mapping and monitoring ecological change at global, regional, and local scales, and developing models that help predict future trends in natural resource use in the hotspots. Our aerial survey capabilities further enable us to acquire land cover data at a scale intermediate to field measurements and satellite imagery. Armed with these tools, scientists from Regional Analysis are modeling the relationships among threats such as deforestation, infrastructure development, wildfires, and climate change, and disseminating the results to conservationists in the field.

Some of the best sources of information on landscape ecological dynamics are derived from multi-institution collaborations involving governmental, research, and non-governmental institutions. These initiatives include the NASA Land Cover Land Use Change (LCLUC) program, the Large-scale Biosphere-Atmosphere Study of the Amazon (LBA), the Global Observation of Forest Cover (GOFC) network, and the NASA NGO Steering Committee for Biodiversity Conservation. Regional Analysis participates in these networks to produce updated land cover and change analyses for the hotspots, and is organizing a series of scientific workshops to help define the next generation of remote sensing technologies and standards for biodiversity mapping.